

## **An Integrated Approach to Teaching and Learning for Students with Cognitive and Physical Differences**

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Leading educational journals abound with information addressing the vast scope of diversity among students to which educators must attend as they seek to construct an environment where all students have access to a guaranteed and viable curriculum (Chalker & Stelsel, 2009; Gasser & Palfrey, 2009; Weigel & Gardner, 2009). Diversity is a broad term that includes the range of cultural, ethnic, cognitive, and physical differences that represent students in United States public schools. Strict federal, state, and local laws add to the complexity of educating students with diverse needs and must be embraced as educators plan, implement, and assess learning activities (Cook, Tankersley, & Landrum, 2009; Parrish & Stodden, 2009). The increasing need for educators to attend to the scope of issues represented by such a diverse group of students provides the foundation for this paper. In it we will connect cognitive psychology, Mel Levine's *All Kinds of Minds* theoretical framework, and Universal Design for Learning within the constructionist paradigm demonstrating an integrated approach toward achieving an academic environment where all children can learn. For the purposes of this paper, the authors have narrowed the issue of diversity to focus on students with cognitive and physical differences as practical classroom applications of *All Kinds of Minds* and Universal Design for Learning are examined.

### **The Constructionist Paradigm**

Constructionists believe that meaning, or truth, is not created but rather constructed by the individual (Crotty, 1998; Gall et al., 2007; Strauss & Corbin, 1990). Social constructionists include the influence of culture, individual experiences, environments, cognitive abilities, and feelings of self-efficacy in the way an individual constructs meaning (Crotty; Gall et al.). They believe our individual view of the natural world is greatly influenced by the social world, the system of principles and ideals that are valued in the culture in which we have grown up and live (Crotty; Gall et

al.; Strauss & Corbin). An example of the added social dimension in constructionism is demonstrated as one comes across the word plant. Objectivist theory would say that the individual would examine the plant and would know that it is a plant because we, as humans, have determined what the characteristics of a plant are and this object fits those objective characteristics. Constructionists recognize that humans have ascribed these characteristics to the plant and that there is a certain amount of subjectivity in ascribing characteristics. Social constructionists would say that the individual is influenced by past experiences with plants as well as by the culture and geographic region in which he lives as he describes or reflects on the ontology of a plant. For example, someone living in a city might envisage a different image when thinking of a plant than someone living in the country due to geography, education, and experience with plants. The urban dweller may view plants as being contained and/or something to add beauty to the home whereas the rural dweller could be a farmer and may view plants as a form of livelihood.

Constructionism grew out of epistemological opposition to positivist theory, which ascribes to the belief that researchers are able to remain objective, or rather, are able to separate their own beliefs from those of the research participant (Crotty, 1998; Gall et al., 2007; Strauss & Corbin, 1990). Constructionists recognize the researcher's own ontology as affecting his perception of how an individual constructs meaning (Gall et al.; Strauss & Corbin). They bring together objectivism and subjectivism in that they examine the world as it is while taking into account individual experienced reality and then blending the two in ways that they believe improves understanding (Crotty). Constructionism provides a foundation for cognitive psychology and a framework from which to examine the *All Kinds of Minds* model and *Universal Design for Learning* in the classroom.

## Cognitive Psychology

The gradual switch from behaviorism to cognitive psychology as the dominant school of thought began in the 1950's and continued through the 1970's as theoretical models like Broadbent's filter theory, Atkinson and Shiffrin's multistore model of memory, Gregory's indirect, constructivist top down theory of processing, and Baddely and Hitch's working memory model began to shape schools of thought (in Brown, 2007). Cognitive psychology examines cognitive processes like how we think, perceive, learn, and remember. It is a branch of cognitive science (Brown). As such, it draws from other disciplines including neuroscience, philosophy, and linguistics (Brown).

Using the model of a computer as an analogy of our brain, cognitive psychologists describe brain processes using input, storage, and retrieval processes. They often use flowcharts, similar to how one would model a computer's "thought" processes to demonstrate how these processes work together (Brown, 2007). Use of the model and flowcharts allow cognitive psychologists a framework from which they can predict, describe, and explain neurological processes. Individual use of neurological processes, however, differs depending on many cognitive and neurological factors that are inherent within each individual (Brown; Levine, 2002). Cognitive neuropsychologists use the study of patients with damaged brains to explain normal brain functioning (Brown). Cognitive neuroscientists examine the biological functioning of the brain as a method for understanding brain functioning. Specifically they investigate the electrical impulses as a measure of brain activity (Brown). The work of cognitive neuropsychologists and cognitive neuroscientists informs understanding of individual differences in neurological processes and therefore is important for educators as they seek to tap into the cognitive processes of students in order to enhance understanding.

### Metacognition

Although Brown (2007) describes cognitive psychologists' model of the brain as a computer and use of empirical studies to discover the workings of the brain, she reminds readers of the importance of

metacognition when describing and understanding brain processes. Metacognition is thinking about thinking; it is the area of neurological functioning that researchers use to make connections when conducting empirical studies. It is also the area of neurological functioning that allows a student to take what he has learned in the classroom, and analyze, synthesize, and create new meaning for himself surrounding the learning. Many educational researchers believe that facilitating daily access to metacognition is a critical element that is missing in many classrooms in the United States (Gronlund & Waugh, 2009; Hiebert et al., 2005; Kuhn, 1999).

### Application for practitioners

Cognitive psychologists' interests lie in uncovering and measuring the internal cognitive processes of the individual (Brown, 2007) which provides useful information for practitioners in a variety of fields. The need for practitioners to gain clear and precise understanding of cognitive processes in order to be able to effectively teach cognitive skills is conveyed by Kuhn (1999). Additionally, accessing multiple cognitive levels is a necessity if students are to gain true understanding of what they are learning in the classroom (Gronlund and Waugh, 2009; McEwan, 2003; Solomon, 2003). A few select terms from cognitive psychology, many of which are applied daily during the design and implementation of effective educational programs, are presented in Table 1.

Table 1

### Select Terms and Themes of Cognitive Psychology

Term	Definition
Chunking	knowledge made up of smaller pieces of information
Gestalt psychology	the idea that cognitions involve active, rather than passive, processing of information
Modularity	the idea that cognitive systems have independent processes or modules
Rehearsal	processing involves the

	repetition of material that has already been analyzed
Schema	a building block of knowledge about people, events and the world that is stored in long-term memory
Semantics	links between meaningful concepts

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*Note:* From “Cognitive Psychology” by C. Brown, 2007. Copyright 2007 by Sage Publications, Ltd. Terms were selected that had direct application to this research paper.

These terms provide foundational knowledge for understanding the work of Mel Levine and utilizing the *All Kinds of Minds* theoretical framework. They also offer evidence of the interrelatedness of cognitive psychology with the field of education.

The interdisciplinary nature of cognitive psychology creates an ideal foundational framework for examining diversity. The current fiscal crises combined with increasing educational issues surrounding diversity in the classroom create unique challenges that require creative collaborative relationships to be built (Economic Policy Institute, 2008). An interdisciplinary approach is essential for effectively addressing the needs of diversity in the classroom (Walther-Thomas, Korinek, McLaughlin, & Williams, 2000). *All Kinds of Minds*, a non-profit organization that promotes methods to help struggling learners find success in school, provides an interesting model using an interdisciplinary approach.

### **Mel Levine and All Kinds of Minds**

#### *A case for interdisciplinary collaboration in education*

Mel Levine is a developmental-behavioral pediatrician whose primary focus, for more than 30 years, has been to understand and explain information concerning children’s learning styles through interdisciplinary study (Levine, 2002). He describes developmental pediatrics as the integrated study of child development, behavior, and learning. While in the Philippines, where he was a school

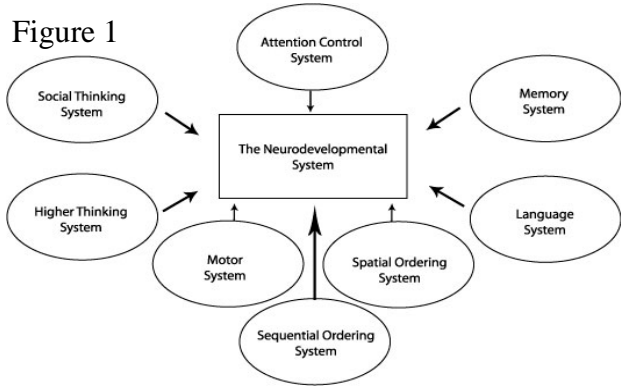
physician in a type of “full-service school”, Levine gained a deeper understanding of the importance of collaboration in better reaching the diverse needs of all children (Levine). The significance of interdisciplinary collaboration and the provision of collaborative structures as a continuum to be accessed depending upon individual needs of the student or professional working with the student is supported in educational research (Walther-Thomas et al.).

The framework for full-service schools, where schools and communities work toward improving education and helping students learn and grow while supporting and strengthening their families and communities, was established nearly eight decades ago by an effort of the Mott Foundation (Cooper & Runnells, 2008). The theoretical framework of the full-service community school continues and provides the cornerstone for schools partnering with other public and private agencies to offer a variety of supports and opportunities to children, youth, families and communities (Cooper & Runnells). In the early 1990s, full-service community schools gained momentum in education and social reform movements as a promising approach for providing integrated, comprehensive, and intensive services to children and their families (Dryfoos & Maguire, 2002).

#### *The inception of All Kinds of Minds Institute*

During this time period, a group of national leaders met at the University of North Carolina with the express purpose of positively impacting outcomes of students who struggle in school (All Kinds of Minds, 2009). It was here that Charles Schwab and Mel Levine began work on developing the non-profit institute, All Kinds of Minds, which would integrate the ideas developed at this national summit into a viable program and then “take the ideas to scale nationally” (All Kinds of Minds). Since this time, All Kinds of Mind Institute has developed a model, presented in Figure 1 and described in the Neurodevelopmental System section of this paper, which provides a foundation from which they are able to study, describe, predict, and inform as they work collaboratively with other professionals, families, and children.

The Neurodevelopmental System



In his interdisciplinary approach to explanation of children’s learning styles, Levine relates the medical model of viewing health within an overall system to the neurodevelopmental system as an overall system for understanding and identifying children’s learning needs. The eight neurodevelopmental systems in the All Kinds of Minds Institute model influence learning in much the same way that our cardiovascular, nervous, and gastrointestinal systems influence overall body health (Levine, 2002). These systems are modular yet also work together as students learn. The eight systems or neurodevelopmental constructs are measured and used to develop a very specific profile that educators, clinicians, parents, and the child utilize to facilitate success in the classroom. The All Kinds of Minds Institute elucidates the eight neurological processes as presented in Table 2.

Table 2

Neurodevelopmental construct	Description
Attention	includes aspects such as the ability to: concentrate, focus on one thing rather than the other, finish tasks one begins, and control what one says and does
Temporal-sequential ordering	the ability to understand time and sequence of various items or pieces of information
Spatial ordering	the ability to distinguish between a objects or to

Memory	use images to remember related information the ability to store and then later recall that information
Language	the ability to articulate and understand language involving elaborate interactions between various parts of the brain as we use receptive and expressive forms of language
Neuromotor functions	the ability to coordinate motor or muscle functions
Social cognition	the ability to succeed in social relationships with peers, parents, and teachers
Higher order cognition	the ability to understand and implement the steps necessary to solve problems, attack new areas of learning, and think creatively

*Note.* Selected text from All Kinds of Minds website: A Neurodevelopmental View. Retrieved April 17, 2009. ([http://www.allkindsofminds.org/about\\_neuroprofile.aspx](http://www.allkindsofminds.org/about_neuroprofile.aspx))

Application for Practitioners

The use of chunking, rehearsal, Gestalt psychology, ideas of modularity, semantics, and building schema are some of the methods used in developing instructional programs that access individual learning modalities (All Kinds of Minds, 2009; Levine, 2002). Metacognitive strategies are also used to facilitate the student’s understanding of how the brain works and why certain strategies must be used to enhance memory and learning. Research from a variety of disciplines is integrated within a social constructionist paradigm thereby facilitating metacognition. The All Kinds of Minds Institute promotes informing the child in a way that explicitly focuses on the child’s strengths to work



toward overcoming areas of weakness. They use an integrated approach involving teachers, clinicians, parents, and including the child as an integral member of the team to nurture a culture of self-efficacy for all members. The education of parents and teachers is an essential aspect of promoting successful learning for students who struggle in school (All Kinds of Minds; Levine). The fundamental goal of All Kinds of Mind Institute is to assist individual children in seeing themselves in a more positive light while providing them with the skills required to experience success in school and in life (All Kinds of Minds; Levine).

Levine (2002) likens the neurodevelopmental system to a team that must work together functionally for children to acquire knowledge much like the team that All Kinds of Mind Institute strives to build to assist student learning. "There is much that parents and teachers can do to redeem such kids, all of whom possess remarkable strengths waiting to be tapped" (Levine, p.15). All Kinds of Minds Institute has sought to provide resources for parents and educators through books, lectures, professional development, etc. that supply the tools needed for early detection of learning differences and act as a "road map" of effective instructional techniques that reach a diverse range of learning styles (All Kinds of Minds, 2009; Levine). In the next section, we discuss the application of universal design for learning as an additional approach that provides opportunities to access learning using students' strengths.

### **Universal Design**

At the beginning of the 20<sup>th</sup> century, people with disabilities were a true minority. As our nation neared the end of the 20<sup>th</sup> century, we were able to reflect on two world wars that resulted in more than 53 million people with disabilities, with 26 million of those characterized as severe (McNeil, 1997). Over the last two decades, the disability rights movement, public recognition of persons with disabilities, and federal legislation has resulted in a shift in architectural focus from "barrier-free" to one of universal design. The barrier-free design specifically focused on those additions that allowed persons with disabilities to access the environment

or make use of things in the environment. In contrast, the term "universal design" refers to a movement in architecture and product development aimed at creating places and products that are accessible to as many people as possible, including individuals with disabilities. Unlike the barrier-free movement, universal design recognized that the creation of facilities and products that allow access to persons with disabilities usually benefited persons without disabilities as well. For example, a curbcut that makes the street and sidewalk accessible for a person in a wheelchair, also benefits a delivery person who uses a rolling cart or a bicyclist.

### **Universal Design for Learning**

As is common, the field of education borrowed from the field of architecture the idea of universal design and created a framework to provide all students with opportunities to learn, referred to as Universal Design for Learning (UDL). The Council for Exceptional Children (CEC, 1999) defined the universal design in education as follows: In terms of learning, universal design means the design of instructional materials and activities that make the learning goals 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 differing abilities. These alternatives are built into the instructional design and operating systems of educational materials – they are not added on after-the-fact (Research Connections, 1999).

The paradigm of UDL was first developed by the Center for Applied Special Technology (CAST) as a framework and set of principles aimed at providing all students with opportunities to learn. The primary purpose of the paradigm was to demonstrate a respect for the diverse individual learning styles without requiring individual adaptations. The three principles that are key to UDL are as follows: presenting information and concepts to be learned in multiple ways, using a variety of formats; allowing students multiple ways of expressing their comprehension and mastery of a

given topic; and encouraging students multiple ways to engage with new ideas and information. The inherent inclusion of flexibility in learning tasks allows all students to have equal access to learning, negating the need to consider how the task might be modified or adapted for those with disabilities. The effective use of UDL in the general education classroom ensures that the curriculum and instruction are not only accessible, but engaging to all learners.

Neuroscientists believe that each individual has a unique way of processing information. The three essential processes for learning include recognition of information to be learned; application of strategies to process that information; and engagement with the learning task” (Vygotsky, 1962). To provide students with a variety of ways to recognize information to be learned, UDL includes various visual, auditory, and tactile representations of the information. UDL also includes multiple means of expression in order to allow the learner to process the information learned. Additionally, UDL provides various ways to challenge and motivate the student to engage with the learning task.

UDL not only benefits the individual learner, but it helps educators meet the requirements of federal laws such as No Child Left Behind (NCLB, 2001) and the Individuals with Disabilities Education Act (IDEA, 2004). In order for student performance to improve, there must first be physical and cognitive access. With barriers to the curriculum reduced and learning supported, students can gain knowledge, skills and enthusiasm for learning (National Universal Design for Learning Task Force, 2009). Furthermore, assessments of their knowledge and skills are more valid.

The Theory of Cognitive Psychology has no better practical match than that of Universal Design for Learning. As a theoretical perspective that focuses on human perception, thought, and memory as they pertain to learning, cognitive psychology recognizes that learners construct knowledge. In teaching from a constructivist perspective, teachers take on the role of observer, coach, and facilitator, as opposed to dominating the teaching experience. Constructivist teaching recognizes that students bring to the educational setting social interactions

that assist them in developing metacognitive processes for judging, organizing, and acquiring new information. Vygotsky (1978) stressed in his writing the role of children’s social interactions with parents, peers, and persons in their homes and communities in learning. An important aspect of Vygotsky’s theory is the idea that full development depends upon full social interaction. The range of skill that can be developed with adult guidance and peer collaboration exceeds what can be attained alone (Vygotsky). Rumelhart (1981) termed the mental “scaffolds” created by learners as they interact with others as schemata used to organize experiences and construct knowledge. These experiences help them to create meaning and process information, as well as create a context in which the constructing of knowledge takes place. As teachers access the students’ prior knowledge and experiences, universal design provides an opportunity for each student to benefit from and contribute to the lesson in an individualized, though equally meaningful way. Teachers then observe, coach, and facilitate learning. This differs greatly from the teacher-dominated perspective that simply transmits knowledge to students.

#### *UDL in the Early Childhood Education Setting*

In the early childhood education setting, teachers and parents grapple with how best to include children with varying developmental needs (Darragh, 2007). In what is tantamount to a merger between special education and early childhood education due to federal legislation, vested participants attempt to address teaching practices, curriculum, and environmental design. However, without a framework for considering and organizing these efforts, they remain, what Darragh refers to as *piecemeal and isolated*. UDL provides such a framework. This synthesizing framework, referred to by Darragh as Universal Design for Early Childhood Education (UDECE) endorses an ecological approach to providing high quality early childhood education for all children. Urie Bronfenbrenner (1979) provides a theoretical rationale that focuses on the changing biology of a child and the impact of society and culture on this changing biology. As the child grows, the world treats the child differently, the child’s relationships

with family, teachers, and peers change at each developmental stage. At each stage, teachers must recognize that the child requires multiple means of representation, engagement, and expression.

### *UDL in the High School Education Setting*

In the high school education setting, use of UDL becomes less daunting as goals are clearly defined, conventional and unconventional instructional materials and methods are used, and multiple options for demonstrating knowledge and understanding are present (Meo, 2008).

Use of the *planning for all learners* (PAL) process, which was developed by the CAST in 2004, in classroom practice will help ensure that the needs of diverse learners are met in the classroom. Once the UDL team, most often co-teachers, is identified, there are four critical steps to effective use of the PAL process. Step 1 of the PAL process requires the UDL team to set goals for what will be achieved through the instruction. Step 2 involves analyzing the curriculum and classroom in order to identify potential barriers and eliminate them before students experience failure. Step 3 of the PAL process requires the team to apply the principles of UDL during lesson planning. This includes, but is not limited to, the determination of the methods, materials, and assessments that have universal access, to be used in the lesson. Step 4 involves the teaching of the UDL lesson while giving due deference to student's prior knowledge, as well as the deficits in their knowledge. Attention to the goals, methods, materials and assessment result in a customized curriculum that meets the needs of diverse learners in the same classroom (Meo, 2008).

### **Summary**

The social constructionist perspective suggests the way an individual views the natural world is strongly influenced by the culture in which he lives and the environment in which he learns. Additionally, constructionists believe each individual brings unique experiences to the educational setting that influences his learning and the learning of others creating a dynamic environment in the classroom. A greater understanding of individual cognitive abilities

occurs as social constructionism blends with cognitive psychology.

All Kinds of Minds Institute and Universal Design for Learning integrate constructionism and cognitive psychology as they provide frameworks and tools for teachers to gain understanding surrounding different learning styles and facilitate student learning for all students. These frameworks present a variety of methods for teachers to access diverse learning styles in ways that allow students who learn differently to retain their dignity and contribute positively to their own and others' learning. Increased understanding of how the individual thinks, learns, and remembers, promotes the use of appropriate interventions through the use of All Kinds of Minds and Universal Design for Learning strategies. All Kinds of Minds Institute and Universal Design for Learning provide a variety of methods to recognize information, express meaning, and engage with learning. The wealth of strategies provided by All Kinds of Minds and Universal Design for Learning allows educators to attend to the assets and needs of the diverse group of learners represented in schools.

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