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Universal design for learning

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Abstract

The purpose of this paper is to discuss the importance of the Universal Design for Learning (UDL) principles, diverse learning styles, assistive technology/ tools for learning in the regular education classroom. This paper will focus on teachers reevaluating their current curricula and how they should start looking at the presentation of materials within their curriculum and consider the barriers their students might have to each of these presentation types. This paper will go into depth about universal access and how important it is in the planning and purchasing of new curriculum materials. It will also discuss the importance of assistive technology tools for learning that are appropriate for every student, not just those with disabilities.

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TABLE OF CONTENTS

The purpose of this paper is to discuss the importance of the Universal Design for Learning (UDL) principles, diverse learning styles, assistive technology/ tools for learning in the regular education classroom. This paper will focus on teachers re-evaluating their current curricula and how they should start looking at the presentation of materials within their curriculum and consider the barriers their students might have to each of these presentation types. This paper will go into depth about universal access and how important it is in the planning and purchasing of new curriculum materials. It will also discuss the importance of assistive technology tools for learning that are appropriate for every student, not just those with disabilities.

Universal Design for Learning originated from the Center for Applied Special Technology (CAST). The UDL framework is comprised of three basic principles: providing multiple forms of expression, control, and representation in curricular design (Orkwis and McLane 1998). The UDL principles will be explained and specific examples will be given in more detail later in this paper.

Assistive technology helps people of all ages and disabilities learn, practice, and accomplish skills necessary to be independent and successful. These customized tools provide individualized and specialized access through technology. They are used with students who have identified disabilities and are not to be confused with the general tools for learning that will be discussed later in this paper.

It is the belief of this author that if every educator would consider diverse learning styles, UDL, and tools for learning, the burden of individualized instruction would be alleviated.

The main goals of the Lisbon pilot project were to make regular education teachers more aware of assistive technology in the IEP process, to make the current curriculum accessible to all learners and to ensure future curricular purchases to be universally designed.

The focus of the discussion will be to demonstrate how these areas were applied to the Lisbon pilot project. In this paper the reader will also find, an explanation of diverse learning styles, a definition of the three principles of UDL, tools for learning, assistive technology and a blueprint of how one school embarked on a journey of change.

Methodology

The sources in this paper come from a variety of authorities. Some of the authors who are sited in this paper have done years of research on diverse learning, tools for learning, and universal access. Many lead the nation in the research of these topics. Some have written books or their works are found on the Internet for all educators to access. There are also some resources from local AEA Assistive Technology Consultants, who were willing to share their expertise on the topics discussed in this paper. They were an integral part of the pilot project implementation and training phases.

The methods used in locating resources for this paper were searches on ERIC using Universal Design for Learning as a descriptor. The professional development library from the local area education agency and resources gathered by attending assistive technology workshops.

Discussion

Universal Design for Learning was developed by an organization called the Center for Applied Special Technology (Orkwis and McLane 1998). The universal design project began in the fall of 1997 and was designed to address the issues involved in universal design as they relate to full access to the general education curriculum for students with disabilities. This activity was a collaborative effort funded by the U.S. Office of Special Education Programs through the ERIC/OSEP Special Project and the National Center to Improve the Tools of Educators (NCITE), with the partnership of CAST (Orkwis and McLane, 1998). The main purpose for this collaborative effort came from the growing interest in the application of UDL principles in various instructional media to meet the requirements of the Individuals with Disabilities Education Act (IDEA).

The IDEA Amendments of 1997 stated that students with disabilities must be given the opportunity to progress in the same general curriculum taught to all other students in the public educational system. This requirement has significant implications for the practice of special education, particularly as it relates to the Individualized Education Programs (IEP) which now must include:

- a statement of how the child s disability affects his/her involvement and progress in the general curriculum;
- a statement of measurable annual goals for enabling the child to be involved in and progress in the general curriculum;
- a statement of the education, services, program modifications and supports necessary for the child to be involved in and progress in the

> general curriculum, including whether the child requires assistive technology devices and services.(Orkwis and McLane, 1998)

Thus, curriculum access for all students, regardless of their disabilities, is not merely a trend in the field of special education but a requirement of the law governing all public schools. The general education teacher plays a much more active role in the IEP process than ever before. (Orkwis and McLane, 1998)

In order for the involvement of special students to be meaningful, and for the expectation of progress to be realistic, the curriculum must be made accessible to the students (Orkwis and McLane, 1998). In light of the IDEA requirements and their implications, it seems particularly timely to examine what curriculum accessibility means for students with various types of disabilities and how to design instructional materials that provide meaningful accessibility and involvement for students, regardless of their ability levels.

What does access to the curriculum mean? For any student to learn and progress in the subject matter taught in school, he or she must first have access to the curriculum (Orkwis and McLane, 1998). Access to the curriculum begins with a student being able to interact with it to learn. For students with disabilities, an inability to interact with the curriculum, because of physical, sensory, or cognitive barriers, can be the first stumbling block to success. In order for these students to understand and learn, the curriculum must be delivered with a variety of supports for the student. This can also hold true for students without identified disabilities. The barriers to access must be removed, but, importantly, the curriculum has to continue to challenge them.

In a perfect world, a curriculum should be able to be modified or customized to meet the needs of both teacher and student. This could mean accommodations for sensory impairments, such as Braille and captioning or alternative text software that will read the textbook aloud for the visually impaired student. The supports and challenges must be embedded in learning activities and the activities must motivate the learner. In addition to accessing the curriculum, the student has to engage it in order to learn (Orkwis and McLane 1998).

According to (Orkwis and McLane, 1998), the foundation of curriculum access for all students is the design of educational materials which are the primary tools used to teach curricular content. For instance, how can textbooks and other instructional materials in any medium meet the learning needs of students with or without disabilities? Can they be readily adapted to accommodate the instructional needs of the many diverse learners in any classroom? The greater the flexibility built into the materials, the greater the number of students who can be reached with a single curriculum. This designed-in flexibility of use is the premise of UDL.

Universal design was a concept originated in architectural studies, where considerations of physical access for individuals with sensor motor disabilities led to designs that incorporated assistive technologies and adaptations. Two examples of such adaptations are curb cuts and automatic doors. One main quality of universal design is that the adaptations are built in rather than added as an afterthought. What makes the design universal is that the adaptations not only allow access to those who have disabilities but they make it easier for everyone to use the space. Ramps built-into a building allow people to easily enter the building when using a wheelchair or when

pushing a cart or a stroller, and anyone with an armload of groceries can appreciate automatic doors (Orkwis and McLane, 1998).

Researchers in education have taken the considerations of built-in adaptations in the architectural world and adapted them to the educational world. These adaptations were first designed for students with physical or sensory disabilities as a means to accessing the curriculum. Two examples of such adaptations are; screen readers and sticky keys. Research has progressed into field of cognitive disabilities and curriculum design. The two groups that have been instrumental in applying the concept of universal design to cognitive issues are CAST and NCITE (Orkwis and McLane, 1998).

Universal design is interpreted as the design of instructional materials and activities that allows the learning goals to be achievable by individuals with wide differences in their abilities to see, hear, speak, move, read, write, understand English, attend, organize, engage, and remember. Universal design for learning is achieved by means of flexible curricular materials and activities that provide alternatives for students with disparities in abilities and backgrounds. These alternatives should be built into the instructional design and operating systems of educational materials-they should not be added later (Orkwis and McLane, 1998).

According to UDL advocates, it is more efficient and economical to buy materials that are universally designed. For instance, if a publisher produces a textbook that is also digitally formatted, that publisher can reach a wider market with a single product. Teachers save time by not having to adapt the curriculum to those with special learning needs. Using universally designed materials, both print and electronic, teachers only need to teach one flexible curriculum in order to reach all learners (Sweeney, 2001).

Universal design does not mean that instructional materials and activities accommodate students by lowering the standards. Universal design is not dumbing down the curriculum. Universally -designed instruction provides alternatives through its flexibility (Orkwis and McLane, 1998).

Universal design is intended to be inclusive, not just for students with disabilities. A curriculum that incorporates universal design features should do more than accommodate physical, sensory, or cognitive disabilities. A universally designed curriculum will also accommodate students with differing abilities, cultural and linguistic backgrounds, and differing learning styles. If any type of learner is excluded from a particular teaching method or material, then it works against the principles of universal design (Orkwis and McLane,1998). What follows is a discussion of the basic principles of Universal Design for Learning including; providing flexible means of representation, control and expression.

There is no single method for presentation of information that will provide equal access for all learners (Orkwis and McLane, 1998). Text that is printed is fixed and creates barriers for many students because it is not flexible. Digital text (on a computer) is flexible. It can be easily transformed in size, shape, or color and be automatically transformed into spoken speech.

Audio formatted information can create barriers for students who are deaf or are non-native speakers of the language, who have auditory processing problems and even for those students who are easily distracted in a noisy environment. Audio with captions provides flexible alternatives for all of these.

Information that is presented solely in graphic or pictorial form causes barriers for those students who are blind or have low vision. Digital images with verbal description provide access and flexibility for those students. (pg.4) Summaries of big ideas for those students with linguistic or conceptual barriers. Those students have difficulties with key concepts and access can be improved by providing summaries.

Pre-testing for required background knowledge prior to an activity can help a teacher be more prepared. Digital materials can include optional supports for background knowledge. There is no single method of expression that will provide equal access for all students. Students with physical barriers to forming letters, writing legibly, or spelling words should not be expected to perform pencil and paper exercises. The same tasks can be performed on the computer using tools such as; on-screen scanning keyboards, enlarged keyboards, word prediction software and spellcheckers. Students with verbal barriers could not do speeches and oral presentations, but providing the option of creating a multimedia presentation gives them access to the curriculum. Students with physical barriers to writing would have a difficult time drawing or illustrating. Digital graphic programs and image libraries provide the needed support for those students.

Students with learning barriers need to have the instruction broken down into explicit step -by -step instructions. Scaffolding is a temporary support for learning that is gradually reduced as the student develops confidence with the new content or skills. An example of scaffolding would be a bilingual student being allowed to give an oral book report in his native language, but the teacher would ask questions regarding the book report in English.

Ensuring that all children are engaged in a learning environment. Providing for individual differences in background, culture, developmental experience, or neurological makeup can result in different patterns of motivation. For a curriculum to engage a majority of learners, it should provide flexible alternatives. Providing flexible options for setting the level of challenge and building in supportive scaffolds allows more children to find the right balance. Providing flexible options for the amount of repetition, familiarity, randomness, and surprise allows more children to stay engaged. Providing key concepts in multiple formats and contents provides alternatives that are likely to engage a broader range of children. For any child or teacher, the opportunity to contribute to the curriculum by adding his/her own images, sounds, words and texts to what has already been developed, often leads to deeper engagement in the curriculum. This type of curriculum is flexibly structured to allow for direct input from students with differing abilities which allows the curriculum to be reached in more effective ways (Orkwis and McLane, 1998).

How is UDL being implemented? Teachers who want to begin implementing universal design must begin by using curricular materials that are flexible. Although digital materials are not the only way to deliver a universally designed curriculum, they allow the greatest flexibility in presentation (Sweeney, 2001). They can be easily customized to accommodate a wide range of student abilities, but the teacher and the students must know how to use them. The mere presence of good software programs in the classroom does not guarantee that they will provide needed access. As stated earlier, access provided by universal design for instructional materials does not mean that students are accommodated by lowering the standards or dumbing down the

curriculum. A software program for beginning readers could have different settings for the speed at which the information is presented and highlighted (multiple representations). It could be controlled with vocal commands, single switch controls, or alternate keyboards (multiple expressions). It could request different levels of responses from students, from having them repeat the sounds of letters and words to creating their own stories using the vocabulary words they have learned. All of these accommodations allow the necessary flexibility for student access and the necessary challenge for learning (Orkwis and McLane, 1998).

Pilot Project

The Lisbon Community Schools became a part of the UDL pilot project to ensure regular education teachers a more active role in the IEP process. The Lisbon teachers were first introduced to UDL through workshops and meetings conducted by local AEA Assistive technology consultants and a nationally known assistive technology expert Judith Sweeney.

Sweeney (2001) shared an assistive technology continuum with the Lisbon staff to be used during child study or IEP meetings. An adapted version of the continuum has been adopted by the school district (Appendix A). This continuum is to be filled out by the regular education teacher before going to an IEP or child study meeting. Since the revised IDEA states that assistive technology is to be considered in the IEP process, the UDL leadership team in Lisbon revised Judith Sweeney s continuum to meet the needs of the Lisbon students.

Now that Universal Design for Learning has been defined and explained, the next portion of this paper focuses on what it takes to get UDL designed technology into

classrooms. The following information is based on a study conducted in a middle school resource program in Wakefield, Massachusetts (Pisha, 1998).

Pisha (1998) along with his colleagues from CAST, did a collaborative study with OSEP researchers. This study was based on the three universal design principles to develop and research a software tool and instructional approach that would improve cognitive access for students with special needs to the general education curriculum. Current textbook materials and teaching practices typically fail to effectively provide support that can be individualized for students who need help (Pisha, 1998, p.11).

The project focused on refining the CAST-developed ULTimate Reader. This software uses an electronic version of the textbook or materials that the teacher is already using, and provides a rich variety of highly flexible reading supports such as adding spoken voice and visual highlighting to the electronic text. It is designed to support students as they learn about social studies from textbooks and the Internet. The support is scaffolded which means, it gradually reduces support as students develop more independence in the curriculum (Pisha, 1998).

Pisha (1998) chose a social studies text that was difficult for students with limited reading skills. With permission from the publisher, the text was digitized and loaded into the ULTimate Reader program. Pisha and his colleagues began studying how students interacted with the new features. The researchers wanted to test the new features of the software with consumer input. They felt it was important to get input from potential users during development so that they could make the technology more usable and better address the student needs.

According to Fuller (cited in Pisha, 1998), one of the resource room teachers involved in the study stated the software really changed the way the students learned the material. The technology changed the traditional practice of having students answer questions at the end of the chapter. With the text in digital form, students could simply drag and drop whole paragraphs for use in their answers or, they could access definitions by hitting a key. Fuller saw the effort as supporting Massachusetts State learning standards, and although it is too early in the study to ascertain student outcome results, teachers and students gave the UDL designed approach high marks. It gave students who have a reading barrier access to the same information and students with a writing barrier the ability to communicate more effectively.

Even though this was an example of one study, Pisha and his colleagues (1998) have studied what it takes to get universally designed technology into classrooms. The following are some of their tips:

- Teachers technology skills must be relatively well developed and supported with ongoing opportunities for learning.
- There must be a clearly defined, but flexible curriculum in place.
- In-house staff must be available to keep computers functioning.
- The software and instructional materials must be compatible with both the curriculum and with the range of existing student needs.
- Staffing must be available to provide instructional supervision to the students working on the computers.
- Teachers must be provided with adequate time and access to resources to prepare new or modified materials.

- There must be commitment to UDL by administration.
- Administrators must allot time for staff to think through what universal design means in relation to children and teaching. (p. 10)

Applied to instruction, the principles of universal design can guide the development of educational tools to accommodate the diverse needs of all learners, including those with disabilities. No two brains learn the same way was the winning essay of a Boston Sunday Globe contest in which students described how they learn (Pisha, 1998). The essayists showed individual preferences for how students acquire information and the types of learning they engage in the most. One child elaborated on her use of mental pictures, and another his reliance on touching, doing, and moving for learning. Still another child explained drawing mind maps, varying color for each topic and then recalling maps when he needed the newly learned information. Other popular strategies included writing definitions, making acronyms, participating actively in class, and practicing new skills.

These children s insights illustrate the unique nature of each person s learning style. Studies have confirmed that brain activity occurs in roughly the same areas for most individuals performing a given task but that each individual has a unique signature of brain activity for that task (Meyer & Rose, 1998).

Teachers are now facing the challenges of classrooms of students with a wider range of diverse learning styles because of larger numbers and full inclusion. Designing for the divergent needs of special populations increases usability for everyone. The classic example is the ramped curb cut. It was originally designed to provide access for

those individuals in wheelchairs, but it also makes it easier for people pushing strollers, riding bicycles or just walking (Pisha, 1998).

Through the use of UDL, educators can now see students with disabilities along a continuum of learner differences rather than as a separate category. Teacher adjustments for learner differences can now occur for all students, not just those with disabilities (Pisha, 1998).

The development of UDL learning tools and teaching strategies requires an understanding of the ways learners may differ. CAST has been on the forefront of examining individual differences within a framework suggested by recent neurological research. CAST uses a framework of three spatially and functionally distinguishable brain systems: the recognition system that identifies patterns, the strategic system that generates patterns, and the affective system that establishes importance and fuels motivation. Each system has its own set of educationally relevant characteristics that may vary among individuals (Orkwis and McLane, 1998).

The recognition systems makes up the part of the brain that identifies patterns, such as objects, voices, faces, letter of the alphabet, and words. Studies have shown that recognition of the letter A in text involves different processing areas for recognizing color, shape, orientation, and location (Cytowic, 1996).

The recognition cortex in Albert Einstein s brain, for example, was disproportionately allocated to spatial cognition. He had difficulty recognizing the letter patterns and connections between sounds and symbols required of reading, but he was a genius in physics (Cytowic, 1996).

To adjust for individual recognition systems, the UDL framework develops curricular materials in many media so that learners can select one or more ways to approach the subject matter. This refers back to the three basic principles of UDL that were mentioned earlier in this document (Cytowic, 1996).

Strategic systems make up the part of the brain that generates such patterns as speaking, shooting a foul shot, reading a book, writing a paragraph, planning a trip or taking steps (Fuster, 1997). These systems are located in the anterior half of the brain, in the frontal lobes. Individual differences within the frontal networks account for much of the variation in students fine motor skills, physical coordination, planning, organizing, strategic thinking, and expression.

Using the UDL approach, multimedia and the Internet increase flexible learning supports and opportunities to practice skills. Feedback that is individualized, substantive or relevant is difficult to automate on the computer, but students can use various tools to make their own learning effective.

The affective systems are found in the core of the brain in the cortical and sub-cortical structures usually associated with the limbic system and are responsible for such feelings as craving sugar, fearing heights, or experiencing happiness (Damasio, 1994). How individuals allocate their attention depends on what attracts, motivates, and engages them. A task that may engage one student, but may bore or frustrate another.

Students learn for many reasons, including positive feedback and an interest in the subject. The reasons students do not learn include little feedback or encouragement, poor match with teaching style, chronic failure, inappropriate level of challenge, or lack of interest (Cytowic, 1996).

Just as other parts of the brain learn from practice, the affective systems learn from emotional response patterns. Past experience teaches us to repeat activities that give us pleasure or satisfaction and to avoid the ones that cause pain or boredom (Cytowic, 1996).

Because students learn for many different reasons, teachers need to have multiple approaches for engagement available. Technology can be just the tool to provide the necessary adjustability. A flexible use of media can support all learners interests by varying content and teaching materials. Teachers can provide varied content in a single Internet activity. This can be done by allowing students to pursue their unique interests within a structured framework (Orkwis and McLane, 1998).

Teachers have learned from experience that students learning styles differ by various strengths, weaknesses, and intelligence types (Gardner, 1983). Each learner s unique preferences, abilities, and disabilities determine how he or she learns best.

New technologies, especially computers and the Internet, can augment and streamline a teacher s ability to give students timely, personalized, balanced, and varied attention. The UDL framework offers ways to adjust to the needs of all students, including those with learning disabilities, visual and auditory impairments, physical disabilities, and diverse learning preferences (Meyer & Rose, 1998).

The most effective and universally designed curriculum includes strategies that engage all three brain systems and take individual differences into account. This seems an almost impossible task at first glance given the increasing diversity within the regular education classroom (Meyer & Rose, 1998). Computers can augment and streamline an educator s ability to give students timely, personalized, balanced, and varied attention.

Computers are flexible and their applications can be customized. These two assets make computers the ideal medium for a new universally designed approach to curriculum, teaching, and learning (Meyer and Rose, 1998).

What part do assistive technology tools play in the UDL framework? Assistive technology enables children with disabilities to participate more fully in all aspects of life (home, school, and community) and helps them access their right to a free, appropriate, public education (FAPE) in the least restrictive environment (LRE). Assistive technology is generally viewed as a tool or set of tools that assists students to benefit from the general education curriculum, it is not solely devices or services. It may also take the form of adaptations or modifications. Legally, assistive technology is defined as: any item, piece of equipment or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve the functional capabilities of a child with a disability (Iowa Area Education Agency Assistive Technology Liaisons, 1998).

An assistive technology service is defined as: any service that directly assists an individual with a disability in the selection, acquisition, or use of an assistive technology device. Specifically this service includes the evaluation needs of the individual.

Evaluation of the technology needs of the individual, including a functional evaluation which takes into account all of the environments within which the individual functions. These include loaning or leasing, writing prescriptions for third party insurance or Title XIX payment in conjunction with the individual s physician, or direct purchase of assistive technology devices for individuals with disabilities. Selecting, designing, fitting/customizing, adapting, applying/maintaining, repairing, or replacing of

assistive technology devices. Coordinating and using other therapies, interventions, or services with assistive technology devices, such as those associated with existing education and rehabilitation plans and programs. Assistive technology training and technical assistance with assistive technology for an individual with a disability, or, where appropriate, the family of an individual with disabilities. Training or technical assistance for professionals, employers, or other individuals who provide services to, employ, or otherwise are substantially involved in the major life functions or individuals with disabilities (Iowa Area Education Agency Assistive Technology Liaisons, 1998).

Assistive technology as stated in IDEA is to be included as a consideration in the development of Individualized Education Programs for all students determined eligible for and in need of special education services. IDEA also requires each school district to ensure that assistive technology devices or services, or both, are made available to a student with an identified disability, in order to receive a free and appropriate public education (Iowa Area Education Agency Assistive Technology Liaisons, 1998).

Assistive technology is used to help a wide variety of students participate in all areas of school life. This type of technology is individualized to meet the needs of a child with an identified disability. It is the legal right of a student with a disability to be given access to the assistive technology tools that will aid them in being successful in a fully inclusive environment.

As stated earlier in this document, universal design principles are geared toward making the curriculum accessible to all learners. Those three key dimensions are:

- Providing multiple representations of content

- Providing multiple options for expression and control
- Providing multiple options for engagement and motivation (Sweeney, 2001 p.5)

There are tools for learning that every classroom should have and the Lisbon pilot project focused on providing these tool kits for all regular education classrooms.

According to Judith Sweeney, there is an assistive technology continuum that should be followed when selecting the correct learning tool for any learning style. These tools are particularly important in the multiple representations of content principle. They are low, mid and high tech tools which are often known as assistive technologies. They are many times introduced and used by special educators, but are really tools from which all students could benefit (Sweeney, 2001).

Work in multiple intelligences also suggests that teachers need to provide different, acceptable formats for students to communicate ideas, share what they know, and build on their own individual strengths. Teachers having access to the appropriate tools allows them to provide students with the options, flexibility, and freedom needed for this kind of expression (Orkwis and McLane, 1998).

Sweeney suggests teachers follow an assistive technology continuum that begins with low-tech tools and ends with more specialized high-tech tools (Sweeney, 2001). For example, teachers who have students who struggle with comprehending, composing, and organizing their thoughts should start with utilizing low tech tools such as, pencil grips or lined paper. If those were not helping then the children would be moved along the continuum to the next level of mid- tech such as, hand-held spell checkers, or talking word processing programs. The regular classroom teacher would need to be aware and

have access to a wide variety of these tools in order to meet the diverse needs in the classroom. It was the goal of the Lisbon Pilot Project to teach and equip the regular education teachers with those tools. Examples of tools that would be used with students who have difficulties comprehending, composing and organizing their thoughts can be found in Appendix B.

Conclusion

In conclusion, every curriculum should fit the student and not the other way around. In a world of students, teachers, and parents with different backgrounds, learning needs, interests, and abilities, it is often hard to fit some or even most of our students into packaged curricula or expectations. Many students, especially those with special needs, simply cannot achieve within the stringent limits of the assignment, exercise, or lesson. These students know the information, understand what it is they want to share, and want to accomplish these tasks independently. They need to be able to learn information in ways which more easily match both their strengths and their needs. They need teachers and curricula that are flexible enough to allow them to build on their strengths and expand their creativity.

Orkwis and McLane explained that because students learn for many different reasons, teachers need to have multiple approaches for engagement available. Technology can be just the tool to provide the necessary adjustability. A flexible use of media can support all learners interests by varying content and teaching materials. Teachers can provide varied content in a single Internet activity. This can be done by allowing students to pursue their unique interests within a structured framework (Orkwis and McLane, 1998).

Meyer and Rose agree that new technologies, especially computers and the Internet, can augment and streamline a teacher s ability to give students timely, personalized, balanced, and varied attention. The UDL framework offers ways to adjust to the needs of all students, including those with learning disabilities, visual and auditory impairments, physical disabilities, and diverse learning preferences (Meyer and Rose, 1998).

Providing the universal access through the appropriate learning tools will benefit all students, not just those with identified special needs. When we as educators provide them with tools, techniques, and strategies they need to learn, retain, recall information and communicate effectively all students will be successful learners.

Appendix A

Identify the problem(s) (Circle your responses)

Tasks	Needs	Environment
reading	faster work	classroom
writing	legible, understandable work	resource
spelling / grammar	comprehension	study hall
communication	same work as everyone else	therapy
worksheet completion	modified, shortened, parallel work	home
math	visual / graphic / auditory presentations	community
mapping	independent work	
note-taking	fine motor practice	
organization / planning	sharing of knowledge	
	correct grammar / spelling	

Devices to try with student:

Low Tech Tools

Previously tried:		Going to try:			
worked	didn't		Check	Date tried	Works??
		specialized pens/ pencils /crayons / markers			
		grips			
		specialized erasers / correction tape			
		raised line paper, grid paper, colored paper			
		highlighters, highlighter tapes			
		color coding			
		Post-It notes, flags, arrows			
		color filters, page overlays (clear acetate sheets)			
		reading / writing guides			
		slanted surfaces, copy holder			
		white board, markers, crayons			
		magnetic letters, tactile letters			
		magnifiers			
		rubber stamps, labels			
		specialized			

		measuring and cutting tools			

Mid Tech Tools

Previously tried: **Going to try:**

worked	didn't		Check	Date Tried	Worked??
		tape recorders			
		calculators			
		spell checker, dictionary/ thesaurus (talking)			
		dedicated word processor			
		electronic organizer			
		audio books			
		music (tapes/CD's)			
		switch operated toys & appliances			

High Tech Tools

Previously tried **Going to try:**

worked	didn't		Check	Date Tried	Worked??
		alternative keyboard /			

			alternative cursor control			
word processing						
word prediction						
brainstorming, graphic organization						
spell checker, grammar checker						
word banks (on screen, overlays)						
text readers						
on-screen math, computer calculators						
communication devices, software						
Internet access						
CD reference (maps, encyclopedias)						
CAI						
environmental control devices						

Appendix B

No Tech

- finger tap- for syllable counting
- visualization-teach imagery techniques for comprehension
- simplification-reduce or simplify the number of steps for a student
- preview-provide extensive preview of material to be covered.
- repeat exposure-provide multiple opportunities to see materials, have access to the content

Low Tech

- magnifying glass-"to find" information; adds motivation and makes it easier for students with visual limitations
- materials list-personal or class version list of items needed to complete task
- highlighting tape or markers-used to highlight directions or vocabulary words
- carbonless notebook-this can be used for students who have difficulty keeping up with note taking prompt cards-to illustrate the steps required to complete a task, including materials needed

Students who struggle with the mechanics of writing would be given the following tools to enable them access to the curriculum.

No Tech

- allow more time to complete assignments
- reduce quantity of final product
- explore different forms of writing-for example, don't restrict writing to cursive
- model writing first-teacher/per/aide writes the word to show student how to form letters
- use "fill-in-the-blank" answer format

Low Tech

- spelling journals
- magnetic alphabet set-sticks to any magnetic surface, e.g, cookie sheet
- Scrabble or other letter tiles-for writing, spelling
- pencil grips-stabilizes student's grip on pen or pencil
- raise lined paper-enhances lines of paper to make them tactile.
- variety of tactile writing surfaces-e.g., sandpaper, screen, etc.
- adapted pens/pencils-Dr. Grip(office supply), EvoPen-small, oval, fits in palm(LoTTIE kit, grocery), triangular pencils, Squiggle Wiggle Writer-triangular, vibrating, battery-operated; 4 color cartridges

- Magic Rub Erasers-easier to use than regular erasers; don't tear paper(LoTTIE kit)
- Erasable highlighters-great for use in textbooks(school supply stores)

Mid Tech°

- digital voice recorder-record homework assignments, etc. (office/electronic supply stores)
- Alpha Smart Keyboard-portable word processor. These are an inexpensive alternative to desktop computers.
- Hand-held talking dictionary/speller-e.g., Franklin Homework Wiz & Speaking Homework Wiz, dictionary/thesaurus; spell check; words appear on small screen; target words, definitions, & synonyms can be pronounced aloud if speaking version; offers practice in cursive and print handwriting with animated on-screen guide
- tape recorder-record answers to tests, etc.; record class lectures

High Tech°

- Inspiration & Kidspiration(K-12) -provides a variety of formats for visually representing, organizing, recording and relating ideas and concepts

Power Point Software-create slides of words for word identification; set the timing for moving from one slide to another at a pace appropriate for the student and increase the time as she/he improves

High Tech (con t) °

- Discover: Switch-provides physical access to all software programs, including on screen keyboard, offers text-to-speech output
- voice recognition software-for specific cases of intensive physical limitation or learning disabilities, e.g., Naturally Speaking(Dragon Systems/Lernout & Hauspie)
- Write Outloud-Talking Word Processing Software
- Co-Writer-Word prediction software

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