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Vygotsky's Theory of Creativity: On Figurative and Literal Thinking

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“Three of us afloat in the meadow by the swing,
Three of us aboard in the basket on the lea.
Winds are in the air, they are blowing in the spring.
And waves are in the meadow, like the waves there are at sea.”

--*Pirate Story* by Robert Louis Stevenson (1885/1905)

The fanciful images conveyed by the Scottish poet Robert Louis Stevenson embody the charm of children's pretend play. Using a laundry basket as if it were a boat, the children pretend to be pirates in a ship at sea while the tall grass, blowing in the meadow, becomes rolling sea waves. The children's imagination takes them to a far away place and time. As a writer, the adult Robert Louis Stevenson used his mature literary skills to compose poetry inspired by his own childhood reminiscences.

The connection between children's pretend play and adult creativity has been noted by many writers. The use of object substitutions (*i.e.*, basket as boat) and the perception of a visual isomorphism (the waving grass seen as waves) are examples of *figurative thinking*. Metaphors and similes become the linguistic expressions of this imaginary experience. Whereas the child is just beginning to create play scenarios based

on these perceived isomorphic resemblances, an adult is capable of consciously directing imagination, along with other thought processes such as logical thinking, to create works of art, science, and technology.

In Vygotskian terms, imagination and creativity begin just like any other thought process as *spontaneous lower psychological functions* (such as dreaming, or trial-and-error problem solving). Then, as children interact with more knowledgeable play partners they learn further pretend play skills, such as using object substitutions and visual isomorphisms to create or extend pretend play scenarios. Children also learn how to direct play activities by *renaming* the objects (calling the laundry basket a ‘boat’) and by *framing* the activities as pretense (“Let’s pretend we’re pirates”). Gradually, the verbalizations and the sensory/motor templates that accompany the object substitutions, are internalized as imaginative *figurative thinking*.

According to Vygotsky, spontaneous lower psychological functions become consciously directed higher psychological functions *as the learner internalizes the verbal guidance of a more knowledgeable person*. Silent inner speech enables the child to guide him-/herself as if guided by another person. Using self-guiding inner speech, the child will eventually then be able to consciously direct figurative thinking along with the other higher psychological functions such as consciously directed logic, memory, and emotion. Famous neuroscientist Alexander Luria, Vygotsky’s friend and colleague, pioneered the study of how the prefrontal cortical areas of the brain mature during childhood to enable the conscious self-regulation of behavior, thoughts, and emotions (Christensen, Goldberg, and Bougakov, 2009).

Vygotsky gave pretend play a position of unique importance. He stated that pretend play created *the zone of proximal development* for the preschooler. Vygotsky described the zone of proximal development *as the difference between what you can do alone unassisted and what you are capable of doing under adult guidance or in collaboration with a more capable peer* (1933/1978a, p.86). In other words, a higher level of performance can be achieved when working with a more knowledgeable person as for example, when fidgeting preschoolers and, can wait if the teacher says “let’s pretend we are soldiers getting ready to march in a parade.”

Vygotsky’s Theory of Creativity was reconstructed by Francine Smolucha and Larry Smolucha through a careful exegesis of the original Russian texts translated by Francine Smolucha during 1984-1986. Prior to this **no one** had recognized that Vygotsky’s three papers on the development of imagination and creativity actually constituted a *theory of creativity* (Vygotsky 1930/1990, 1931/1991, 1932/1960).

The Smoluchas first presented “Vygotsky’s Theory of Creativity” in 1986 at the 94th Annual Convention of the *American Psychological Association* in Washington D.C. . That conference paper was subsequently published in 1986 both in West Germany in the *Siegener Periodicum zur Internationalen Empirischen Literaturwissenschaft* and as an ERIC Document by the U.S. Department of Education (Smolucha & Smolucha 1986a). In 1992, Francine Smolucha published another paper titled “Vygotsky’s Theory of Creativity” in the *Creativity Research Journal* (F. Smolucha, 1992a).

Interest in Vygotsky’s Theory of Creativity, and in its implications for using pretend play in early childhood education, has grown over the last 25 years. Section One of this paper surveys *Research and Educational Programs* inspired by Vygotsky’s

writings on creativity. In Section Two, the *Importance of Figurative Thinking for Creativity* will be discussed further.

SECTION ONE

Survey of Research and Educational Programs

The following survey of research and educational programs inspired by Vygotsky's writings provides critiques of several different approaches to Vygotsky's theory. Readers seeking new ideas for their own purposes, might not care how accurate their interpretation of Vygotsky's theory is, but the *scientific validity* of the theory depends upon a systematic analysis of Vygotsky's writings, and the research and educational programs inspired by Vygotsky's writings. This requires a clear delineation of concepts taken from primary sources and how these concepts are being used by current writers.

The survey of research and educational programs that directly relate to our reconstruction of Vygotsky's Theory of Creativity, as presented in the introduction to this chapter, is followed by a survey of other approaches that differ significantly from our own.

Showing Children How to Use Object Substitutions in Pretend Play is Important in the Development of Creative Imagination

For Vygotsky, pretend play is the activity that leads to the highest levels of preschool learning (Vygotsky. 1978b). Pretend play creates the *zone of proximal*

development when a preschooler functions as though a head taller than him-/herself behaving as if older than his/her actual age (Vygotsky. 1933/1978, p. 102). Notice that Vygotsky did not claim that academic instruction, or arts and crafts activities, were the leading edge of preschool development. Vygotsky also specified that object substitutions, such as pretending that a stick is a horse, play a key role in the development of abstract thinking, imagination, and literacy (Vygotsky, 1978c). Vygotsky introduced the example of using a stick as a horse in 1928 in *The Prehistory of Written Language*, when he described his own research on how preschoolers respond to object substitutions during play. Later, in 1932 Vygotsky began to collaborate in play research with Daniel El'Konin who went on to become a leader in Soviet preschool teacher education during the subsequent forty years.

When Stalin banned Vygotsky's writings, Vygotsky's colleagues discreetly continued the lines of research they had begun in collaboration with Vygotsky. Daniel El'Konin and his colleagues continued to research pretend play and its role in preschool education. Even in the post-Stalinist Soviet era, there was no research on using pretend play to teach children how to be creative and innovative thinkers.

This aspect of Vygotsky's theory can now be investigated in a systematic scientific way; all that is needed is to show preschool teachers (and/or parents) how to teach children to use object substitutions in pretend play, then do a follow-up assessment of creativity. Simple enough, when one knows how to do it.

Working to this end, the Tools of the Mind preschool program in the United States has done some preliminary work that is very promising. The program's co-founder, Russian psychologist Elena Bodrova had been a senior researcher at the Institute

for Preschool Education before coming to the United States. Bodrova and her American colleague Deborah Leong initiated the Tools of the Mind preschool program in 1995, which now enrolls over 28,000 preschoolers.

The Tools of the Mind program has been recognized for its success in developing preschool literacy and self-regulation skills (Diamond et al., 2007; Barnett et al., 2008; Bronson & Merryman, 2010). Teachers are shown how to model the use of object substitutions in pretend play, engaging the children in brainstorming activities to find multiple uses for common objects like a wooden block. In play, a block can be used as a car, a bed, or even a play character. Gradually, child-initiated object substitutions become a regular feature of the pretend play scenarios. Tools of the Mind is unique in its emphasis on using objects in more than one way, while limiting the availability of ‘replica toys.’

Consider how non-replica objects, such as blocks can be used in different ways to support two totally different play scenarios. The child can play with wooden blocks pretending that the blocks are cars parking inside a garage for instance, that is actually a box that has been opened along one side. Or, the same blocks can be used as furniture inside a ‘doll house’ (placed flat as a bed, upright as a refrigerator, sideways as a kitchen counter) with the box now a house.

It is important to note that not all preschool programs that encourage dramatic play, value the ability to use one object as if it were another. For example, Marie Montessori only encouraged realistic activities with child-sized replica objects, such as a table, chairs, a broom for sweeping the floor, and gardening tools.

While Tools of the Mind was not designed to teach creativity, Bodrova and Leong have done preliminary investigations in this area. A preliminary study of ten children, using a conventional assessment of creativity, the Torrance Tests of Divergent Thinking, yielded equivocal results (Personal communication). Since the Torrance Tests assess how many different *verbal* responses are given, Torrance Tests might not be an age-appropriate measurement tool for an emerging ability in the preschool years. A more age-appropriate assessment of creativity for preschoolers would involve the hands-on manipulation of objects. For example, given an object the preschooler would be asked, “Can you show me how many ways you could use this, if you were playing house?” Another way of assessing creativity in a preschooler would be to give the child a small number of blocks and ask, “Can you show me how many things you can make out of these blocks?” Such hands-on assessments of creativity can be scored for divergent thinking and then correlated with established assessment instruments like the Torrance Tests.

In 1983 the Smoluchas presented a preliminary study of a creativity test that they had designed consisting of four blocks (circle, semi-circle, square, and triangle) each in two sizes (Smolucha & Smolucha 1983, 1984, 1985a,b). Children as young as two and a half years of age were able to make a variety of things out of the blocks, for example, the circle became a birthday cake and the other blocks became the children at the birthday party.

From a Vygotskian perspective, divergent thinking can operate as a higher psychological function when consciously directed by inner speech. This inner speech is the internalized of the verbal guidance of a more knowledgeable person acquired during

activities that required a variety of novel responses. In other words, consciously directed divergent thinking can be taught moreover, it can be used in collaboration with other consciously directed higher psychological functions, such as figurative and logical thinking to produce a creative works in art or science. While tests of divergent thinking measure an important aspect of creativity, creative thinking also involves these other skills.

In addition to quantitative assessments of creativity (such as tests of divergent thinking), qualitative observational research can also be done in a systematic way. Preliminary observations of preschoolers in the Tools of the Mind program shows a trend toward more imaginative and self-initiated play scenarios. For example, three year olds typically played mother/baby role play, or played with trains. By kindergarten, the children began playing “Magic Tree House” (inspired by Mary Pope Osborne’s books in which the tree house transports children to different lands and historical periods.) The kindergarten children had to use the furnishings and objects in their classrooms in new ways to recreate a foreign land or another time (Personal communication, with Deborah Leong.).

Tools of the Mind preschools enroll children from 3.5 to 5 years of age, but this prompts questions about the skill levels of younger children. Do younger children engage in object-substitution play? Do toddlers perform object substitutions? What about infants, can they participate in social pretend play involving make-believe object substitutions? If so, would such infant play lay the neurological foundation for language development, literacy, and creative imagination?

Not so long ago the mere suggestion that toddlers might be capable of cooperative play was thought ludicrous. Not until the early 1980's did Western researchers begin to question Piaget's claim that pretend play begins as a solitary activity at approximately 18-months of age (1933/1978, pp. 99-100). The ability of toddlers to engage in pretend play interactions, however, gained credibility as research evidence accumulated (see Smolucha & Smolucha, 1998).

Concerning infants, their first experience with pretend play object substitutions depends upon their caregiver's cultural background and personal style of play. For example, a 3-month old infant might be placed sitting upon (or straddling) an adult's knee while the adult very gently moves the knee up-and-down, saying, "going for a horsey ride." Or, a bouncy chair might be jiggled as the young Space Ranger's rocketship blasts-off. At first, the infant's experience is sensori-motor; linguistic and imaginary associations come later.

Traditional infant games, such as peek-a-boo, pat-a-cake, and creepy-crawly introduce the infant to cooperative pretend play (F. Smolucha, 1998). From a Piagetian perspective, the game of peek-a-boo is not really a game at all but rather a simple demonstration of the infant's lack of object permanence; but from a Vygotskian perspective, peek-a-boo introduces the infant to social pretend play as the infant comes to realize that the play partner is only *pretending* to disappear.

The pantomimic game of pat-a-cake simulates the making of a flat cake with the hands, an example of pretend play involving an *imaginary substance* instead of an object substitution. Commonly encountered examples of pretend play involving imaginary

substances include pretending to feed someone with imaginary food from an empty bowl, or drinking from an empty cup or bottle.

In the Creepy-crawly game, someone's hand moves like a spider crawling slowly up the baby's arm or chest, then suddenly jumps up to the baby's neck for a tickle. Like many of the Old World fairy tales, Creepy-crawly has a slightly sinister "Gotcha" subtext. The shape of the hand, and especially the crawling motions of its fingers, mimics a spider as an object substitution.

In one variation of Creepy-crawly, the index and middle fingers are moved as if tiny legs running in a circle on the baby's hand and then quickly up the baby's arm. This is accompanied by singing (to the tune of *Frere Jacques*) "Teddy Bearkin, Teddy Bearkin, Running 'round, Running 'round; Is he going to get you? Now he wants to kiss you (here 'Teddy Bear' jumps up and touches the baby's cheek as he makes a kissing sound, exclaiming: "Oh, a kiss!"), Run and play, Laugh all day!"

Interestingly enough, cats can also be engaged in Creep-crawly play. Small objects moving in certain provocative ways, such as a gloved "crawling" hand or wriggling string "snake" will elicit a playful attack from a cat—provided the cat is in a playful mood. The cat seems to sense this is play (a cat owner can tell you that a playful cat can quickly switch to *real attack mode* if over-stimulated). For both the cat and the human infant, the crawling hand or wriggling string would be *considered a proto-object substitution*, because the object and its referent are not clearly distinguished, so closely do its crawling or wriggling motions mimic the real thing.

A longitudinal study of toddlers from 14-months of age to 28-months showed how some mothers introduce and support/scaffold pretend play involving object

substitutions. Initially, toddlers imitate the object substitutions their mothers introduced them to, but gradually the toddlers begin to initiate novel object substitutions of their own making. By 28- months of age, children performed as many objects substitutions as their mothers had done (F. Smolucha, 1991; Smolucha & Smolucha,

Play scenarios that the toddlers participated in involved mother/baby role-play and playing-house. The toddler was placed in a playroom that contained 1:6 scale doll-sized table-and-chairs, refrigerator, kitchen stove, sink, and a 3-doll family (mother, father, and baby doll). These replica toys constituted the primary play props, but replica toys were *not* provided for the secondary props (such as pots and dishes, baby's bottle, baby's bed, and blanket). Instead, a variety of non-replica toys were supplied such as plastic lids, stacking cups, empty boxes, wooden blocks, and a cloth handkerchief.

The idea that games such as peek-a-boo, and more particularly pat-a-cake and creepy-crawly are, in fact, examples of pretend play involving object substitutions is a new and unique concept. Play research has demonstrated that by 3-months of age infants are capable of engaging in pretend play with object substitutions. Toddlers as young as 14-months of age are capable, moreover, of participating in more complex pretend play scenarios involving object substitutions like mother/baby role-play and playing-house. Future research will determine if object substitution pretend play during infancy leads to the development of later metaphoric thinking, divergent thinking, and creativity.

The three types of figurative thinking: using object substitutions, recognizing visual isomorphs, and metaphoric speech and their relationship to creativity will be discussed further in the second half of this chapter. Now, let us consider other

approaches to the study of creativity inspired by Vygotsky's writings, but not focused on object substitutions in pretend play.

Other Vygotskian Approaches to Creativity

Several preschool programs focus on socio-dramatic role-play with minimal or no attention paid to the use of object substitutions in pretend play scenarios. In these programs the dramatic role-play of children may be considered evidence of children's creativity, but that creativity is not actually assessed in any systematic way.

In the Golden Key Schools' curriculum, developed by Vygotsky's granddaughter Elena Kravtsova, object substitutions are considered an important part of pretend play (Kamen & Murphy, 2011), however, there is no mention in their literature concerning the origins of object substitutions. Since the Golden Key Schools use mixed-age groups, the use of object substitutions might be introduced by the more experienced play partners. At each preschool age specific types of pretend play scenarios are used to build literacy as well as math and science skills (Kravtsova, 2005). The development of creative thinking has not been addressed as a specific measurable outcome of the Golden Key Schools curriculum.

In Sweden, Gunilla Lindqvist's Playworlds preschool curriculum similarly uses adult-guided dramatic role-play to lay a foundation for future academic skills, but does not assess creativity *per se* (Lindqvist, 1995). In Columbia, Zayda Sierra has also used a Vygotskian framework for adult-guided dramatic role-play for preschoolers (Sierra, 1998). In Italy, Reggio Emilia preschools have used guided pretend play techniques, derived in part from Vygotsky's theory, to develop preschoolers' artistic abilities; the

imaginative stories, plays, and artworks produced by the children have been indeed remarkable, however, it is important to note that professional artists-in-residence also work with these children as well.

Proponents of cultural-historical/activity theory have recently taken an interest in Vygotsky's writings on play, creativity, and the psychology of art. During Vygotsky's own lifetime his theory was known as *Cultural-Historical Psychology*. In our own contemporary times, however, the key phrase *cultural-historical approach* has also come to be applied to Alexander Leontiev's post-Vygotskian *Activity Theory* as well as to its various permutations. A colleague of Vygotsky, Leontiev formulated his Activity Theory during the Stalinist suppression of Vygotsky's works after Vygotsky's death in 1934. Activity Theory became the leading psychological theory in the Soviet Union, and remains, arguably, a major theory in international psychology. Much disagreement exists, however, between some Vygotskians and the proponents of Activity Theory as to whether the latter can actually be considered a logical and true extension of Vygotsky's work.

At the core of this disagreement lies Vygotsky's concept of the *zone of proximal development*—specifically, how this concept is defined and how it is understood to operate. Some Vygotskians continue to emphasize the ZPD as interaction with—and subsequent internalization of—the verbal guidance of a more knowledgeable person. In contrast, advocates of Activity Theory have focused on “social activities” that do not necessarily involve another person; as for example, an infant handling a toy rattle (i.e., a social artifact) who discovers alone how to shake it, without having ever seen someone else perform the action. The rattle itself, being a *social artifact*, conveys important

cultural meanings and possesses its own historical legacy. Was the rattle handmade made from a tortoise shell filled with tiny pebbles? Or, was it a commercially manufactured commodity? Does it look like Mickey Mouse? Was it made in a sweatshop factory in a Third World country, thus making it a product of economic imperialist oppression? Activity Theory considers the political and socio-economic contexts within which actions are performed (unlike Piagetian theory which focused solely on actions in the physical world). It should be emphasized, however, that Vygotsky's original definition of the zone of proximal development does not preclude such instances of independent discovery; rather, interactions with a more knowledgeable person advance learning to an even higher level than that attainable when working alone (Vygotsky, 1933/1978a, p. 86).

The Cultural-historical activity theory (Leontiev's approach) is represented in *Vygotsky and Creativity: A Cultural-historical Approach to Play, Meaning Making, and the Arts* (Connery, John-Steiner, & Marjanovic-Shane, 2010). In the introductory and the concluding chapters, the editors M. Cathrene Connery, Vera John-Steiner, & Ana Marjanovic-Shane changed the definition of the zone of proximal development so that it no longer required interaction with a more knowledgeable person. Instead, they view the "ZPD as multi-directional" and as an "evolving process that facilitates both evolution and revolution in the course of individual and social transformations" (pp.221-222). As a multi-directional process, learning takes place between peers at the same level and teachers can learn from their students. Solitary (*sic*) social activities, such as the infant's exploration of a rattle, demonstrate learning through an individual's own *Perezhivanie* (*i.e.*, Russian for "lived emotional experience"). To Connery, John-Steiner, and

Marjanovic-Shane these processes can bring about evolution and *revolution* in the course of individual development and societal transformations.

This interpretation clearly contradicts the conventional view of the zone of proximal development, defined by Vygotsky as interactions with a more knowledgeable person. The conventional view, to reiterate, does not exclude opportunities for independent learning. David Wood's research on *scaffolding in the zone of proximal development* found that the most effective teachers knew when to increase their level of assistance and when to decrease their involvement, so that learners could exercise occasional autonomy (Wood, 1988/1998). But the *verbal guidance of the more knowledgeable person* remains the model for the formation of one's self-regulatory inner speech.

Vygotsky and Creativity focuses on some of Vygotsky's earliest writings, specifically his book *The Psychology of Art* (1924/1971). The contributing authors describe a variety of artistic activities (dance, music, visual art, story telling) that give children the opportunity to explore and communicate their own lived experience and to formulate new personal and social frameworks in which to operate. Emotional catharsis (release) is seen as central to this process. This form of "creative education" is advocated as the basis for a revolutionary new way of teaching whose success can "only be measured by its social, emotional, and transformative impact on our individual and collective growth" (p.229).

It is important to disabuse the misapprehension that Vygotsky's theory arose from one book, as claimed by Connery, John-Steiner, and Marjanovic-Shane (2010, p. 5). At time that he was writing *The Psychology of Art*, Vygotsky held a faculty appointment at

the Teacher's College in Gomel, instructing future teachers how to educate the deaf. This experience, in turn, became the basis for Vygotsky's paper (1924), presented at the 2nd Psychoneurological Conference in Leningrad, on Pavlov's second-signal system as *mediated* learning (the *memory* of the smell of the dogfood functioned as a *cognitive* stimulus for the dog's salivation response). This presentation so impressed Alexander Luria that it led to Vygotsky's appointment as a researcher at the Moscow Institute of Psychology (Kozulin, 1986, p, xvii). Subsequently, Vygotsky's publication, "Consciousness as a Problem in the Psychology of Behavior" (1925) introduced his basic theory of how the internalized verbal guidance of a more knowledgeable person enables an individual to direct one's own self as if he/she were directing someone else (Vygotsky, 1979). Thus, speech actually has *two functions*: one function is communication with others, the other is self-guiding inner speech. According to Vygotsky, hearing impaired persons should be taught how to use sign language as much to direct their own thoughts and behaviors, as to communicate with others.

Vera John-Steiner, one of the editors of *Vygotsky and Creativity* (2010), pioneered the study of creativity as a collaborative process in *Notebooks of the Mind* (1985/1997). Creative partnerships have been important in the arts and sciences throughout history (for example, Pierre and Marie Curie). Friendships have helped sustain and inspire creative thinkers such as C. S. Lewis and J. R. R. Tolkien. Even the solitary creative genius Beethoven utilized musical instruments and established symbol systems, a cultural legacy to which he was heir. Even working alone one utilizes internalized higher psychological functions that have social origins.

Vygotsky points out that individual creativity is an example of *combinatory*

imagination, because the individual builds something new from the accumulated knowledge and inventions of past generations. Vygotsky distinguished between the combinatory imagination that characterizes creativity and *reproductive imagination* which figures prominently in memory (Vygotsky, 1930/1967, p.3).

Cultural differences in the ultimate value and in the very definition of creativity deserve consideration, as well as cultural differences in play activities. In her book *Early Learning and Development: Cultural-historical Concepts in Play* (2010) Marilyn Fleer does not address the development of creativity, but does raise the issue of Euro-centrism in some Vygotskian studies of children's play. Cross-cultural research has shown that dramatic play using object substitutions is *not* characteristic of every culture (Gaskins, Haight, Lancy, 2007). Using object substitutions in pretend play might represent a more European style of play. Vygotsky, himself, spent his childhood in European Russia of the late 19th and very early 20th centuries, thus, the emphasis that Vygotsky placed on pretend play as the leading activity of the preschool years, gives us an insight into his own *kinderkultur*.

But all this begs the question: was Vygotsky correct when he said that object substitutions, like using a stick as a horse in pretend play, help to develop literacy skills and other forms of abstract thinking? The success of *Tools of the Mind* and the *Golden Key Schools* provide supporting evidence that he was correct in this assertion.

Does the use of object substitutions in pretend play help to develop creativity? The time has come for systematic studies to answer this question. Marilyn Fleer's book *Early Learning and Development: Cultural-historical Concepts in Play* (2010) ends with the assertion that old theories of child development are no longer viable now that

education has become multi-cultural. The solution, according to Marilyn Fleer, is to formulate a new culturally sensitive play-based curriculum in lieu of imposing an academic curriculum upon preschool children.

This proposed solution, however, remains problematic since the current global economy still demands the possession of basic academic skills sets for employment. Advanced literacy, knowledge of mathematics and science, as well as technological skills remain the pre-requisites for economic prosperity. Preschoolers need a curriculum that prepares them for viable adult roles by laying the foundation for academic skills during the preschool years while simultaneously developing a healthy personality, interpersonal communication skills, and creativity.

Currently no preschool curriculum model exists that addresses the development of creativity in any formal way involving the actual assessment of creative activity over time. Such assessments ought not be structured as invidious comparisons of who is more creative; rather, any such assessment could be based upon an individual's own performance record over time.

Newsweek magazine recently (July, 2010) contained an article on "The Creativity Crisis" in which journalists Po Bronson and Ashley Merryman voiced concern over an apparent decline in American creativity evidenced by lowered test scores of divergent thinking. Since such tests have only been used since the 1950s, it remains unclear how earlier generations of Americans would have fared in this area. Yet, a growing concern is felt among Americans that, as a nation, the U.S.A. has lapsed both academically and creatively, due to lowered academic standards and poorer discipline in schools. Too much idle time spent watching television, text messaging, and playing videogames.

The next section of this paper explores the importance of creativity, especially *figurative thinking* in the arts, in the sciences, and in everyday life, with an eye toward its role as a possible solution to these pressing problems.

SECTION TWO

Figurative Thinking Examined More Closely

Creativity appears to fluctuate over time in any given culture. At certain times the general public may seem particularly resourceful, demonstrating a knack for creative problem-solving—the early American pioneers leap to mind—while, at other times, only iconoclasts dared to challenge the *status quo* by introducing new ideas. Moreover, creativity has not always been held in high cultural esteem; the French court of Louis XIV, for example, regarded creativity as frivolous and uncouth, and derided any manifestation of it.

The rapid rise of technology, beginning with the Industrial Revolution and continuing throughout the 19th and 20th centuries, has significantly affected the development of the sciences and, in turn, the global economy. Advances in medicine, particularly the introduction of new pharmacopeia: antibiotics, insulin, statin drugs, and anti-depressants, have greatly enhanced the quality of life and, along with minimally-invasive laser and micro-surgical techniques, have greatly extended the human lifespan. Similarly, advancements in genetics and the introduction of proactive birth control measures have brought certain aspects of human reproduction under unprecedented levels of control, often raising non-trivial moral questions in the process. Not unexpectedly,

most of these important discoveries or inventions have emerged from the highly industrialized countries of Europe, the United States, and Russia. In the face of this unprecedented technological progress, non-industrialized agricultural societies have been challenged to find ways to maintain their traditional life-styles and cultural traditions. These new technologies, as we have seen, often come at a high price causing secondary effects that have impacted the environment and human life in negative, often destructive ways; the rise of pollution and the emergence of antibiotic-resistant virus strains are only two examples. Progress brings not only solutions, but poses new problems as well. From where will the new solutions to the world's problems come?

The invention of new tools, machines, and technologies represents only one type of creativity. Vygotsky's great insight into the role of tools in culture contained the realization that language is perhaps the greatest cultural tool. Language both transmits cultural knowledge to the next generation, as well as introduces new ideas to the culture.

Thomas Kuhn's *The Structure of Scientific Revolutions* (1967) awakened philosophers and scientists to the importance of figurative thinking in science. The use of visual isomorphisms, and their accompanying linguistic metaphors, are deeply imbedded in scientific thinking and discourse (Mashhadi, 1997). Charles Darwin's use of the bifurcating branches of a tree to illustrate and organize sequences of evolutionary development holds a revered place, along with Kekule's self-devouring serpent, as one of the most evocative uses of imagery in science. The tree is one of many bifurcating models; a river also has branches, as does the circulatory system. Both are shaped by the forces exerted upon them by the fluids they contain. The Kabala, too, organizes the

metaphysical levels of existence as a “tree of knowledge.” The family tree, used to trace one’s genealogy, follows this same pattern, so rich in meaning and varied in application.

Figurative thinking provides a means of finding the patterns that give meaning to experience. Figurative thinking is not just a matter of linguistics, nor is it simply a matter of verbalizing metaphors. Figural thinking involves the *visual process of seeing correspondences of shape or function*, a completely different dynamic altogether from the processes operating in the linguistic modality. Vygotsky’s reconstructed theory of creativity, put forth at the beginning of this chapter, proposes a developmental progression from learning how to use object substitutions in play, to learning how to recognize and use visual isomorphisms, to using metaphoric language to express holistic meanings.

Consider the following situation:

[EDITOR: INSERT *FIGURE-IN-BOAT* IMAGE HERE]

A traveler wearing a large, loosely tied robe, steps into a boat just as a gust of wind suddenly rises; the garment billows, driving the boat across the water (see Figure N). A person who witnesses this event (though *not* necessarily the same person in the boat to whom it has actually happened) notes the effect the wind has produced and, realizing the effect can be duplicated, modified and controlled, invents a device (*i.e.*, a mast and sail) that harnesses the motive power of the wind. This represents a creative leap of imagination (in fact, it has been speculated that nautical sails originated in this way).

Another witness to the very same event may arrive at an entirely different insight, and proclaim: “What sort of *vessel* is a man, adrift upon the Sea of Fate, subject to its currents and eddies!” Although present in both situations, figurative thinking has enriched the experience, whether in the practical manner as it inspired the nautical architect, or in the poetical manner as it prompted the utterance of the poet, philosopher, visual artist, or psychologist.

The three types of figurative thinking: object substitutions, visual isomorphisms, and metaphoric speech, operate across three different functional domains: using tools, recognizing patterns in nature, and/or expressing depth-psychological meanings. These three domains are not separate and discrete because, as Freud observed, symbols are *over determined* and may have more than one simultaneous meaning. Literal language usage is actually an exercise in restricting word meaning to a single definition based on context and sentence structure. Figurative thinking works in the opposite direction, so to speak.

Tool-usage, the first functional domain of figurative thinking, includes the sort of object substitutions in pretend play (*i.e.*, basket as boat), but would also include the literal/physical use of one object as if it were something else, as happens when a shoe is used as if it were a hammer. Visual isomorphisms are sometimes used as tools to communicate; the hand gesture that resembles a telephone means, *call me*. Vygotsky pointed-out that language is a tool and, as a linguistic tool, metaphors have the power to transmit cultural legacies or stimulate cultural transformation. Puritan John Winthrop’s immortal phrase, “Shining City on the Hill”, borrowed by both John F. Kennedy and Ronald Reagan to evoke a positive image of the United States, presents one example.

The second functional domain, *recognizing patterns in nature*, involves the realm of object substitutions typically made when natural objects are introduced into a play scenario. Stones become potatoes or meatballs, grass turns to spaghetti, and tree branches become forks. Visual isomorphisms abound in nature. Trees in autumn take on the appearance of gaunt skeletons. And the sort of pattern recognition that led to the organization and naming of the star constellations provides another example. The coincidental resemblance between certain flowering plants and their namesakes, such as the Bleeding Heart plant, the Dutchman's Pipe, and the Bird-of-Paradise are well known. The enchanted gardens and forests of fairytales are filled with such visual isomorphisms.

Metaphors based on the recognition of patterns in nature can produce vivid poetic images, the road as a *ribbon of moonlight*, or incisive scientific models, as in Michelson-Morley's experiment on the propagation of electrons as *light-waves*. Gregory Bateson (1991) proposed that such metaphoric thinking provided another way of understanding the universe that could yield valuable insights. But, some literal statements are false, and likewise, all metaphors do not necessarily ring true.

The third functional domain of figurative thinking, *to convey depth-psychological meanings*, evokes the rich language of symbolism. Freud (1901) described how primary process thought creates symbols based on analogies and shape resemblances (*i.e.*, visual isomorphisms). Figurative thinking, in the form of an unconscious and spontaneous lower psychological function, appears as a process in the dreamwork. Fetish objects, as well as the many *transitional objects* to which people become emotionally attached (teddy bears, cars, jewelry, figurines) are often based on an unconscious association to a real 'love object', a fact well understood and exploited by consumer advertising.

Multiple levels of depth-psychological meaning produce “thick texts” rich in interpretive possibility. It is the nature of such thick texts that they can be revisited time and again always yielding new insights. This accounts, in part, for the compelling nature of some films and videogames which incorporate thick texts rich in metaphoric meaning similar to those found in fairy-tales and heroic/romantic myths (Mackey, 2009).

Some creative events have far reaching cultural implications while others are more intimate, remaining a personal part of our everyday lives. The former type is sometimes referred to as *Creativity with a capital ‘C’*, while everyday creativity is relegated to the lower case. Using the analogy of electricity, Vygotsky contrasted the great Creativity of the famous inventors, scientists, and artists like Beethoven as analogous to lightning unleashed by an electrical storm, while average everyday creativity is more like the modest light of a lamp (1930/1990).

There is more to this analogy than meets the eye; it is actually quite rich in meaning, like a Russian fable. Electrical storms are awesome events, but such Creativity often strains the Creative individual sometimes beyond their psychological limits. The night light that burns in the nursery may be dim, yet it consistently provides just the right amount of light to sustain a child through the night as does the improvised lullaby or bedtime story.

Conclusion

New directions for research as well as practical current applications have been offered in this chapter. Research has supported Vygotsky’s description of how the internalized speech of a more knowledgeable person can be used as silent self-guiding

speech directing one's thoughts, behaviors, memories, emotions, perception, attention, imagination, and creativity (Winsler, Ferryhough, & Montero, 2009).

Martha Daugherty's research has shown a connection between creativity and private speech, the intermediary stage between external and inner speech when one talks aloud to one's self. (White & Daugherty, 2009). Similarly, Julia Matuga (2003) found that children use private speech more during make-believe drawings than during realistic drawings. Other studies have demonstrated that pretending with object substitutions promotes the development of self-regulation (Carlson & Beck, 2009; Bodrova & Leong, 2007). Self-regulatory neural networks have been identified that operate from the prefrontal areas of the brain, and research has shown how the development of this executive function is related to language acquisition due to the legacy of Alexander Luria's research.

At approximately the age of 7-years, children no longer need to talk aloud to themselves to guide their creative imaginations. Their memory recall, analytic and logical problem-solving skills, as well as other higher psychological functions become self-regulating through the use of inner speech. According to Vygotsky, the adolescent can coordinate several different consciously-directed higher psychological functions to produce a creative work (1931, 1991). This means that the adolescent also has a newly emergent ability to co-ordinate the internalized verbal guidance of several different mentors. Thus, a new mature creative voice emerges at this point.

Future researchers have an opportunity to identify how different higher psychological functions are used in specific areas of the arts and the sciences. One of these higher psychological functions is figurative thinking

Figurative thinking is a higher cortical function. The prefrontal cortex of the right hemisphere likely directs most figurative thinking. This would explain how creative insights emerge suddenly, often unexpectedly, after a period of incubation.

Readers interested in the latest neuroscience research on the role of left and right prefrontal cortexes in different types of creative thinking are referred to Joaquin Fuster's book *The Prefrontal Cortex* (2009). In pages 369-371 on "Creative Intelligence", Fuster discusses the contributions of Vygotsky and Luria to the study of language as a tool for self-regulation, and its relationship to the prefrontal cortical supervision of creative intelligence.

In the more than seventy-five years since Vygotsky's death, his writings continue to inspire new theories, new educational programs, and new lines of research. Vygotsky, like other psychologists, used metaphors to express concepts whose meaning would be diminished by literal treatises (Blake, 2011; Leary, 1994).

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