Chapter One Defining Creativity, Dyslexia, Dysgraphia and Dyscalculia

Book · April 2021

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Chapter One

Defining Creativity, Dyslexia, Dysgraphia and Dyscalculia

Abstract

This chapter provides the foundational knowledge of Dyslexia, Dysgraphia, Dyscalculia, Comorbidity and Twice Exceptional conditions. We further discuss definitions and key ideas of creativity.

Chapter One

Defining Creativity, Dyslexia, Dysgraphia and Dyscalculia

Teachers are the key to nurturing their students' creative strengths. Creativity is one of the important skills needed for the 21st Century. In addition to reading, writing, and mathematics, the soft skills of critical thinking, problem solving, communication, collaboration, creativity and innovation are necessary for developing accomplished citizens including our future workforce (Chu, Reynolds, Tavares, Notari, & Lee 2017).

When creativity is nourished in the classroom, students with dyslexia, dysgraphia and/or dyscalculia, who often have creative strengths, learn from a strengths-based approach rather than a deficit-based approach. It is important to encourage and recognize these creative strengths.

What does a creative nurturing classroom look like?

Teachers foster a climate in which creative thinkers are respected, students and teachers tolerate new ideas, conformity is not imposed, and diversity in ideas is encouraged and appreciated (Cropley, 2006).

How can teachers improve creative thinking in students?

By providing choices, rewarding different ideas and products, encouraging sensible risks, and emphasizing student' strengths and interests (de Souza Fleith, 2000; Kaufman & Sternberg, 2007).

What happens when teachers are aware of and model their own creativity?

Creative learning is likely to occur (Jeffrey, 2006; Rejskind, 2000). Teachers can self-assess their own creativity using the Reisman Diagnostic Creativity Assessment (RDCA) presented in Chapter 5. Knowing your own creative strengths can increase the likelihood that you will model creative strategies in your own classroom.

Defining Creative Thinking

Current definitions of creativity accept two main concepts: i. producing original, novel ideas, and ii. relevance to the problem to be addressed. We also distinguish between creativity and innovation. Creativity refers to generating original ideas; innovation is the implementation of these ideas. Both are needed in creative problem solving. It is not enough to generate creative ideas if they just float up into cyberspace; there must be an implementation activity to ensure relevant results.

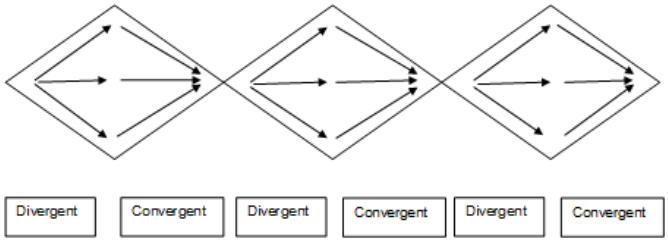
Thus, creativity involves something new and relevant to an identified issue. With over 100 definitions, creativity can manifest as ideas, theories, artwork, inventions and numerous other iterations. (Meusberger, 2009). These definitions of creativity involve the production of novel, useful products (Mumford, 2003) or the production of something original and worthwhile (Sternberg, 2011). Definitions of creativity also include a process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on. Further involved are identifying the difficulty, searching for solutions, making guesses, or formulating hypotheses about the deficiencies; testing and retesting these hypotheses and possibly modifying and retesting them; and finally communicating the results (Torrance, 1998).

The study of creativity as a human quality, rather than a vehicle for the divine, first emerged during the Renaissance. Leonardo da Vinci epitomized creativity during that time, and excelled in fields as varied as mathematics, engineering, painting, sculpting, astronomy, anatomy, and a litany of other topics. However, serious study of creativity did not occur until the Enlightenment in the 18th century when imagination became a key element of human cognition (Albert & Runco, 1999; Runco & Albert, 2010).

Many believe that creative thinking is synonymous with divergent thinking, which involves generating unique, novel and original ideas (e.g., brainstorming). But this is only one component of creative thinking; convergent thinking also is involved. Convergent thinking is analytical, judgmental and involves evaluating choices before making a decision. Convergent thinking includes narrowing ideas by evaluating the previously generated ideas that emerged in the

divergent portion of the sequence (e.g., settling upon an idea from a selection of ideas). Figure 1.1 shows the sequential process of divergent-convergent thinking that comprises creative thinking.

Figure 1.1. Creative Thinking Process here



However, throughout the world, the term "creative" can conjure up many images and, therefore, it has many meanings (Kaufman & Sternberg, 2006). There doesn't appear to be a universal agreement (Antonenko & Thompson, 2011; Reid, 2015). Most researchers agree that creativity is the mind's attempt to find an answer to a problem or the resolution to a given set of circumstances (Amabile, 1996; Runco, 2014; Sternberg, 1999). The point that every creativity expert seems to agree on is that creativity involves originality (Sternberg, Grigorenko, & Singer, 2006). Table 1.1 presents various definitions as provided by leading experts in the field of creativity:

Table 1.1. Creativity as Defined by Leading Experts {Adapted from: Reisman, 2016)

Expert	CREATIVITY DEFINITION
Carl Rodgers (psychologist)	the essence of creativity is novelty, and hence we have no standard by which to judge it (Rogers, 1961)
John Haefele (CEO and entrepreneur)	the ability to make new combinations of social worth (Haefele, 1962)
Mihaly Csikszentmihalyi (psychologist, academic, writer)	any act, idea, or product that changes or transforms an existing domain into a new one (Csikszentmihalyi, 2013)
Robert Sternberg (psychologist)	The ability to produce work that is novel (original) and adaptive with respect to task or situational constraints (Sternberg & Lubart, 1995)

Ellis Paul Torrance (psychologist)	a process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on; identifying the difficult, searching for solutions, making guesses, or formulating hypotheses and possibly modifying and retesting them; and finally communicating the results (Torrance, 1966)

Creativity is both an outcome and a process (Potočnik, & Anderson, 2016; Shalley & Gilson, 2017). It is also a skill that is capable of being developed with deliberate practice (Sale, 2015). The pitfalls in definitions of creativity affect the teachers' ability to identify often hidden creativity of their students. Teachers often misidentify creativity in students. In fact, students that are complacent, agreeable, subordinate, task-oriented, and smile are identified as creative by their teachers (Whitelaw, 2006; Torrance, 1975). However, creative students can be a challenge. They question and request evidence for statements, may daydream if bored, and often have a lot of energy, which inhibits their ability to sit still for hours at a time. These behaviors are often disruptive, and the students are perceived to have behavior problems.

Dyslexia

Background

It is true that as long as humanity has been writing, some people have had difficulty reading. As far back as 1887, Rudolf Berlin coined the term dyslexia to refer to "the loss of reading ability due to brain injury or disease" (Henry, 1999). In 1896 Dr. W. Pringle Morgan used the term Congenital Word Blindness to refer to the inability to read even though there was not an injury or illness as the cause. This was followed in 1928 when Dr. Samuel Orton used the term Specific Reading Disability and in 1935, Anna Gillingham used the term Specific Language Disability (Henry, 1999).

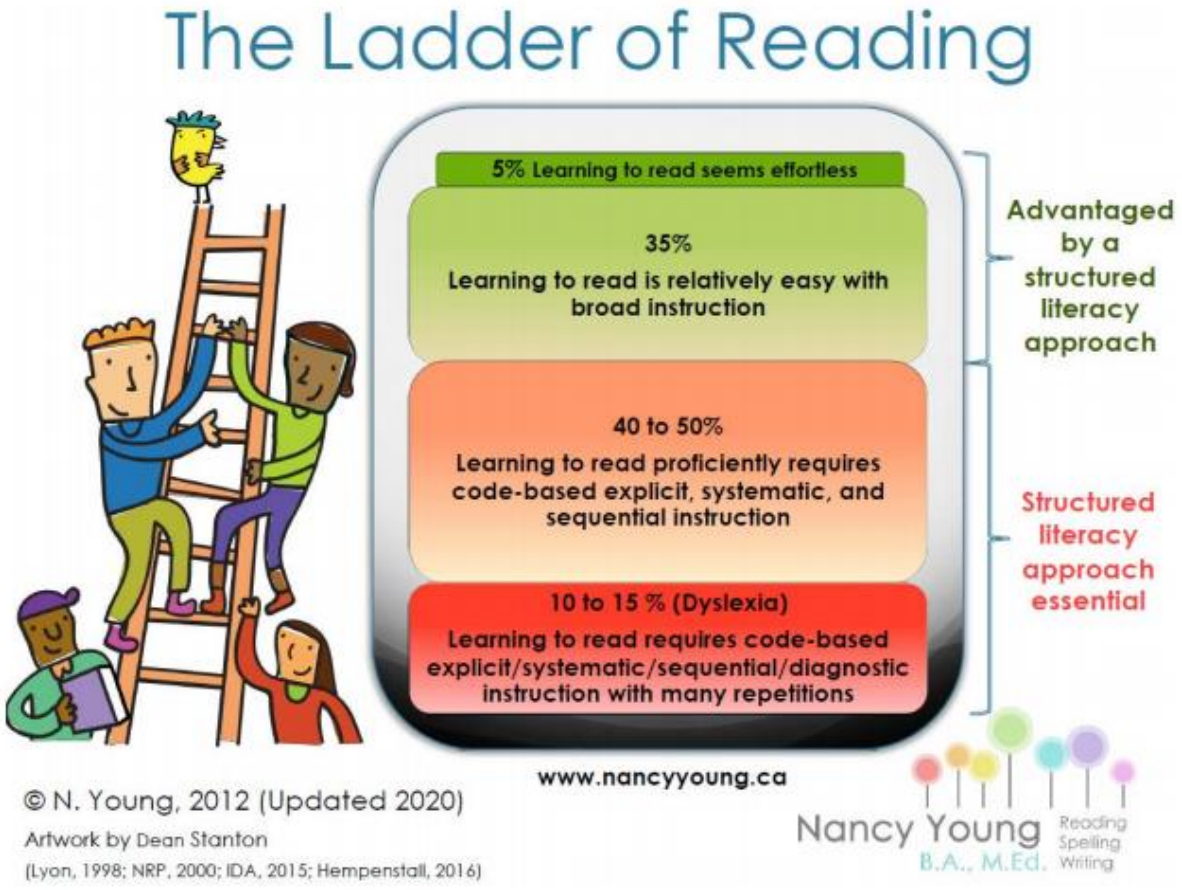
In discussing reading difficulties, it is important to understand The Simple View of Reading (Gough &Tunmer, 1986; Hoover & Gough, 1990) and how it can be used to classify the various types of reading issues. This theory was introduced in 1986 and continues to be important (Catts, Adolf & Weismer, 2006; Hoover & Tunmer, 2018). The Simple View of Reading (SVR) asserts that a child's reading comprehension is the *product* of his decoding skills and language comprehension.

$$RC = D \times LC$$

If a child has issues with decoding (recognizing printed words) then reading comprehension would be affected. If a child has issues with language comprehension (understanding spoken language), comprehension is affected. Both decoding and language comprehension are necessary to get to the endpoint- comprehension (Hoover & Tunmer, 2018). While language comprehension will be discussed in relation to reading comprehension, the focus of this chapter will be on the difficulty with understanding the alphabetic code as it relates to dyslexia.

Understanding the alphabetic code and being able to map the letters and sounds of the English language is a developmental process. Some children will be able to figure that out on their own. Most children need direct, explicit instruction on identifying the letters and then mapping the sounds to those letters and learning the patterns of words and syllables. The Ladder of Reading (Young, 2017) showcases the breakdown of the percent of children that learn to read by a structured literacy approach (Figure 1.2) For students with dyslexia, we must provide code-based, explicit, systematic instruction to provide them with the foundational skills necessary to decode. When efficient decoding skills are in place and students have good oral language skills, we can better ensure reading comprehension is successful.

Figure 1.2 The Ladder of Reading (Young, 2020)



In 2001, Hollis Scarborough created The Reading Rope (Figure 1.2) which identified the components of decoding and language comprehension to get a better understanding of all the necessary strands to achieve effective comprehension. Each strand is necessary and must be woven together tightly. The word recognition part of the rope consists of background knowledge, vocabulary, language structures, verbal reasoning and literacy knowledge. These skills are often taught throughout the school day in multiple ways. Of course, we also understand that vocabulary and background knowledge develop from birth and having experiences and conversations in the home contribute to better language comprehension when a child enters school. What is not as readily understood is that the strands that make up the word recognition part of the equation also begin to develop before a child enters school. In 2013, researchers found that fetuses can distinguish sounds at approximately 27 weeks in utero (Partanen, et.al., 2013). Phonological awareness is the skill necessary for recognizing and manipulating sounds. It includes being able to identify words that rhyme, counting the syllables in a word, and eventually identifying the phonemes (smallest unit of sounds) in words. You can see the progression from identifying the sounds in words to being able to map those sounds to the written letters (graphemes) to decode words. Recognizing words by sight is also important for those words that

occur frequently and for those words that do not follow the typical patterns of the English language. As the student becomes more automatic, skilled reading occurs which leads to better comprehension.

Figure 1.3 The Reading Rope (Scarborough, 2001)

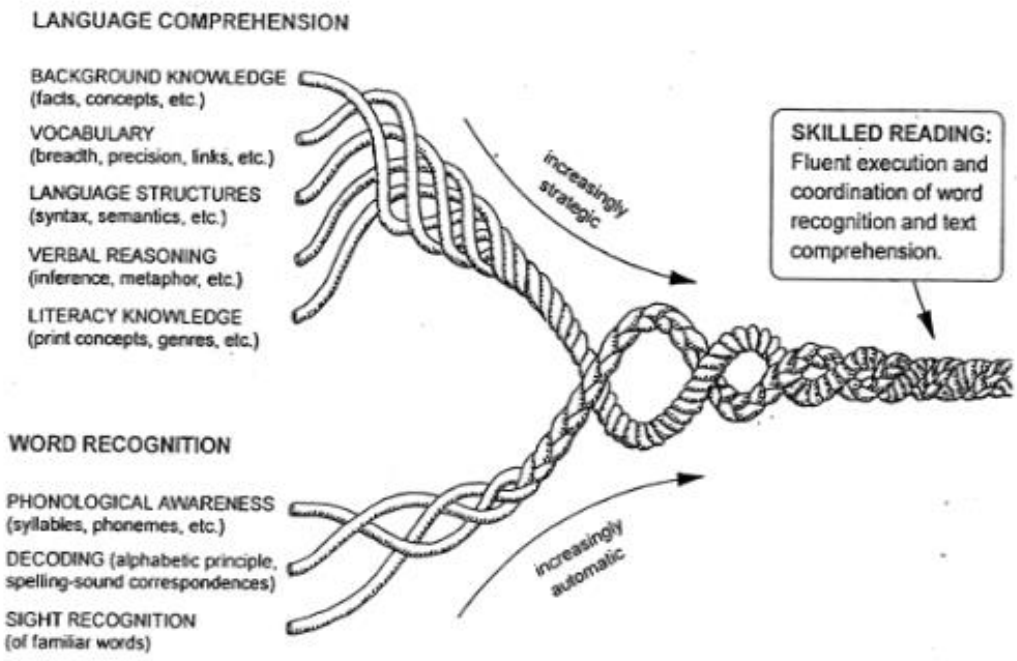


Figure 1.3 Scarborough, H. S. (2001). Connecting early language and literacy to later reading (dis)abilities: Evidence, theory, and practice. In S. Neuman & D. Dickinson (Eds.), Handbook for research in early literacy (pp. 97-110). New York: Guilford Press.

Students with dyslexia typically have phonological deficits. One of the main theories of development dyslexia is the phonological deficit theory where a phonological deficit is "a crucial feature" (Ramus, Marshall, Rosen, van der Lely, 2013). Students with Specific Language Impairment (SLI) also often have phonological deficits. In this book, we are specifically addressing developmental dyslexia and not SLI. Dyslexia and SLI are two distinct disorders that are often comorbid (Ramus, et al, 2013; Bishop & Snowling, 2004; Catts, Adlof, Hogan, Weismer, 2005) which will be addressed later in the chapter. Therefore, many of the strategies, assessments and activities addressed in this book can also be applied for students with SLI.

Definition

The term dyslexia comes from the Greek roots *dys* meaning difficult and *lexia* meaning reading. Dyslexia is a brain-based disability that affects the ability to read even though the person has average or above average intelligence (NIH, 2014). Today, dyslexia is a pattern of learning difficulties characterized by problems with accurate or fluent word recognition, poor decoding, and poor spelling abilities." (American Psychiatric Association, p.67) While the term dyslexia is used for these types of difficulties, the DSM-5 uses Specific Learning Disorders as the category that includes dyslexia.

The International Dyslexia Association defines dyslexia as:

> A specific learning disability that is neurobiological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge. (IDA, 2002).

The brain is not wired to read. It is wired for oral language, but not to convert print into speech. Approximately 67% of students (Colletti, 2013) will not learn to read by being exposed to books or being read to on a regular basis. Most students will need to have explicit, direct instruction in phonemic awareness and phonics to be able to read successfully. While not all the 67% that need direct instruction have a learning disability, most children would benefit from this type of reading instruction. Being able to identify this type of learning disability and then provide the necessary instruction is important. It is just as important to help students with dyslexia focus on their strengths. To help combat the self-esteem issues of these students, an effective strategy is to help them become aware of their creativity and innovation talents. Suggestions for accomplishing this are integrated throughout the book.

As stated earlier, dyslexia is a neurobiological issue. Researchers have not yet determined the cause of dyslexia, but have identified how the brain is affected. Dyslexia is linked to genetics and is thought to be hereditary. It has been identified in 40- 60% of children of a parent with dyslexia (Volge, DeFries & Decker, 1985; Grigorenko, 2004). Each person with dyslexia is unique and can be affected differently.

For many years, it was not understood if the issues in the dyslexic brain were due to lack of reading (because it was difficult) or if the issues began long before the individual began the process of learning to read. With the use of MRIs and EEGs in scientific studies, much more was discovered about the reading brain. "Successful reading involves the ability to efficiently integrate visual signals with the sounds of speech and the language system; thus, diagnosing the reading circuitry requires testing the cortical and white matter regions that carry reading information from the visual, auditory, and language systems" (Wandell & Le, 2017, p. 298). There are neural circuits in the brain that are used in the process of reading. The typical reading

brain uses the inferior frontal cortex, the superior temporal cortex, the temporo-parietal cortex, and the occipito-temporal cortex.

Warning Signs

Just as the brains of every individual are different, so are the brains of individuals with dyslexia. There are, however, signs and symptoms that are demonstrated in students with dyslexia:

- Difficulty rhyming
- Difficulty learning names of letters of alphabet and sounds of the letters
- Mispronouncing familiar words
- Difficulty sounding out words
- Trouble understanding words are made up of different sounds
- Difficulty finding the right words to answer a question
- Difficulty with remembering sequences and order of things
- Issues with spelling
- Avoidance of reading- complaining it is too difficult

It is important to note that not every student with dyslexia will display all these signs/symptoms, but the general result is an issue with being able to read and spell words.

How it affects learner (self-concept/self-efficacy) and learning

Mental health issues such as depression, anxiety and even suicide among students with dyslexia is becoming more prevalent. Reading and learning disabilities may have higher rates of suicide (Daniel, et al., 2016). Without proper intervention and instruction in the area of need, students with dyslexia experience greater frustration and fall further behind peers. Academic failure can lead to dropping out of school and other issues. There is a link between dyslexia and the school to prison pipeline. In study of Texas inmates, 80% involved in the prison system are illiterate and over 48% with word decoding deficits (Moody, et al., 2000).

Dysgraphia

Dysgraphia was originally included with issues surrounding dyslexia. Anna Gillingham presented a series of workshops in 1936 on issues with reading and spelling and handwriting (dysgraphia). She discussed how writing issues affected achievement. She believed that teaching students with dysgraphia to type would be beneficial. Anna Gillingham worked with Bessie Stillman in the 1930s and wrote the book *Remedial Work for Reading, Spelling and Penmanship.* Dysgraphia was defined during this time as difficulty with forming letters, spacing letters, and writing legibly.

Definition

Dysgraphia is a specific learning disability with a difficulty with sub word letter formation when a developmental motor condition can be ruled out (Berninger, V.W.; Wolf, B., Alfonso, V.C.; Joshi, R.M.; & Silliman E. R. 2016). "At its broadest definition, dysgraphia can manifest as difficulty writing at any level, including letter illegibility, slow rate of writing, difficulty spelling, and problems of syntax and composition" (Chung & Patel, 2015). Dysgraphia, a writing disability, has been considered the forgotten Specific Learning Disability (Katusic, Colligan, Weaver, & Barbaresi, 2009). These students have difficulty forming legible letters automatically. The amount of effort used to form the letters drains the working memory and limits the ability to get thoughts on paper (or device). Students with dysgraphia may or may not have difficulty with reading. For some, it is only an impairment of forming the letter and retrieving the word to write it. Others may also have dyslexia which would also affect the student's ability to read the words. Comorbidity is when the student has more than one area, i.e. dysgraphia and dyslexia. It is estimated that 10%-30% of school-aged children have difficulty with written expression (Chung & Patel, 2015). Depending on the definition used, between 30-47% of students with dysgraphia also have dyslexia (Chung & Patel, 2015).

The DSM-5 does not include the term dysgraphia. It identifies the issues in this area as "an impairment in written expression" under the specific learning disability category (SLD).

IDEA (2004) identifies SLD as:

> a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, that may manifest itself in the imperfect ability to listen, think, speak, read, write, spell, or to do mathematical calculations, including conditions such as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. Specific learning disability does not include learning problems that are primarily the result of visual, hearing, or motor disabilities, of intellectual disability, of emotional disturbance, or of environmental, cultural, or economic disadvantage.

Dysgraphia can also occur in students with other cognitive or developmental disorders such as autism, cerebral palsy and ADHD.

What helps students with dysgraphia?

Many teachers not teaching or focusing on handwriting : "many teachers in the United States no longer explicitly teach the process of writing letters, which can hinder those children who struggle to master this skill" (Chung & Patel, 2015; Beringer 2008; Graham & Perin, 2007).

With recent research in this area, there is a movement to bring handwriting back into the curriculum.

For students who have fine motor issues, having the student select a pencil that may be thicker and bulkier and offering a selection of pencil grips can be very helpful. Students that have issues with spacing can benefit from lined paper that provides more space or providing paper that has slightly raised lines for the student to feel where the lines are. Helping students get thoughts on paper takes a bit more planning on the teachers' part. Graphic organizers that help students organize before writing are helpful. Choosing the graphic organizer to match the task is important. A very useful tool is to have a speech to text program for the student to use when writing longer essays. The student can use a graphic organizer to plan and then use the speech-to-text to put their ideas into sentences. For students that have difficulty with spelling and handwriting, this is an excellent accommodation.

Warning signs: Handwriting

- Poor spacing between letters or words
- Difficulty with pencil grip, too tight of a grip
- Various sizes of letters
- Unusual position for paper, posture, pencil
- Slow letter formation

Warning signs: Spelling and Writing

- Poor spelling
- Difficulty getting ideas on paper
- Complaining that the task is too difficult

How it affects learner (self-concept/self-efficacy) and learning

Students with dysgraphia may take much longer to copy notes, write sentences and summaries than their typically developing peers. The student may become frustrated and want to stop the activity. Fatigue is also a factor as these students are expending a lot of mental energy in the task. For an older student that may have to take notes during a lecture, the student may not be receiving the information presented because he must concentrate on the writing; therefore, not hearing everything in the lecture. The student may also choose to listen to the lecture rather than take notes, and then does not have notes to refer to when studying for a test.

Anxiety and depression can become an issue as it can with any of the learning disorders we are discussing.

Dyscalculia

Background- historical development

Dyscalculia was first recognized in 1919, by Salomon Henschen, who noticed that students who displayed mathematics learning difficulties, affecting learner's ability to read and to comprehend mathematics language, often were of average or above average intelligence.

Israel and Olubunmi (2014) pointed out that an impaired ability to learn basic mathematics results from prevalent emotional, psychological, physiological and sociological problems associated with mathematics learning. Many students who suffer from dyscalculia have little confidence in their ability to study mathematics and experience feelings of tension, helplessness, anxiety, and mental disorganization when required to solve mathematical problems (Ashcraft and Faust, 1994). Hence emotion as well as interpersonal and intrapersonal factors (as discussed in Chapter Four under generic influences on learning) play significant roles in learning mathematics.

Dyscalculia has a history in mathematics accomplishments of Poincaré and von Helmholtz that were built upon writings regarding the creative process by Graham Wallas and Max Wertheimer. Wertheimer distinguished between reproductive thinking and productive thinking. Reproductive thinking is associated with repetition, conditioning, habits or familiar intellectual territory. Productive thinking, which is insight-based, is the product of new ideas and breakthroughs that result in true understanding of conceptual problems and relationships. He believed that creativity underlied positive thinking (Wertheimer, 1996). Similarly, Wallas (1926) in *Art of Thought*, presented one of the first models of the creative process which we discuss in Chapter Two.

Cahan (1994) described Von Helmholtz's four stages of mathematical thought: saturation, incubation, illumination, and verification that were built upon Wallas' theory. Saturation involves taking hold of the problem, which then either results in illumination or dropping the problem. Next incubation in which unconscious stewing occurs; what we call the fuzzy mess. Then illumination or the eureka moment happens followed by verification—the checking phase. Relatedly, Poincare (1908) concluded the following regarding mathematical thinking:

- The creations involve a period of conscious work, followed by a period of unconscious work.
- Conscious work is also necessary after the unconscious work, to put the unconscious results on a firm footing.

Definition

Developmental Dyscalculia or Dyscalculia, as it will be referred to in this book, is a learning disability that makes it hard to make sense of numbers and mathematics in general. The prevalence of dyscalculia is between 3 and 6 % of the population (Kaufmann & von Aster, 2012; Shalev & von Aster, 2008) Learners with dyscalculia lack an intuitive grasp of numbers and have problems learning number facts and procedures. Even if they produce a correct answer or use a correct method, they may do so mechanically and without grasping the underlying meaning. This will lead to further problems in higher level mathematics. Dyscalculia involves impaired number sense and concepts like cardinality (the how muchness of a set of objects) and ordinality (counting the order of things), and lack of organizing one's thoughts when engaging in number tasks. It involves inability to compare and estimate quantities on a number line, how to work with numbers in computation -- adding, subtracting, multiplying or dividing, how to employ numbers when counting, measuring, estimating, and solving word problems and yet - doing well in other subjects. A student may also have very limited retrieval of calculation skills (Kucian & von Aster, 2015).

Warning Signs in Preschool or Kindergarten

- Has trouble learning to count, especially when it comes to assigning each object in a group a number
- Has trouble recognizing number symbols, such as making the connection between "7" and the word seven
- Struggles to connect a number to a real-life situation, such as knowing that "3" can apply to any group that has three things in it—3 cookies, 3 cars, 3 kids, etc.
- Has trouble remembering numbers, and skips numbers long after students the same age can count numbers and remember them in the right order
- Finds it hard to recognize patterns and sort items by size, shape or color
- Understand the order of numbers in a list: 1st, 2nd, 3rd, etc.

Warning Signs in Grade School or Middle School

- Poor understanding of the signs +, -, ÷ and x, or may confuse these mathematical symbols.
- Has difficulty learning and recalling basic math facts, such as 2 + 4 = 6 or 3 x 5 = 15
- May still use fingers to count instead of using more sophisticated strategies
- Has trouble writing numerals clearly or putting them in the correct column
- May reverse or transpose numbers for example 63 for 36, or 785 for 875.
- Shows difficulty understanding concepts of place value, and quantity, number lines, positive and negative value, carrying and borrowing
- Has difficulty understanding and doing word problems
- Has difficulty sequencing information or events
- Exhibits difficulty using steps involved in math operations

- Shows difficulty understanding fractions
- Is challenged making change and handling money
- Displays difficulty recognizing patterns when adding, subtracting, multiplying, or dividing
- Has trouble coming up with a plan to solve a math problem
- Struggles to understand words related to math, such as greater than and less than
- Has trouble telling left from right, and has a poor sense of direction
- Has difficulty remembering phone numbers and game scores
- Difficulty with conceptualizing time and judging the passing of time.
- Difficulty with everyday tasks like checking change.
- Difficulty keeping score during games.
- Has difficulty understanding concepts related to time such as days, weeks, months, seasons, quarters, etc.
- Difficulty grasping concepts like *more* and *less*, or *larger* and *smaller*.
- Difficulty with number comparisons (for instance, 12 is greater than 10, and 4 is half of 8).

Warning Signs in High School

- Struggles to apply math concepts to everyday life, including money matters such as estimating the total cost, making exact change and figuring out a tip
- Has trouble measuring things, like ingredients in a simple recipe
- Has hard time grasping information shown on graphs or charts
- Inability to grasp and remember mathematical concepts, rules, formulae, and sequences.
- May have a poor sense of direction (i.e., north, south, east, and west), potentially even with a compass.
- May have difficulty mentally estimating the measurement of an object or distance (e.g., whether something is 10 or 20 feet away).
- Make number comparisons (for instance, 12 is greater than 10, and 4 is half of 8).

How it affects learner (self -concept/self -efficacy) and learning

Emotions play a significant role in learning and performing in mathematics (see emotional aspects of learning disabilities under generic influences on learning in Chapter Three). *Pseudo-dyscalculia* causes the same difficulties as dyscalculia, but the explanation for the difficulties lies not in cognitive dysfunction or brain disturbance but in the psychosocial environment, i.e., in emotional blockings, or a communicated family history of failure in mathematics (e.g., parent says things like “Oh I never could do math”). Students with pseudo-dyscalculia have the cognitive ability to achieve, but they may have accepted the idea that they absolutely cannot succeed in math tasks. They may think they are not smart enough, or they expect to fail; they lack self-efficacy and self-esteem, they endure feelings of stupidity and other types of emotional blockings.

Co-Morbidity

Co-morbidities and Commonly Associated Accompanying Phenomena

Comorbidity refers to the presence of two or more distinct issues. Students with dyslexia can be combined or intertwined with dysgraphia, dyscalculia, ADHD, anxiety, depression, disruptive, impulse-control and conduct disorders or autism spectrum disorder (Hendren, Haft, Black, Cushen White, & Hoeft, 2018). There is evidence that a disorder of linguistic development in preschool children is associated with poor performance dealing with calculations in early childhood education (Cohen Kadosh, Cohen Kadosh, Schuhmann, Kaas, Goebel, Henik & Sack 2007; Wilson & Dehaene, 2007).

Dyslexia and dyscalculia are often comorbid and have separate cognitive profiles: dyslexia having a phonological deficit and dyscalculia having a deficient number module(Landerl, Fussenegger, Moll & Willburger, 2009). The term comorbidity can indicate a condition existing simultaneously, but independently with another condition.

Definition

A student is considered to have comorbidity if there is a combination of a reading disability and/or a math disability, and/or a writing disability. Reading disability and math disability have an approximate 40% comorbidity rate (Wilcutt, et al., 2013). It has been more difficult to determine the rate of comorbidity of dyslexia and dysgraphia, due to overlap in phonological awareness, visual attention, working memory and auditory processing (Dohla & Heim, 2016).

"Comorbidity is the concept that individuals can have more than one distinct disease" (Frenz, 2016). Here, Frenz is discussing psychiatric comorbidity; however, comorbidity can be applied to having more than one distinct learning issue. Most common is the presence of Attention Deficit Hyperactivity Disorder (ADHD) and Dyslexia. Of those with reading disabilities, 20%-40% also have ADHD (Germano, Gagliano & Curatolo, 2010; Margari, et al. 2013). There are multiple combinations that can affect student learning. In this realm, one cannot dismiss psychiatric comorbidity, as this may be more of an issue in recent years. In a study by Margari et al. (2013), neuropsychopathologies were found in 62.2% of the participants with Specific Learning Disorders (SLD). In the same study, Anxiety Disorder was present in over 28% of those with a Specific Language Disorder.

How it affects learner (self-concept/self-efficacy) and learning

The effect on the learner is the same as if the student had only one issue: reading, writing or math. However, if the comorbidity includes a psychiatric issue, as discussed earlier, the issues could lead to school drop- out and even suicide.

Twice Exceptional

Definition

The twice exceptional student has an identified disability and giftedness. These students may show strengths or gifts in cognitive abilities, visual or performing arts, athletics or leadership and be identified with one or more areas of learning disabilities (dyslexia, dysgraphia or dyscalculia) (Berninger & Abbott, 2013). It is possible for a student to be gifted in mathematics and have a learning disability in reading and vice versa.

How it affects learner (self-concept/self-efficacy) and learning

Having a disability and giftedness can have positive and negative impacts on the learner. One issue that may arise is a misunderstanding of the student's abilities by teachers and administrators. When a student appears gifted in one or more areas, teachers may see the student as lazy or unmotivated when it comes to assignments that require the student to rely on reading, writing or mathematics. When a student is gifted, educators can mistakenly believe the student is gifted in all areas. Expectations of the student may apply pressure on the student and anxiety and depression can occur.

Focusing on developing creativity, particularly for twice exceptional students, can have a positive impact on the emotional, social and cognitive development of the learner.

Regarding co-morbidity and twice exceptional, it is important to be aware of the differences. Learners with co-morbidity have a combination of disabilities that interfere with learning such as: ADHD and dyslexia or dyslexia and dyscalculia, or Autism Spectrum Disorder and dyslexia. Whereas twice exceptional learners have a disability and are gifted. This is a student with both disability and talent.

Summary

Understanding the characteristics of dyslexia, dysgraphia and dyscalculia will help teachers of all students understand the complexities involved in learning particularly for those with a Specific Learning Disability. Having a basic understanding of the causes and characteristics supplies the basis for being able to use the creative strategies discussed in this book to help focus on the strengths of students.

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