Universal Design for Learning: Cognitive Theory into Practice for Facilitating Comprehension in Early Literacy

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Abstract

Addressing the unique needs of children of all ages and abilities, Universal Design for Learning (UDL) is gaining momentum in schools and preschools around the nation and the globe. This article explores Universal Design for Learning and its promising applications to a variety of reading and language arts experiences in the Early Childhood classroom. In UDL-infused classrooms, literacy experiences become multi-sensory and meaningful for young learners, thereby increasing their motivation and ultimate reading comprehension. The four core principles of Universal Design for Learning--multiple means of representation, multiple means of engagement, multiple means of engagement, and multiple means of assessment—are integrated into a sample literacy comprehension program designed to improve young children's text connections.

The applications of UDL to enhancing children's reading and comprehension connections are demonstrated through the use of grand conversations, literacy circles, oral language experiences, creative dramatics, and play in teaching reading and language arts. This article illustrates how informed teachers may enlist a plethora of multiple intelligence and cognitive theory-based literacy strategies that promote automaticity and a life-long love of reading for young children. Using stimulating and engaging text-to-text, text-to-self, and text-to-world connections, teachers and learners realize the rich implications of the four key principles of Universal Design for Learning.

Introduction

"If our teaching is to be an art, we need to know we can draw from all we know and believe and see in order to create something beautiful."
(Lucy Calkins, 2001, p. 6)

Universal design for learning is a teaching and learning approach that helps to ensure that high quality literacy and learning experiences are multi-dimensional, multi-sensory, satisfying, meaningful, and exciting for every child. Universal Design began as an architectural concept that involved planning the environment for optimal accessibility and productivity. Recently, it has become extended and infused into learner-centered classrooms, involving the carefully planned arrangements and applications of space, materials, curriculum, technology, and personnel. "Universal design is the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design" (Mace, 1996).

Universal Design for Learning (UDL) encourages the "design of instructional materials and activities that allows learning goals to be attainable by individuals with wide differences in their abilities to see, hear, speak, move, read, write, understand English, attend, organize, engage, and remember without having to adapt the curriculum repeatedly to meet special needs (Orkwis, 1999).

> Universal Design for Learning involves the integration of initiatives.
> "The concept of UDL is the intersection where all of our initiatives—integrated units, multi-sensory teaching, multiple intelligences, differentiated instruction, use of computers in schools, performance-based assessment, and others—come together" (Palley, 2001).

Therefore, UDL is a method of teaching and learning that encompasses a wide variety of content areas while it is also simultaneously customized to meet the needs of all individuals. Founded in 1984 as the Center for Applied Special Technology CAST developed Universal Design for Learning as a means of expanding learning opportunities for all students. CAST is a nonprofit research and development organization that works to expand learning opportunities for all individuals, especially those with disabilities, through Universal Design for Learning. Its staff includes specialists in education research and policy, neuropsychology, clinical/school psychology, technology, engineering, curriculum development, K-12 professional development, and more.

The four Core Principles of CAST[1] are:

- Multiple Means of Representation (enlisting the knowledge network)
- Multiple Means of Expression (enlisting the brain's affective network)
- Multiple Means of Engagement (enlisting the brain's strategic network)
- Multiple Means of Assessment (enlisting the brain's knowledge, affective, and strategic networks)

Using the four principles of UDL, above, teachers of reading and language arts can conveniently and effectively integrate sensory-rich learning opportunities into their daily literacy teaching that enable young learners to make text connections and thereby increase their vocabulary and text comprehension. Comprehension, the ultimate goal of all reading, is facilitated by the application of Cognitive Principles (Bransford et al, 2005) Multiple Intelligence Theory (Gardner, 1983), and Universal Design for Learning (Orkwis, 1998). According to cognitive learning theory, implicit learning plays an important role in language development and reading comprehension, beginning very early in life (Bransford et al, 2005).

[1] (adapted and expanded by the UDL Task Force at Rhode Island College (RIC) and University of Rhode island, 2009)

Implicit learning involves indirect, automatic processes that frequently lie beyond the conscious awareness of those who process the information. Patterns and strategies learned early, such as text-to-text, text-to-self, and text-to-world reading connections, are quite literally learned for life because, with practice and experience, they are processed automatically and with high efficiency. In addition, researchers attest that the neural efficiency for certain well-practiced signals can allow for increased attention and creativity in other areas of learning (Bransford et al, 2005).

Teachers of young children who support implicit and automatic learning using Universal Design for Learning provide rich environments that provide numerous opportunities for social interaction, direct physical contact with the environment, and a changing set of objects for play and exploration. Gardner maintains that all human beings are born with a multiplicity of intelligences that, when developed by schools and society, promote the achievement of great individual accomplishments (Gardner, 1983). Literacy learning experiences that extend beyond paper, pencil, and book tasks, and that enlist learners' multiple intelligence areas, promote learners' active engagement, self-efficacy, and motivation (Rosenzweig, Bennett & Diamond, 1972).

While enlisting UDL in their reading, children elaborate on the author's message, making text connections in creative and engaging ways that are personally relevant (Tompkins, 2008). Moreover, learners extend the author's message by enlisting their schemata to make compare and contrast connections between community and world events and the texts they read. Through UDL-infused dramatizations and sensory experiences, making predictions about text content, identifying with protagonists, and using classmates' feedback in their writing and artwork to provide enough detail to allow others to make connections, children establish solid foundations for learning and comprehension.

The four tenants of Universal Design for Learning are explored below, using the framework of a literacy curriculum that is designed to enhance all children's vocabulary and text comprehension. Specifically, Text-to-Text, Text-to-Self, and Text-to-World connections are exemplified and discussed using the foundation of Universal Design for Learning.

Literacy Instruction: Past and Present: Reading is an endeavor whose ultimate goal is meaning. It is meaning—the story, the information and the ideas—that make children want to read (Neuman & Roskos, 2005a). Developing meaning is closely related to children's prior knowledge, their interaction with related sensory experiences and materials, with their learning to read at their own pace, and in the way they learn best (Fields, Groth, and Spangler, 2008). "The goals of language and literacy are for children to expand their ability to communicate through speaking, listening, reading, and writing and to develop the ability and disposition to acquire knowledge through reading (BredeKamp & Copple, 1997). Social situations and

meaningful contexts play a major role in children's acquisition of reading skills and in their making meaning from reading.

However, with the 2001 passing and implementation of the No Child Left Behind Act, views on teaching and learning changed dramatically. Reading was viewed in a new light—one that involved the acquisition of discrete skills and sub-skills. Phonemic awareness, phonics, vocabulary, fluency, and comprehension were viewed as necessary and separate skills to acquire in order to become a skilled reader. In the Early Reading First program, which was implemented as a No Child Left Behind grant program for "at risk" preschool children, the alphabet, phonological awareness, print awareness, and oral language were taught using a set of prescribed and pre-packaged lessons and materials. Against their better judgment, many teachers now must teach reading primarily as a separate subject. Teachers have little time and support to integrate reading into social studies, science, math, or the expressive arts. With the increased emphasis on accountability, teachers are training students to master the material that will appear on their regularly administered standardized tests.

Inappropriate educational practices will persist as long as people remain ignorant of what is actually involved in becoming literate (Routman, 2003). Many policy makers and administrators believe that reading is about letter sounds and word recognition, overlooking the fact that reading needs to become an ingrained, pleasurable, lifelong habit that will help children become better citizens and lifelong learners. Yet, learning to read is a complex and intricate weaving of the child's background knowledge, individual interests and learning styles, physical, social, and emotional maturity, motivation, and ability to attend to the visual and oral tasks that are involved in reading. Phonics and work-recognition activities must remain only tools, or the means to an end, and not the end goals, themselves. (Mesmer & Griffith, 2005).

Literacy Basics

Fields, Groth, and Spangler (2008) delineate literacy basics as the following:

- *A print-rich environment* containing labeled objects, word walls, pocket charts, classroom books and libraries, shared reading, storytelling, and reading and writing corners and supplies.
- *A rich oral language environment* containing puppetry materials, peer conversations, peer sharing time, book reports, literature circles, and oral reading opportunities.
- *Firsthand experiences of interest* featuring field trips, cooking, gardening, classroom pets, classroom plants, project learning and sharing, nature explorations, and guest speakers
- *Symbolic representation experiences* including a variety of art, dance, dramatic play, and music integration into literacy and other content areas; use of photographs, computer images, and poetry.

- *Pressure-free experimentation with writing* (independent writing) including inventive spelling, writing for a variety of purposes including imaginative, expository, and narrative, and drawing and scribbling using a variety of media such as colored pencils, crayons, liquid markers, and pens.
- *Pressure-free exploration of reading* (independent reading) including the use of books of all genres—biography, historical fiction, poetry, fiction, autobiography, mystery, and science fiction and the use of context cues, memory, and matching print to oral language, and the language experience approach.
- *Information about literacy skills* including left to right sequence, letter-sound relations, checking for meaning, and metacognition.

Children whose teachers use developmentally appropriate practice, including the universal design for learning approach and materials as illustrated above, have improved creative thinking skills, better memory skills, and a better grasp of letter and word identification. Moreover, children enrolled in programs that enlist developmentally appropriate practice, including universal design for learning, exhibit better listening skills and perform better on measures of reading comprehension. (Dunn, Beach, & Kontos, 1994; Hart et al, 1998). These children also exhibit more cooperation and more positive outlooks about themselves as learners. (Jambunathan, Burts, & Pierce, 1999).

A developmentally appropriate approach incorporating Universal Design for Learning provisions can provide an effective and meaningful approach to children's literacy learning and text comprehension. As teachers provide children with learning experiences that involve Multiple Means of Representation, Multiple Means of Engagement, and Multiple Means of Expression, they prepare children to derive enjoyment, meaning, and enduring learning from their reading. Assessment, the fourth tenant of Universal Design for Learning, is integrated seamlessly into children's experiences with Representation, Engagement and Expression, as well as implemented as a separate but flexible feature following the lesson or activity. Three main networks in the human brain are addressed by the implementation of Universal Design for Learning. The *knowledge network* is addressed when teachers implement Multiple Means of Representation; the *affective or emotions network* is addressed by the use of Multiple Means of Engagement; the *strategic network* is emphasized by using Multiple Means of Action and Expression; and all three networks are addressed by incorporating Multiple Means of Assessment.

Multiple Means of Representation:

Options for Perception: A Universal Design for Learning approach provides *options for perception, options for language and symbols, and options for comprehension* for all learners in their literacy learning. When the literacy teacher provides options for perception, he/she displays

information in various ways, such as using a word wall with parts of speech represented by different colors, varies the size of fonts to meet the visual needs of the students, and provides auditory information, such as books on tape at various speeds or volumes, as needed for the learners.

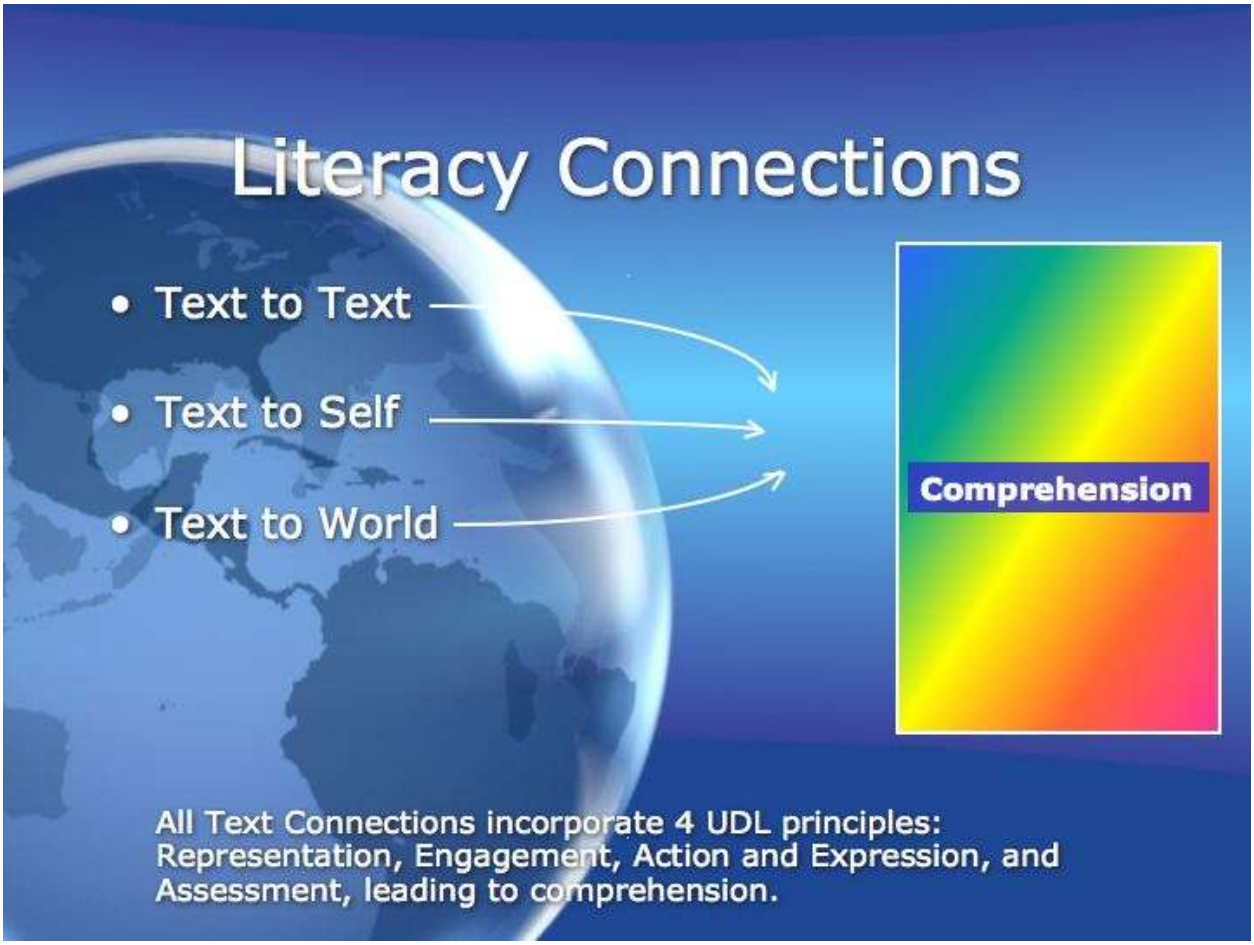
The spoken word is accompanied by the written word on chart paper, Smart Boards, the overhead projector, or dry erase white boards. Teachers provide concrete materials, especially for introducing new concepts, such as physical objects or spatial models to represent the written or oral message that follows.

Options for Language and Symbols: Options for symbol and language are plentiful for reading teachers who embrace the UDL approach. They include pre-teaching vocabulary words, clarifying language structure and rules, providing alternatives for text symbols, and use of non-language alternatives for concepts. Teachers pre-teach vocabulary before children begin to read and pause to define, describe, or pantomime unknown or difficult words as needed. They simplify vocabulary or provide alternative words to accompany more difficult words. The use of text-to-speech programs for digital text is a helpful tool for many learners, as is the provision of the printed or spoken word in both the dominant and the second language. Effective reading teachers in UDL-rich classrooms also link computer graphics and graphic organizers to enhance children's concept development.

Options for Comprehension:
In a UDL classroom the teacher of literacy continually accesses students' background knowledge, highlights essential information and big ideas, guides information selection and processing, and supports the transfer of memory and knowledge.

Accessing students' background knowledge through K-W-L charts, concept maps, pre-teaching, and grand conversations prepares both student and teacher for the upcoming unit of study or lesson. Multiple examples are provided to help clarify information and keep students interested and motivated. Concentrating on the "big ideas" and avoiding extraneous material assists learners in staying focused and organized. As teachers guide information selection and processing, they use interactive models, chunk the presentation of information, and provide scaffolding and prompts as students work. They may provide peer or adult tutors to guide students, as needed, throughout the lesson. Memory and knowledge transfer are supported by the teacher's use of checklists, electronic reminders, and connecting of new knowledge with each students' prior knowledge

Figure 1 Model of Literacy Connections Leading to Comprehension



Multiple Means for Engagement:

Options for recruiting interest: Students are given freedom to choose their own information tools, design their own products to show what they have learned, and make their own decisions about timing and sequence of their tasks. Activities are relevant and personalized to students' lives. Students are encouraged to self-reflect and set their own goals for learning. Depending upon students' needs and the nature of the tasks, social demands are flexible and varied, as are the use of novelty and risk-taking in activities in developmentally appropriate UDL-infused classrooms.

Options for sustaining effort and persistence:

In the UDL-infused classroom, goals are clearly displayed, and students measure their own degree of success in attaining their goals and objectives. Collaboration is offered to students so that they can work together to complete tasks. Peer tutoring and classroom teaching assistants may provide additional guidance in the UDL classroom. Feedback on students' work is

consistent and regular, and students self-evaluate in conjunction with the adult or peer tutor. The results of the feedback help to determine future goals and objectives.

Options for self-regulation: Students' self regulation is assured and maintained when they are provided with beginning and ending times, checklists, rubrics, mentors, and coaches. Individualized coping skills are addressed by the use of models, checklists, and feedback to provide emotional support. Self-regulation is fostered when teachers provide charts and checklists that enable students to monitor their own behaviors and progress over time.

Multiple Means for Action and Expression:

Options for physical actions: When students are engaged in physical activity, teachers in developmentally appropriate UDL classrooms provide students with alternatives in rate, timing, amplitude, and materials as they complete tasks. Teachers provide rich sensory materials related to the story the students are reading; they use assistive technologies to support students' access to learning, and allow students to navigate reading materials in a variety of ways—by voice, by computer, or by paper and pencil.

Options for expressive skills and fluency: Students are free to express themselves in a plethora of ways in the developmentally appropriate/UDL-infused classroom**.** As a result, fluency is more easily achieved than in the traditional "one size fits all" approach. One student may don headphones and use a tape recorder to follow along with a book on tape, while another student reads a book of his/her choice to a classmate. Other students may read their books silently in a private corner of the room, while the remaining students may read a book at a round table, in a guided reading setting, with the teacher leading the group. Teachers gradually release supports to increase students' independence.

Options for executive functions: Providing a variety of tools is a key ingredient for success in the UDL-rich classroom. Attractive tools include story starters, concept maps, pocket charts, word walls, sentence strips, magnetic words, Smart Boards, computers, and recording devices. The use of "turn and talk" and "stop and think" prompts allows students the opportunity to tackle the learning one step at a time, and to stay motivated throughout the reading or literacy activity.

Multiple Means of Assessment of Student Understanding

Assessment for outcome determination (student understanding): Options for methods, formats, scope/range/level, product and outcome, and feedback are all embraced by teachers and learners in the developmentally appropriate UDL-infused classroom. Options for methods include multiple choice versus essay or fill-in-the-blank tests. Options for formats of assessments include a visual test, a written report, an auditory test or speech, a project-based performance measure, or a video or audio taped project or report. For example, for an exam culminating a thematic unit on "Helen Keller," the teacher may provide several options for assessing students' knowledge. Students are allowed to choose their preferred presentation method for their final project. Several students choose to write and orally present a book report on Helen Keller. Other students decide to take a multiple choice test on the life of Helen Keller. Other students create a series of posters detailing the main events in Helen Keller's life. The remaining students create a dramatic production about the life of Helen Keller and perform it for the class.

Options for scope/range/level include the provision of more detailed tests for more experienced learners and less detailed tests for learners with little background or experience in the topic. More advanced students may study materials from higher grade levels and take exams that were traditionally reserved for higher grade levels. Conversely, less experienced learners may borrow books from a lower grade level and take the accompanying tests that were traditionally intended for that lower grade level.

Teacher feedback is an important factor in successful classrooms that embrace UDL and developmentally appropriate principles. Teachers learn to use effective questioning, including the Socratic method of questioning, to lead discussions so that all children can contribute at their own levels. Teachers ensure that students are able to monitor their own progress as they work. Students ultimately determine their own degree of success and readiness for more advanced instruction or higher level reading materials.

I. Provide multiple means of representation *(Knowledge Networks)*		
Provide options for perception	**Rating**	**Comments**
1.1 Vary ways to display information Visual Information: Size, contrast, color, layout, spacing, etc. Auditory information: Amplitude, speed, timing, cueing, etc.		
1.2 Alternatives for auditory information Text provided for spoken language, voice recognition-to-text, visual symbols for emphasis, sound alerts, etc.		
1.3 Alternatives for visual information Text or spoken equivalents for graphics/video/animation, tactile supports for visuals,]Use of physical objects or spatial models, etc.		
Provide options for language and symbols		
2.1 Alternative access to key vocabulary & languge Pre-teach vocabulary & symbols, highlight components of complex words, embed vocabulary supports in text—hyperlinks, footnotes, definitions, etc.		
2.2 Clarify language structure & rules Make rules & relationships explicit, clarify links between concepts, use less complex vocabulary or language structures, etc.		
2.3 Alternatives for text symbols & mathematical symbols Text-to-speech programs for digital text, use digital math notations (Math ML) with voicing, use text alternatives (tapes, DVD, digital text) with human voicing, etc.		
2.4 Provides connections across different languages Key information in dominant and second languages, vocabulary definitions & pronunciations in both languages, shared/related roots identified, syntax/grammar links I& differences identified		
2.5 Use non-language alternatives for concepts Present complementary representations (e.g., text with animation/graphics, etc.), link illustrations and verbal enhancements, make text-to-chart or diagram links, explicit, etc.		
Provide options for comprehension		
3.1 Access background knowledge Activate prior knowledge with imagery, concepts, etc., use organizers (KWL, concept maps, etc.), pre-teach concepts, "bridge" ideas with analogies & metaphors, etc.		
3.2 Highlight essential information & "big ideas" Emphasize key elements, use organizers, prompts I& cues to identify & connect key elements, use multiple examples and non-examples, mask or reduce extraneous elements, etc.		
3.3 Guide information selection & processing Use interactive models, explicit prompts and scaffolds, develop multiple points-of-entry & pathways for content, chunk information, release information progressively, etc.		
3.4 Support memory & knowledge transfer Checklists, sticky notes, electronic reminders, mnemonic devices, space out reviews, organizers for note-taking, connect new information I& prior knowledge, embed analogies & metaphors, etc.		

II. Provide multiple means for engagement (Affective Networks)		
4. Provide options for recruiting interest	**Rating**	**Comments**
4.1 Support individual choice & autonomy Challenge levels, types of recognition used, vary content or context for learning, choice of information tools, design of products, timing & sequence of tasks, etc.		
4.2 Make learning personally relevant & valuable Activities personalized to students' lives, socially relevant, age & ability appropriate, culturally & racially appropriate, active participation, authentic & purposeful outcomes, use of self-refection, etc.		
4.3 Reduce distractions and perceived threats Vary novelty & risk-taking in activities & transitions (predictability, scheduling, routines, novel events, etc.) vary sensory stimulation levels (background noise, # of items, etc.), vary pace & length of work sessions, vary social demands required for activities, etc.		
5. Provide options for sustaining effort and persistence		

5.1 Strengthen connection to goals and objectives Develop explicit goals, restate goals for clarity, clearly display goals, develop short- term objectives for long-term goals, use prompts to visualize & clarify outcomes, etc.		
5.2 Vary levels of challenge & support Vary difficulty in core activities, use tools & scaffolds to provide alternatives, use collaboration, vary ranges for acceptable work, emphasize process, effort & improvement, etc.		
5.3 Support collaboration & communication with peers Create cooperative learning groups, clarify roles & responsibilities, positive behavioral **supports, differentiated supports, peer tutoring & support systems, connect to virtual communities, etc.**		
5.4 Focus feedback on effort, practice, and mastery Encourage perseverance, self-awareness & self-efficacy, emphasize effort & improvement, give frequent, on-going, & substantive feedback, model evaluation strategies, etc.		
6. Provide options for self-regulation		
6.1 Support and guide personal goal-setting Model goal-setting process, coach or mentor students in goal-setting, use prompts, rubrics, checklist, etc. to support self-regulatory goals, on-task behaviors, and self-reinforcements, etc.		
6.2 Develop individualized coping skills Use differentiated models & feedback to develop skills (e.g., managing frustration, seeking emotional support, and developing internal controls, etc.)		
6.3 Support self-monitoring and self-assessment Use tools & models to collect & determine own behaviors (e.g., charts, recording devices, etc.), build student self-awareness (and reduce scaffolds) over time, etc.		

III. Provide multiple means for action & expression (Strategic Networks)		
7. Provide options for physical actions	**Rating**	**Comments**
7.1 Varied & alternative physical responses Alternatives in rate, timing, amplitude, range-of-motion, materials, manipulatives, & technologies, allow response alternatives from standard means (e.g., computer response vs. paper & pencil), etc.		
7.2 Varied ways to interact with materials Use multiple means of navigating materials (e.g., by hand, by voice, by switch, by keyboard, etc.)		
7.3 Use assistive technologies for access to learning Determine appropriate technologies (physical, sensory cognitive, communication) needed to access instruction, integrate training to support & enhance learning and goal achievement, etc.		
8. Provide options for expressive skills and fluency		
8.1 Vary choices for expression of knowledge Choices may include text, speech, illustration, physical models, film, video, pictures, music, art, etc.		
8.2 Vary tools for composition & problem solving Choices may include spell checks, grammar checks, word prediction, speech-to-text software, dictation, recording, sentence starters, story webs, concept webs, outlining tools, calculators, graphing calculators, software for problem solving skills, Computer-Aided Design (CAD), etc.		
8.3 Vary ways to support practice and performance Differentiated approaches, strategies, skills to achieve same outcomes, use diverse mentors to guide differentiation processes, gradual release of supports to increase independence, etc.		
9. Provide options for executive functions		
9.1 Guide & support effective goal setting Use a variety of tools (e.g., prompts, scaffolds, models, guides, checklists) to support process of individualized and appropriate goal-setting, etc.		
9.2 Support goal-related planning and strategy development Use "stop & think" prompts, use checklists and templates to prioritize & sequence, model "think-aloud" process, guide transition from long-term goals to short-term objectives, etc.		
9.3 Use tools to manage information & resources Keep information organized and accessible with graphic organizers, templates, embedded prompts, checklists, note-taking guides, software tools, etc.		
9.4 Enhance capacity for formative progress self-monitoring Develop self-monitoring through guided questions, frequent representations of progress, self-reflection templates, differentiated self-assessment strategies, etc.		

IV. Use multiple means of assessment of student understanding (All Networks)		
10. Assessment for outcome determination (student understanding)	**Rating**	**Comments**
10.1 Options for methods Discrete vs. elaborative response (i.e., multiple choice vs. essay), varied time allowance, individualized vs. group or peer-supported, location varies within the curriculum, embedding assessment opportunities, etc.		
10.2 Options for formats **Visual information: Photographs, pictures, picture-symbols, written, computer text, computer** text-to-speech, video, kinesthetic supports (with low-tech), etc. Auditory information: Oral, technology-supported (taped, computer speech-to-text, voiced word processing, kinesthetic supports (with low-tech), etc.		
10.3 Options for scope/range/level Choice in number of items, type of items. Choice in focus. Deconstructs grade-level expectations. Connects across grade levels. Tiered assessments-from "big idea" (all learners) to complex details (some learners). Multiple levels of understanding—concrete through synthesis, etc.		
10.4. Options for product & outcome Consider formative vs. summative assessment. Consider authentic assessments with "real-world" products. Include differentiated products (e.g., plays, video productions, essays, point-of-view "rafts," "tic-tac-toes," debates, artistic productions, student-driven assessments, etc.)		
10.5 Options for feedback Teacher: Acknowledgement, probing, challenging questions, positive feedback, detailed response, real-time vs. delayed, etc. Student: Journals, writing, prompts, reflection, peer feedback, self-evaluation, self-awareness, etc.		

Modifications to original CAST educator Checklist made by RI-UDL Workgroup @Rhode Island College, Providence, RI & University of Rhode Island, Kingston, RI (2009, 2011 REV).

Universal Design for Learning and Reading Connections

Instilling a lifelong love of reading for students requires that teachers' reconsider their views on comprehension. Comprehension is not something that happens after a child decodes a set of words or a story; rather, it is complex meaning making with text that emerges along with other literacy and life skills, including physical growth, socialization, language development, maturity, ability to attend to task, the accumulation of prior knowledge, and visual and auditory acuity. Young children also manifest unique cognitive, social, and emotional developmental characteristics that need to be recognized and addressed in order to fully promote comprehension. (Dooley, 2010—The Reading Teacher, 64 (2), pp. 120-130)

A promising means of facilitating comprehension of text for emergent and beginning readers is to activate the Knowledge network, the Affective network, and the Strategic network of the brain using a Universal Design for Learning approach in the reading classroom. Currently, many teachers recognize the value of children's "connections" in their reading and in making sense of what they read. As children read a narrative or expository text, for example, they are connecting the new concepts with other texts they have read, with life experiences they have had, and with concepts they have learned about the world from television, movies, friends, and the internet.

Text-to-Text Connections and UDL

Universal Design for Learning (UDL) involves the design of the environment to meet the needs of all learners so that provisions for unique learners' needs are naturally imbedded in the setting, supplies, and lesson planning. As the reading teacher plans for meaning-rich reading opportunities for learners of various levels and with widely differing schemata, he/she selects books from a wide variety of levels, topics, and features (including pop-ups, flaps, sound books, and Big Books) to motivate each child.

Once the classroom library is established, arranging books by themes will enable children to locate books about a favorite topic or hobby and to develop a greater breadth and depth of knowledge about a given topic, thereby enhancing comprehensions. For example, books that address the theme of "Bears," such as The *Berenstain Bears* series, *Bear Wants More!*, *Blueberries for Sal*, and the *Three Little Bears,* could all be displayed on a book shelf in a private reading corner of the class. Children could then self-select two or three books to read using independent reading, buddy reading, or to read and share with several other classmates and the teacher in a guided reading group.

The UDL-supportive reading classroom includes books-on-tape, allowing children to wear headphones to listen to the books and read along silently or orally. Text-to-text connections are also facilitated when teachers invite children to bring books about a topic of study from home to share with the class. Additional ideas and formats that integrate the Representation, Engagement, Expression, and Assessment components of Universal Design for Learning and allow children to make text-to-text connections include the following:

Book Reports: Compare and report on Big Books with the same themes (UDL Checklist: 1.1, 1.3, 3.2, 5.3, 7.2, 8.1, 10.2, 10.5)

Compare/Contrast Graphic Organizers: Complete Fact Sheets or Venn Diagrams comparing vocabulary and content of two books on a pocket chart or at an easel or Smart Board (UDL Checklist: 2.1, 3.2, 3.4, 6.1, 6.2, 7.1, 8.2, 10.2, 10.5)

Debate: Hold a debate about book ratings between two similar books. Children may face each other or sit on opposite sides of the classroom. Each group addresses and rates several characteristics of the book they are supporting, including interest level, illustrations, writing style, plot, and overall appeal. (UDL Checklist: 4.1, 4.2, 5.3, 10.1, 10.4, 10.5)

Walking, Talking Book Covers: Children create and wear walking, talking book covers about several books that contain a specific theme such as books about insects. They use poster board, paints, photographs, and string to create replicas of their favorite books revolving around a

common theme. Learners attach the walking, talking book covers to their shoulders and share their books' themes, main ideas, protagonists, and favorite parts with other children who also wear walking, talking book covers. (UDL Checklist: 1.1, 1.2, 1.3, 3.2, 3.4,

Literature Circles: In a group of 5-6 learners (more or fewer, if desired), readers compare one book to another, compare several books about the same theme, or compare books written by the same author. Children self-select their roles of illustrator, note keeper, reporter, word wizard, investigator, and inquirer and apply these roles as they interact with books and peers in the literature circles. (UDL Checklist: 2.1, 2.2, 2.5, 3.1, 4.1, 4.2, 4.3, 5.1, 5.2, 5.3, 5.4, 6.1, 8.1, 8.2, 8.3, 9.3, 9.4, 10.1, 10.3, 10.5)

Text-to-Self Connections and UDL

Children learn best and retain what they learn when they have opportunities for authentic self-expression during their literacy work. (Penny Oldfather, 1995, Commentary: what's needed to maintain and extend motivation for literacy in the middle grades. Journal of Reading, 38, 420-422.) Students are more highly motivated when they can take ownership of their reading experiences and connect these experiences to their own background of experiences. For example, students prefer to express their own ideas and opinions, choose their own topics for writing and books for reading, talk about books they are reading, and pursue "authentic" activities using reading, writing, listening, and speaking. Judith Irwin (1991) adds that comprehension is the reader's process of using his or her prior experiences, combined with and the author's text, to construct meaning that is useful to the reader for a specific purpose. (Irwin, J.W. (1991). Teaching reading comprehension processes (2nd ed). Boston: Allyn & Bacon.

With the goal of creating personal meaning for the student in mind, helping learners establish Text-to-Self Connections is a critically important teacher role for enhancing comprehension for learners of all ages and abilities. In a UDL-infused classroom that supports developmentally appropriate practice, teachers invite students to bring in and share artifacts from home that relate to the book being read. Other students learn vicariously from these sharing experiences, and concepts and vocabulary are enhanced as a result. A prominent word wall containing words that children are sharing with others from their own past experiences often appears in a UDL-rich classroom. Additional text-to-self connecting ideas that relate to the UDL areas of Representation, Expression, Engagement, and Assessment are the following:

Venn Diagram: Readers complete a Venn Diagram comparing and contrasting a text character to themselves. They share their text-to-self comparisons with others in the class in small or large groups. For example, a third grade student recently completed reading Louisa May Alcott's *Little Woman*. She developed a fascination for the fact that Louise May Alcott wrote a fictional story of four women that strongly resembled her own life. Therefore, as a self-selected story

extension activity, this young learner used a lap top computer program to design a large Venn Diagram, with facts about Louisa May Alcott's family life on the left circle, and facts about her own life on the right circle. The intersection of the two circles was used for typing the ways in which this learner's life paralleled that of Louisa May Alcott. (UDL Checklist: 1.1, 4.1, 4.2, 7.3, 8.1, 8.2)

Classroom Visitors: Children invite their parents or relatives to the class to speak or present a slide show about an experience related to the trade book or topic that is being studied. For example, a New England child's parent was a lobsterman. Responding to his invitation from the literacy teacher, this lobsterman appeared in class one afternoon, dressed in his fishing gear, and carrying a lobster trap bearing six live lobsters. Needless to say, the son of this lobsterman, and all of his classmates, had no difficulty reading and researching stories—both expositional and narrative—about the lifestyles and varieties of lobsters, creating their own seafood menus, and writing a class "thank you letters," in both English and Spanish, for the exciting lobster adventure this father had provided. UDL Checklist: 1.1, 2.4, 4.2, 8.3, 10.4).

Time Line: Students create a time line of their own lives using printed papers strung onto a yarn necklace, rectangular poster paper, or a computer graphic illustration. They create a time line of their favorite protagonist's life, and compare it to their own experiences and dreams for the future. For example, one learner cut nine colored circles from construction paper. She hold-punched each circle, and printed one significant life event upon each circle, including date of birth, date of losing her first tooth, and date of a favorite vacation. When she had recorded each event, she strung the circles onto yarn, creating a colorful "My Life Necklace." She created a similar necklace about "Annie," the protagonist from *Lions at Lunchtime* and shared both necklace with classmate, just as they shared their creative projects with her. (UDL Checklist: 1.1. 1.3, 2.1, 3.1, 3.2, 3.4,, 4.2, 4.3, 5.3, 8,1, 9.3, 10.1, 10.4))

Expressive Arts Project: Young readers create a play, an artistic mural or painting, a clay sculpture, or a musical that incorporates others' languages and customs, relating the theme or character from a favorite book to their own lives. Later, in small or large groups, they share their artistic creations with others, explaining the implicit or explicit text-to-self connections. (UDL Checklist: 1.1, 1.2, 1.3, 2.4, 2.5, 3.4, 4.1, 4.2, 8.1, 10.2, 10.4)

Text-to-World Connections

As Lucy McCormack Calkins eloquently expresses in the forward to her book, *The Art of Teaching Reading*, reading, writing, listening, and talking are ways to build a better world. Reading and writing, speaking and listening can help fight social injustices, really around causes, and create communities. (Calkins, 2001). When teachers become catalysts for children's learning by urging them to make text-to-world connections, then, teachers are in actuality laying the

foundation for a better, more informed, more enlightened, and safer world. As readers apply Know-Want to Know-Learned (KWL) charts, create projects to deepen understanding, write reports about the relations between their books and the world, and investigate news media and the internet to explore a reading topic in more depth, they are making significant and lasting text-to-world connections.

Additional ideas that enlist the four tenants of Universal Design for Learning—Representation Expression, Engagement, and Assessment are discussed in the following paragraphs.

Researchers: Children research a newspaper story and compare it to an historical event. For example, while reading a book about the Titanic, one child recalled a news story that she had heard the evening before about a cruise liner's accident. Answering the five "W" questions (who, what, where, when, why, and how), she was able to create a news bulletin and "radio broadcast" of the two episodes, summarizing the main events of each, answering each of the "W" questions, and providing just enough detail to make the report meaningful to the listeners.
(UDL Checklist: 1.2, 3.2, 5.1, 6.3, 7.3, 9.3, 9.4, 10.1)

Pen-Pals: Children can write to other students in local or regional schools or even overseas in pen-pal programs. At the senior's author's university, 12 students became pen-pals with 12 second and third grade students from an urban school in the same state. Letters were exchanged throughout the academic year, and some of the pen-pal friendships have continued for years. Children read their letters with great interest, and even the parents became involved and added notes to the letters to the university pen-pals. text-to-world learning was optimized, since readers were fascinated to read and learn more about the world, people, and experiences outside their urban neighborhood. The use of advanced technology, including electronic pen-pals and Skype-Pals, is strongly supported in UDL-rich classrooms. Bilingual peers and adults were on-hand to provide support for second language learners. (UDL Checklist 1.1, 1.3, 2.4, 4.2, 5.2, 8.1, 8.2, 8.3)

Past and Present Research: When children have completed reading books of their choice, they are invited to write a new book about a famous person from history. By researching media, exploring the internet, interviewing experts, and locating comparisons between a famous past and present day character, readers glean knowledge about history and our rapidly changing world and lifestyles. For example, one nine-year-old boy completed an illustrated bibliography about his baseball hero, Babe Ruth. He was eager to learn about present-day baseball heroes, and to create an illustrated short bibliography or oral report about the life of Derek Jeter, including comparisons to Babe Ruth and Jeter's baseball teams, seasonal records, number of hits, salaries, and community service. Upon finishing his reports, he completed a checklist assessing his own

performance in the areas of effort, coverage, language usage, and organization of main ideas and details. (UDL Checklist: 3.2, 3.3, 4.2, 5.1, 5.4, 6.1, 6.3, 8,1, 8.2, 9.4, 10.1, 10.2, 10.4)

Field Trips: Reading "comes to life" when children experience the settings first-hand through taking a factory tour, visiting a forest and locating insects with magnifying glasses, discovering newly-hatched chicks on a farm visit, or preparing pancakes in the school kitchen like they ones they have read about in Eric Carle's book, *Pancakes! Pancakes*! UDL-supportive reading teachers supply children with clipboards, journals, and background vocabulary words and reading materials before they venture out into the world. Upon their return to the class, readers report on their findings, perhaps using K-W-L charts, Concept Maps, videotaping, or tape recorders. They relate their findings to the books they have read, about the place they have visited, or the experiences they have had. As children make text-to-world connections, they read with a focused purpose and with great interest and motivation. (UDL Checklist: 1.1, 1.2, 1.3, 2.1, 3.4, 5.3, 7.1, 7.2, 7.3, 8.2, 10.1, 10.2, 10.4, 10.5)

Conclusions

Children's behaviors in reading and writing are indicators of their many selves—their emotional selves, their physical selves, their social selves, and their intellectual selves. The realization of each child's unique literacy potential is best achieved when teachers plan a meaning-based, multi-sensory curriculum that is tailored to students' individual talents and needs. Students learn literacy best when carefully planned, differentiated instruction is combined with a meaning and literature-based, multiple intelligence approach (Armstrong, 2003). They are thereby afforded opportunities to make emotional connections to the literacy texts and activities. Such connections facilitate children's attention span, memory, processing skills, and comprehension (Gardner, 1983; Armstong, 2003; Brand & Donato, 2001a.) When children's limbic, or emotional, systems are activated through emotionally meaningful activities, they are better prepared to tackle the more abstract tasks of successful emergent literacy (Brand, 2006). As teachers design a highly motivating literacy curriculum, they simultaneously recognize and eliminate barriers to learning, therefore paving the way for a seamless transition for young literacy learners.

The process of eliminating barriers to literacy learning for all students is best supported by a universal design for learning curriculum with embedded provisions, including technology. Prior to beginning each new academic year, teachers may form professional development communities, identifying potential barriers to learning, and implementing solutions to these barriers. Resultantly, teachers and administrators are able to create solutions to literacy challenges for all learners before challenges arise.

Barriers to children's literacy learning may include language differences, visual barriers, auditory barriers, limited attention spans, physical disabilities, processing challenges. intellectual limitations, and emotional challenges. Classroom barriers may include limited space, a shortage

of personnel, limited funds for technology, a shortage of materials, and a prescribed or inflexible curriculum. Universal design for learning addresses each of these potential barriers through flexile provisions of space, materials, curriculum, technological applications, and personnel. In the literacy curriculum, comprehension strategies of text-to-text, text-to-self, and text-to-world connections overcome learning barriers as all learners embrace texts that are meaningful and relevant to their own lives. These text connections permeate the walls of traditional oral reporting and the inherent restrictions of pencil and paper reports, and extend into the innovative domains of digital texts, peer tutors, differentiated approaches, and connections across different languages. As teachers of reading integrate multiple means of representation (addressing the knowledge network), multiple means for engagement (addressing the affective network), multiple means for action and expression (addressing the strategic network). and multiple means of assessment (addressing all networks) into the literacy curriculum, they enable the promise of universal design to unfold for each child.

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