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Multiple Perspectives on Cognitive Development: Radical Constructivism, Cognitive Constructivism, Sociocultural Theory, and Critical Theory

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Opening Vignette

During a spring semester one section of early childhood majors met for a class session in the sanctuary of a local synagogue. For many of these students it is their first time in a synagogue, and for some, their professor is the first Jewish person they have met. The professor asked the students to begin their visit by noting synagogue items and identifying corresponding questions that would explore deep cultural topics. One student initiated the conversation by asking, "Does Judaism believe in Heaven?" The professor answered that heaven is a concept in Judaism. "How does someone get into heaven?" wondered another student. At that point one student boldly claimed, "I am an atheist and don't believe in any of this". The professor commended the student for sharing her thoughts and continued the conversation asking if anyone cared to share their understanding of how one gains entrance into heaven. A student murmured under her breath, "This is going to get very awkward". The majority of students responded that in order to get into Heaven one must believe in Jesus. With no hesitation the professor then asked, "If a person does not believe in Jesus what happens?" Instantly the students became quiet and looked down. Finally, one responded in an almost questioning voice, "but you are such a kind person, you are such a good teacher, and you care about us all." The student looked around seemingly in hope that her peers would agree that this one Jewish person could gain admittance into Heaven even without believing in Jesus. But, this often-boisterous class was visibly dismayed and remained silent.

Introduction

This multi-vocal article represents the work of three teacher educators. In conjunction with Glasersfeld's (1996) description of Radical Constructivism, we agree that any theory "cannot claim to be anything but one approach to the age-old problem of knowing. Only its application in contexts where a theory of knowing makes a difference can show whether or not it can be considered a viable approach." (von Glasersfeld, 1996, p. 309). In this conceptual piece, we examined the relationship between Radical Constructivism and three distinct, yet sometimes overlapping, theories: 1) Cognitive Constructivism 2) Sociocultural Theory; and 3) Critical Theory. First, we discuss the key premises, elements, and/or assumptions of each theory as well as points of convergence and divergence between each theory and Radical Constructivism. Secondly, we will analyze the opening vignette through the three different theoretical lenses.

The opening vignette describes an experience that occurred in the synagogue to introduce his students to the elements of culturally relevant pedagogy. Even with the common knowledge of the goal of this experience and (seemingly) objective documentation of the events, analyzing this vignette from the four theoretical perspectives described in this paper can produce demonstrably different results. These results emphasize the importance and variance that can be found when using different constructivist theoretical lenses.

At the forefront, we concede that there are points of agreement and departure among all four theories, which creates an opportunity for dialogue that can lead to a greater depth of understanding of each theory as well as new possibilities (Chubbuck, 2010). The first author writes from a Cognitive Constructivist perspective; the second, Sociocultural, and the third, Critical. Hence, variations in the tone, voice, and style of the discussion reflect the integrity of

the individual theoretical stances—each which has its own assumptions about how words are used as well as the type of words that are used. Each author has read and commented on all sections of the article and the general sections were collaboratively written.

Of Snails and Frogs—A Cognitive Constructivist Perspective

Exploring the relationship between Piaget's cognitive constructivism and von Glasersfeld's Radical Constructivism presents multiple challenges. To gain a clear picture of Piaget's theories is difficult for even the most dedicated reader. This is due in part to: (a) the magnitude of his publications – some 100 books and 600 published papers (Archives Piaget, 1989), (b) multiple errors in translation (Duckworth, 2012), and (c) Piaget rarely identifying numerous evolutions of his theory, which leaves the reader to recognize the new iteration and decode the significance of the change.

A further challenge in comparing the two bodies of work is being able to comprehend exactly where Piagetian theory ends and Von Glasersfeld's work begins. Von Glasersfeld work presents a mixed message of whether he attributes the premise of Radical Constructivism to Piaget or if it is a step beyond the Piagetian model. For example, Von Glasersfeld was once asked about the difference between Radical Constructivism and Piaget's constructivism (Kenny, 2006). He responded that if he were younger and had unlimited time he might write a twenty page essay on the topic. As VG never wrote this essay, in the following section I attempt to provide one possible answer to the question. In this subsequent discussion I compare key components of Piaget's cognitive constructivism and von Glasersfeld's Radical Constructivism using a biological example from Jean Piaget's research (snails) and one favored by Ernst von Glasersfeld (frogs).

Of Snails.

One key to understanding Piaget's theory is to view him as an epistemologist—someone who traces the development of ideas and studies the history of knowledge. Piaget once described himself as "a psychological epistemologist who loves to return to his original biological interests" (1977, p. 9). Messerly (2009, p. 94) summarized the motivating question for Piaget as "What was the relationship between biology and knowledge? Or to put it more fully, is there any connection to the relationship between biological organisms and their physical environment that parallels the relationship between human minds and their epistemological environment?" To answer this question Piaget spent fifty years studying children. However, before Piaget studied children he had a keen interest in snails.

Piaget examined three kinds of snails: 1) ones that lived in smooth, peaceful water, 2) those that lived near pebbly shores with mildly agitated water, and 3) those that lived in harshly agitated water. The snails that lived in the peaceful water had an elongated shape, while the snails in the other two settings were more globular in shape (wider and shorter). Piaget reasoned that the globular bodies resulted from the snail anchoring itself to a solid object, drawing on the muscles that attach to the shell causing the spiral part of the snail to shorten (Piaget, 1977). Piaget transferred the globular snails to calm water. The snails that originally lived in mild water conditions reproduced snails with elongated bodies, but those that originally lived in rough water conditions continued to reproduce snails with globular shapes—even after 16 years of living in calm water. Piaget reasoned that mild water snails adapted to their new environment (change in phenotype) but the snails from the more agitated water actually changed their genome (genetic materials) in reaction to the environment. Based on his observations of snails, Piaget formed a

theory that relied on the internal activity of the organism to react to an environmental perturbation in order to purposefully become more viable in the surrounding environment.

Working to identify a parallel between the biological development of snails in their physical environment and the relationship between human minds and their epistemological environment, Piaget (1977a) explored children's cognitive development. In his investigations he found that a child does not construct knowledge due to direct actions of the environment. Piaget posited that change occurs due to the organism sensing an internal imbalance and creating a new structure to regain balance. Piaget called this process of cognitive self-regulation equilibration. Piaget (1977) explained that equilibration is the ability of the child to either assimilate new knowledge into his existing mental structure or accommodate the mental structure to incorporate new knowledge. Thus, a person facing disequilibrium spurs this process of assimilation and accommodation (as seen in the opening vignette as the college students grapple with various religion's understanding of entry into heaven).

Of Frogs.

Radical constructivism revolves around two principles: 1) knowledge is not passively received, but actively constructed by the cognizing subject; and 2) the function of cognition is adaptive and serves the organization of the experiential world and not the discovery of ontological reality (Glasersfeld, 1989, p. 162). Most branches of educational constructivist theory agree with the first principle, however, the second point might be considered radical. Von Glasersfeld (2005, p. 3) posits that to understand his theory one must demolish the everyday conception of reality, "Knowledge does not and can not have the purpose of producing representations of an independent reality." This novel idea that nothing can be taken as proven,

being that there is no independent reality, is radical. To explain this concept von Glasersfeld (1974, 1987, & 2001) used information from a seminal paper on cybernetics describing a frog's visual system (Lettvin, Maturana, McCulloch, and Pitts, 1959)

The cybernetic researchers found that a frog has four types of highly specialized receptive transmitter systems: 1) light-dark contrast, 2) convexity of small dark objects, 3) movement of a dark object, and 4) sudden darkening of the area the frog can view. The synergy of these receptors trigger the action for the frog to capture its prey. The authors of this work concluded their article by stating that they were tempted to call the frog's visual system a "bug perceiver". Von Glasersfeld might very well take issue to the idea that the frog is a "bug perceiver", as this assumes a reality to perceive.

A fly, or other bug, has all the characteristics that fit the frog's sensors, which consequently trigger the frog to jump, snap, or dart out its tongue. However, von Glasersfeld points out that if a black bead, an air gun pellet, or another small dark moving item enters the frog's vision, the frog will react in the same manner as if it were a fly. From the frog's perspective all items with these characteristics are a "fly" because "the frog's concept of "fly" could be defined only in terms of the neuronal signals that concur in the experience, and never in the terms of the inaccessible hypothetical "causes" of these signals" (von Glasersfeld, 1974, p. 7). In other words the frog cannot know whether he perceives an actual fly or an object that is a representation of the fly. While the frog's nervous system creates a construct that does not provide a picture of reality, it does provide a sufficient system for the frog to find food in its environment. Like the frog, von Glasersfeld believes that our perceptions are composed of signals that fall in our frame of experience. He offers that some might consider these signals to be based on an ontological reality. However, because it is impossible to remove one self from the

experience, one cannot observe the reality. Instead, all we can do is form a representation and declare that one's actions are viable within the framework of the construct.

In Comparison: Cognitive Constructivism and Radical Constructivism.

Would Piaget agree with the two principles that serve as the foundation for Radical Constructivism? One might comfortably state that Piaget's theory is the basis of the first principle, while perhaps being congruent with the second principle.

The first principle of Radical Constructivism states that knowledge is not passively received, but actively constructed by the cognizing subject. Piaget's theory clearly shows that the first principle of Radical Constructivism is a foundational Piagetian concept with numerous examples of this principle throughout Piaget's writing (1970, 1971, 1977a, 1977b, 1987). In fact, this first principle of Radical Constructivism can be found in one of Piaget's first books, his autobiographical novel, Recherche (1918). In this novel Piaget mentions the first iteration of his theory of equilibration and the central role of action. In the final section of the novel the narrator stated, "Everything is reduced, therefore, to a question of equilibrium between parts and whole." (p. 48). From this early work one can move forward in time almost 60 years to find Piaget once again considering this concept. Piaget's (1977a) final reworking of the model of equilibration focused on the child's constructing relationships between affirmations (observable) and negations (that which needs to be constructed).

The second principle of Radical Constructivism is the more difficult to claim as a Piagetian idea. It should be noted that 32 years prior to being asked about the comparison of the two theories, von Glasersfeld wrote an article entitled, *Piaget and the Radical Constructivist Epistemology* (1974). In this paper von Glasersfeld stated Piaget's writings, "may make it

difficult to guess what Piaget actually believes" (1974, p. 2). In this ten-page article, Von Glasersfeld states eight examples of why a reader might believe that Piaget does not ascribe to Radical Constructivism. These include the difficulty of Piaget's writing style, poor translations from French, and the changes in Piaget's own theory over his long career. However, von Glasersfeld brings reasons why each example does not contradict a Piagetian acceptance of Radical Constructivism. The article concludes with,

> "He (Piaget) has time and again made statements that go beyond a mere suggestion of a radical constructivist basis; they can be integrated into a coherent theory of knowledge only if we interpret them from a radical constructivist point of view" (10).

Von Glasersfeld (1982) returns to this topic in *An Interpretation of Piaget's Constructivism*. Similarly to his earlier article, von Glasersfeld declared Piaget is in alliance with Radical Constructivism. He concludes with the statement, "Himself a knowing subject, he could not possibly have been concerned with objects *qua* things in themselves, but only with his way of knowing objects." (1982, p. 632).

These two strong statements (1974 & 1982) beg the question that if von Glasersfeld felt he already presented the case that Piaget agreed with his theory, why later in his life (Kenny, 2006) did he feel that a new twenty-page paper was needed to address this question? Very likely there are multiple answers to this statement. Perhaps von Glasersfeld wanted the chance to refute post 1982 statements such as "radical constructivism asserts itself as a distinct movement from Piaget's genetic epistemology" (Brown, 2008, p. 11 & Lerman, 1989). Or, perhaps he wanted to

shed further light on the seemingly conflicting passages of Piaget including *The Construction of Reality in the Child*, a title and book that von Glasersfeld found "difficult" as there is no ontological reality to construct (von Glasersfeld, 1984, p. 21). He even might address Gruber and Voneche (1977, p. xxii), who when writing about the ontological question wondered, "if in all this, does Piaget mean to say that there is a reality external to the behaving and experiencing person, to which the individual gradually and imperfectly attains?" Gruber and Voneche informed their readers that when asked questions of this type, Piaget likely would reply, "Je m'en fous de la re'alite (I don't give a damn about reality)." More likely than not von Glasersfeld was confident in his previous essays (1974 & 1982) that showed Piaget's theory was viable with Radical Constructivism. However, as a radical constructivist he would undoubtedly say that according to his theory one could never know that our knowledge or thoughts are "true" in the sense that it reflects the real world or that one could claim ontological status for any idea. Hence, von Glasersfeld might very well have wanted to revisit the two schools of thought along with the interpretations of modern scholars to see if his constructs might meet new constraints, or if they are still viable.

Sociocultural Theory

Active thinker, quest-ce que c'est? Is it one who engages in the process of actively reorganizing information gleaned through various experiences? Or, is the active thinker one who becomes acculturated into a community of practice (Cobb, 1994)? The premise of each of these questions captures the essence of the key differences between Radical Constructivism and Sociocultural Theory, but also complicates the delineation of these two theories due to the mutual emphasis on active, rather than passive, thought. In the minds of radical constructivists and socioculturalists alike, learning exists in the context of activity. While socio-cultural theory

holds a foundational assertion of radical constructivism, "knowledge is not passively received but actively built up by the cognizing subject" (von Glasersfeld, 1989, p. 182), the way in which the theories are structured seems to be sharply juxtaposed. As Lerman (2000) argued, "radical constructivism, and cognitive constructivism in general, is too narrow an interpretation of social life to explain all that one needs to study" (p. 210).

Socio-cultural theorists view the learner as an active interpreter of information within a structured society. These cultural contexts are not mere backgrounds that can be arbitrarily altered with the same results. In fact, "cognition is culturally mediated by material and semantic artifacts such as tools and signs, it is founded in purposive activity" (Packer & Goiceochea, 2000, p. 229). As a result, the cultural environment distinctively shapes cognitive development. When one assumes that knowledge and learning are always individual, he or she "fails to grasp the affective, relational, and cultural dimensions of activity… Constructivism also can take for granted the objective appearance of the world and fail to recognize its cultural and historical basis; the objects we know are also products of human activity" (Packer & Goiceochea, 2000, p. 235). Thus, taking some direction from Vygotsky's emphasis on the essential role of the environment when reanalyzing the constructivist theory, those that ascribe to SC hold distinct differences from radical constructivists.

Sociocultural Theory: In the beginning.

The roots of SC are grounded in the work of key theorists such as Vygotsky, and activity theorists such as Davydov, Leont'ev, Lave, Saxe, and Galperin (Cobb, 1994). While much of the initial framework for SC corresponded to psychological development and was put forth by Lev Vygotsky (1941/1997), extensions, elaborations, and refinements of Sociocultural Theory in the

context of cognition can be found in writings regarding activity theory (Chaiklin & Lave, 1993; Leontiev, 1981), cognitive apprenticeship (Brown, Collins, & Duguid, 1989; Rogoff, 1990), legitimate peripheral participation (Forman, 1992; Lave & Wenger, 1991), and cultural-historical activity theory (Cole, 1996; Cole & Engestrom, 1994). Despite the variation that exists within each of these strands of Sociocultural Theory, each of these situates the act of learning within a position of cooperative participation in cultural practices.

Researchers and theorists such as Vygotsky portrayed the acquisition of knowledge as an activity that is "profoundly influenced" (Cobb, 1994, p. 13) by an individual's participation in social and cultural situations, and that this social dimension precedes the individual dimension of consciousness. In an extreme sense, one can contend that cognitive development is inexorably tied to, or as Cobb (1994) explains—"subsumed by"—social and cultural processes. Vygotsky (1978) argued that in learning environments individuals first acquire knowledge and skills before the development of higher mental functioning such as abstract thinking or reasoning. More specifically, the interactions and conversations with others, particularly more knowledgeable others, can later be used as a mediator that the learner uses to respond to and internalize experiences in his or her own voice. Bakhtin (1981) described this process as appropriation, and this concept is identified as a central tenet in sociocultural theory.

Vygotsky, in particular, emphasized that the nature of human cognitive development is uniquely different from that of other animals through the acquisition of language. The learning process occurs as people interact and converse in the context of situations and environments. Thus, learning—according to sociocultural theorists—is a social activity, which exists only through linguistic interactions with other humans or cultural artifacts such as literature or conventional tools like calculators (Cobb & Bauersfeld, 1995; Rogoff & Lave, 1984; Wertsch,

1991; Vygotsky, 1978). Just as von Glasersfeld identified two key principles that embody Radical Constructivism, Vygotsky identified the role of: 1) interactions with a more knowledgeable other, and 2) culturally developed sign systems. Wertsch (1991) proposed that these major themes in Vygotsky's work clarify the interrelations between individual and social processes.

First, Wertsch (1991) identified that the origin of psychological and cognitive development originates in social interactions. Consequently, these exchanges serve as the catalyst to cognitive development when individuals are engaged in an environment that supports interaction and shared thinking (Rogoff & Toma, 1997). "Any function of the child's cultural development appears on the stage twice, or on two planes, first the social, then the psychological, first between people as an intermental category, then within the child as an intramental category" (Vygotsky, 1941/1997, p. 105–106). As individuals engage in conversations, the members of the community first negotiate a shared understanding of a concept, and then individually appropriate meaning; thus "advancing their ideas in the process of participation" (Rogoff, 1990, p. 196). In the Vygotskian perspective, higher mental functioning such as memory, thinking, metacognitive strategies such as self-monitoring, or the use of signs (Confrey, 1992) begins in the social environment as individuals interact with other individuals or with cultural tools. However, it is crucial to note that the *quality of the interactions* is what contributes to the advancement of conceptual understanding. The nature of tasks and the depth of the dialogue related to those experiences have a powerful impact on what individuals internalize.

Secondly, Wertsch (1991) noted that human activity is negotiated through the use of tools and signs. These semiotic means include symbol systems such as "language; various systems of counting; mnemonic techniques; algebraic symbol systems; works of art; writing; schemes,

diagrams, maps and mechanical drawings; all sorts of conventional signs and so on" (Vygotsky, 1981, p. 137). However, additional semiotic means involve tangible tools including computers, calculators, or paintbrushes, all of which can be utilized to represent and communicate thinking. Wertsch (1992) also described Vygotsky's philosophy related to signs as an instrument for communicating with and influencing others in the initial sense, and secondarily transforming into a tool to mediate one's own knowledge and understanding. As a result, these semiotic means become both the tools that facilitate the cooperative construction of knowledge amongst members of the community, and also the means by which one internalizes a taken-as-shared meaning in order to effectively implement independent problem solving activities in the future. Despite the existence of distinguishing features, specifically corresponding to the theorists' attention to the social and cultural context in Sociocultural Theory or the individual's construction of knowledge in Radical Constructivism, corresponding relationships exist between these two epistemological perspectives.

The Fruits of Epistemology: Comparing Apples and Oranges.

One might argue that constructivism, particularly Radical Constructivism, and Sociocultural Theory are in dynamic opposition to one another. On the surface socio-cultural theories do not seem to account for the individualistic learning process, while a criticism of Radical Constructivism corresponds to the notion that viewing learning through this lens fails to account for the influence of society and culture. However, as we have demonstrated in this discussion, others assert that the theories share similarities (Confrey, 1992) or are complimentary (Cobb, 1994). As Cobb (1994) contends, "each of the two perspectives, the socio-cultural and the constructivist, tells half of a good story (p. 17) constituting the background for the other" (p. 19).

Furthermore, Cobb asserts that learning should be "viewed as both a process of active individual construction and a process of enculturation into the [mathematical] practices of wider society" (Cobb, 1994, p. 13).

As thoroughly described in the comparison between Radical Constructivism and Piaget's cognitive constructivism, von Glasersfeld's work –much like that corresponding to sociocultural theory—demonstrates a similar epistemological lens. The predominant element of Radical Constructivism is that knowledge is not passively received, but instead actively constructed. Evidence for an individual's construction of knowledge is particularly evident in empirical studies where researchers identified "significant qualitative differences in the understandings that students develop in instructional situations, [which] are frequently very different from those that the teacher intends" (Cobb, 1994, p. 13). However, because learning in the sociocultural sense is defined through the negotiation of meaning, a critical difference stems from the ontological perspective of Radical Constructivism. Von Glasersfeld argued that an individual cannot know reality, but only can assert that his or her perception of reality is viable with the events that occurred within the environment. This perspective seems in stark contrast to the philosophy of Sociocultural Theory in which members of a community negotiate meaning among personal interpretations and the culturally established characterization within the immediate community (such as the classroom) or wider society.

When exploring the nature of the data through the lens of Sociocultural Theory one attends to the ways in which the environment influences the individual, whilst a cognitive constructivist may analyze the learning process solely by viewing the individual learner as a distinct, unique entity. Therefore, it seems that Radical Constructivism and Sociocultural Theory provide different frameworks to analyze separate sides of the same story; consequently

addressing different questions. A sociocultural analysis, unlike a constructivist perspective, situates an episode within a specific environment such as a classroom setting in order to use participation in a social or cultural activity as a means to explain thinking and learning. In fact, according to a sociocultural theorist it is "inappropriate to single out qualitative differences in individual thinking apart from their sociocultural situation" (Cobb, 1994, p. 15). Thus, as a sociocultural theorist analyzes learning experiences, he or she views an individual's thinking and learning as an internalization of "taken-as-shared" meanings established by the group in culturally organized activities. In contrast, constructivist theory places emphasis on individuals' interpretations and the cognitive processes used to rectify perturbations. Through the lens of a radical constructivist, the emphasis is solely on the individual's construction knowledge, focusing the analysis on the manner in which an individual constructs his or her personal understanding.

Critical Theory[i]

Critical Theory is broad in its conceptualization and draws from a number of disciplines and related paradigms (e.g., sociocultural, history, sociology, psychology, social sciences, political science). As such, a central belief is that it can be directed at the totality of human existence; thus, it has been applied to a wide array of disciplines. Critical Theory does not study cognitive development particularly or directly, but follows an epistemological line of reasoning which demonstrates how culture, contexts, macro-level variables and experiences such a racial stereotyping can impact cognitive and social variables (Lee, 2008; Rogoff, 2003; Steele, 1998; 2004). Critical Theorists insist that researchers are value-laden individuals who bring with them certain assumptions and biases to the research process. As value-laden individuals, then, theorists

(e.g., cognitive theorists) are influenced and limited by their own epistemologies and ways of thinking.

Critical Theory is concerned with critiquing society as a whole. It raises questions regarding the basic assumptions of positivistic theories and epistemologies (Lather, 1992). At its core, Critical Theory addresses fundamental issues of power and voice. Hence, it rejects universal notions of development. Rather than normative pathways, Critical Theorists argue for and honor multiple pathways for human beings to pursue cognition (Lee, 2008). It asserts that people are experts on their own lives and that the appropriate education for students can best be devised in consultation with adults who share their specific cultural contexts. Routine practices and contexts help shape people and people also shape contexts. Therefore, the cognitive, social, physical, and biological dimensions of the individuals themselves and their contexts interact in adaptive and essential ways (Lee, 2008). The goal is for humans to critique and question the conditions of their lives. Therefore, the purpose is not simply to describe reality, but to transmute it.

Following a Black psychological and critical theoretical line of reasoning based on the work of Franz Fanon (1952), Sylvia Wynter (2005) concluded that humans are first biological beings who then create culture. Hence, as humans, we are bioevolutionarily prepared by means of language and cognition to inscript ourselves into this or that modality of being human. This process is always in adaptive response to the ecological and geopolitical circumstances in which we find ourselves. Agreeing with Fanon (1952), Wynter (2005) suggested that there is need to move beyond a biological conception of being, which underlies many present conceptions of development. As a result, she proposed a mode of what she referred to as *sociogeny*, which

includes a conception of humans that acknowledges cultural influences on biology and socialization within the terms of a specific "culture".

Discursively, a basic Critical Theoretical proposition would surmise that cognition is complex, interactional, and dynamic. Humans possess cognitive flexibility based on contexts indicating there are multiple pathways for pursuing cognitive goals depending on contextual adaptations. That is, biology has primed people to acquire a cultural way of learning and we are hardwired to be adaptive, not necessarily in a linear manner. To be clear, this argument is fundamentally different than the heritability argument, which proposes that particular cultural groups (e.g., Whites versus African Americans) are genetically inferior from others (Gould, 1981/1996). Darwin's evolutionary biology acknowledges sources of human unity with minimal genetic distances among races/cultural groups. What Critical Theory rejects is the deterministic pronouncements about cognitive development, which cause educators to overlook and disregard other forms of cognition not proscribed by constructivism. Critical Theorists value the heterogeneity or variety of human existence.

Divergent and Convergent Points Amongst the Four Perspectives.

When comparing the four theoretical positions, at times it may make more sense to speak of differing degrees or areas of focus. However, there seems to be a fundamental disagreement regarding assumptions about the role that culture plays in cognition. Four points of discussion follow: 1) agreement on active learning; 2) social identities, issues of power and culture; 3) narrow definitions of cognition; and 4) relationships between Critical Theory and Sociocultural Theory.

Agreement on Active Learning. Constructivism (Piagetian and Radical Constructivism), Sociocultural Theory and Critical Theory seemingly agree with the premise that thinking and learning are active, rather than passive, processes. Likewise, all four schools of thought would all likely concede that *individuals might know more than they can tell or demonstrate. Thus, the limits of language or actions/demonstrations of thinking are not limits of cognition.* Of the four perspectives, Critical Theory would likely have the broadest definition of what counts as cognition within various cultural contexts, and would not likely view one type of thinking (e.g., what constructivist theory may see as concrete actions) as necessarily lower levels of cognitive reasoning. Moreover, a critical theorist would not use a narrow definition of abstract reasoning because different cultural lenses may result in varied understandings and interpretations of what counts as higher or lower levels of cognition. However, from a constructivist standpoint, there seems to be an implied belief that "some cultural practices are preferable (and others, if not 'deficient,' certainly less desirable)" (Mallory & New, 1994, p. 20). Critical Theorists would likely be hesitant to assume that equilibration, assimilation, and accommodation are essential or unitary cognitive processes, or that cognition proceeds in a unitary and universal predictable fashion that does not vary by culture and context. Such a concession would be seen as premature foreclosure on other possible processes that exist in various cultural contexts or if other theoretical or practical lenses are used. In fact, a basic premise that can be inferred from Critical Theory is that *there are many diverse ways of thinking both concretely and abstractly that may not be captured via linear and Western epistemologies.*

Social identities, issues of power, and culture. A Critical Theoretical analytic lens would be sensitive to the fact that all theories are written by persons of a particular race, culture, gender, and so forth, which have influenced their epistemological stances and parameters of

thought. Critical Theory holds that knowledge is not neutral or universal, and since the theories in question have been constructed by White, European men and their lived experiences and theoretical ways of knowing, such theories are inherently influenced by the theorists' *raced, classed,* and *gendered* identities. Conscious of issues of power, Critical Theory would further probe and reject any suggestion of linear assumptions (e.g., versus circular or curvilinear) about knowledge such as, who determines what is abstract and what is not? What makes one kind of thinking prototypical? Better or worse? Superior or inferior? Is knowledge only legitimate if a Western-type taxonomy (i.e., cumulative, linear) is created to explain it? Aware that all conceptions beyond the biological are socially constructed, Critical Theorists may question focusing on cognition in an isolated fashion versus along with other interlocking aspects such as affect, spirituality (King, 2006; Lee, 2007; Wynter, 2005). Such decisions and areas of emphasis represent decidedly different epistemic assumptions about knowledge. Lee (2008) explained that emotional, social and cognitive development jointly shapes individual's ways of being. In essence, theories are derived from particular assumptions and carry with them particular biases and limitations. This includes Critical Theory of course, but Critical Theory is self-aware of its subjectivity and selected areas of foci as well as its ideological/political stances.

To elaborate on the point that all theories represent the cultural thought processes of the conceiver, a number researchers have pointed out that African epistemologies or indigenous thinking is often dismissed or viewed from deficit perspectives (Boykin, 1979; Hilliard, 2001; Nobles, 1974; Van Wyk, 2012). For example, many tacit and nonverbal expressions of cognition would undoubtedly escape constructivist radar. That is to say that in terms of application of Radical Constructivism, it is questionable whether it can be used as an analytic tool to explain the cognitive development of African and African American children. Theories derived from the

observation of primarily White and/or European children and interpreted from that particular epistemological worldview cannot necessarily be extrapolated to other children in distinctively different cultural contexts. In fact, from a critical theoretical perspective, it is quite presumptuous and ethnocentric to assume that there is a prototypical or unitary path to development. As Vygotsky's work emphasized, there is variation within and between various European cultures, based on the sociocultural context. Additionally, meaning is always subject to negotiation and can be influenced by people who view the issue or construct from different perspectives, ideological stances, and worldviews. Critical Theorists find that positivistic theoretical orientations often have limited applicability for children from nonmainstream cultural backgrounds because they fail to consider and actively engage particular histories, social embeddedness, experiences, cultures and prior knowledges in classrooms (Chalmers, 1997).

From a critical theoretical perspective, I am arguing, then, that it is possible that racism, oppression, or other structural inequities change the way knowledge or new cognitive information is processed. Suppose that a cultural adaptation has caused the creation of an oppositional function or process which makes first line of reasoning and processing an active rejection/blockage of new knowledge rather than trying to fit new information into existing structures (assimilation). Perhaps one learns to consistently organize and program thinking oppositionally to mainstream logic and ways of knowing. Conceivably, there could be cognitive and emotional/psychological *interference,* which prohibits assimilation and accommodation from occurring or even making them likely/useful processes.

Indeed, using Black Critical Theoretical lens, African Americans have been shown to use one of three modes of responses to endemic linguisism and racism: 1) Adaptation, or adopting what is deemed useful; 2) Improvisation, or substituting or improvising alternatives that are more

sensitive to African American culture; and 3) Resistance, or resisting that which is destructive and not in the best interests of African Americans (King, 2005). Following this line of reason, African American Language[ii] speakers who respond using the first mode (Adaptation) are likely to learn to code switch and alternate between using African American Language (AAL) and Mainstream American English (MAE), depending on the context and benefits. These speakers seem to follow the *assimilation-disequilibrium—accommodation—equilibrium* processes and will likely use AAL in informal settings and MAE in formal settings.

AAL speakers who *improvise* may find ways of making AAL work for them (e.g., blending the two languages in their speech and writing). Improvisation has also been referred to as code meshing or code mixing (Canagarajah, 2006; Kirkland & Jackson, 2009; Young, 2009). These speakers *do not* seemingly assimilate or accommodate the mainstream language mode into their existing language structures, and in fact may create novel ways of blending the two language systems (code-meshing); thus, creating a totally new entity. While some may think that this choice is related to age, examples of this process with adults have been widely documented among age groups spanning from young children to adults (Alim & Smitherman, 2012).

Narrow Definitions of Cognition. A goal of Critical Theory is to emancipate groups that are oppressed. Oppression is broadly and comprehensively conceived to include theoretical orientations and explanations, which do not "accurately" capture the realities of minoritized cultural groups. Radical Constructivism would fall short using this analysis since it views cognition as "a constitutive activity, which, alone, is responsible for every type or kind of structure an organism comes to know" (von Glasersfeld, 1974, p. 5). This conception, which views cognition in an isolated versus and interlocking manner, would likely render certain cultural groups' cognitive abilities as inadequate—even though a within-group analysis may

view them as cognitively adept. From a Piagetian and Radical Constructivist point of view, culture is to be acknowledged, but is not a major influence on *natural* course of development (Penn, 2002). Hence, while not suggesting that the cognitive processes proposed by Piagetian and Radical Constructivists do not have validity, I *am* suggesting that they seem to be inadequate in terms of explaining how culture influences thinking. From a Critical Theory Perspective, the conception of the role that culture plays in cognition would need to be integral versus peripheral.

Critical Theory and Sociocultural Theory. Critical and sociocultural theories both argue that cognition and logic are socially mediated and influenced by culture and that the ways people make sense of their worlds is culturally based. Concurring with sociocultural theorists (e.g., Vygotsky, Bakhtin), Critical Theorists would view cognitive development as occurring on both intrapersonal and interpersonal planes. From perception (e.g., preferences for smells, sounds, tastes, touch) to cognitive representations, there is tremendous variation within and between cultural groups, which may defy Western taxonomic systems.

Like sociocultural theories (in particular the work of Mikhail Bakhtin), Critical Theory accepts the position that each person represents a consciousness that is the composite of all of their experiences at a particular point in history, which is based on choices that have been made (Holquist, 1981). Therefore, in making sense of the world, logic is never done individually. Each thought and thought process represents a multiplicity of thought, which embody many experiences—some of which cannot be conveyed in utterances and action. Bakhtin used the term *heteroglossia* to refer to this plenitude of conscious and unconscious meanings. When people think or speak, even if by and to themselves, they are continuing a "dialogue" that began before the use of tools, language, and reasoning that they have inherited from others (Holquist, 1981; Lee, 2007. Hence, we are always speaking and thinking collectively.

Also congruent with Sociocultural Theory, Critical Theory values multiple perspectives on the same issues. The concepts, dialectic and heterglossia/multivocality support the existence of a multiplicity of theoretical standpoints rather than one grand, all-encompassing theory. In fact, Critical Theory acknowledges that the metanarratives, or dominant discourses that are created and reinforced by dominant power structures, are only one part of a larger story.

Response to Opening Vignette

At the beginning of this article, we provided a classroom episode from one of our Early Childhood Education courses. Specifically, viewing the classroom episode through the lens of constructivism, Sociocultural Theory, or Critical Theory would result in one attending to the units of analysis and epistemological implications in various ways—depending on which theoretical position he or she bases pivotal research question(s).

A Cognitive Constructivist Response.

Piaget and von Glasersfeld agree that knowledge is not passively received, but actively constructed by the cognizing subject. Piaget proposes four factors that affect active construction of knowledge: maturation, experiences, social interactions and equilibration (Duncan, 1995). Each of these factors is present in this vignette. The professor purposely waits till the students have had a semester or two in his courses before having this conversation (maturation), an experience is presented (investigation of the synagogue), social interaction is encouraged (students converse freely with one another as they explore the synagogue), and equilibration is set in motion (regarding entry into heaven).

From the students' responses one can also draw the conclusion that knowledge is not passively received, but actively constructed by the cognizing subject through the process of assimilation, accommodation, and equilibration. Students ask questions and seem to assimilate information (Jewish tradition has a notion of heaven), accommodate (alter existing understandings to recognize variations of religious beliefs in regards to Jesus and heaven) or enter a state of disequilibrium (when confronted with the reality that their faith beliefs might exclude the professor from heaven).

In the vignette the goal of the class was to help the students construct an understanding of culturally relevant pedagogy. This concept is often difficult for young college students as it includes decentering from their lived experiences and seeing the world through the eyes of others. Through a Radical Constructivism lens, the synagogue visit affords the students an opportunity to confront the insight that no faith is universally embraced as an ontological truth, but only a construct in an almost paradoxical manner. By having students experience the disequilibrium of having two "realities" clash (requirement of acceptance to heaven that rejects another's acceptance) the instructor intended to prepare them to enter classrooms ready to accept and teach students whose culture differs from their own. By creating an experience that both challenges a concept that students may view as an ontological reality, and casting the students in the role of active constructors of knowledge, the vignette exemplifies tenets of both cognitive and Radical Constructivism.

A Sociocultural Response.

In research the question defines the methods, unit(s) of analysis, and corresponding framework. Consequently, it lies within the responsibility of the researcher to determine what story he or she would like to tell and explicitly identify the framework and rationale for adopting

this lens in order to answer a particular question. In the context of the vignette, one may be curious as to how the dynamics of the established classroom culture, the historical and religious history of participants, or the dialogic exchanges amongst the individuals contributed to the common conclusions the students drew about the fate of a beloved professor as they recognize his faith does not align to their perceptions. Moreover, the Sociocultural Theory lens provides a means to examine how the students negotiated these understandings within the context of the existing environment.

Sociocultural Theory provides a strong backdrop to address these questions because the cultural contexts and the deep-seated beliefs are not mere backgrounds that can be arbitrarily altered. In fact, how the students and professor grapple with and mediate the new information through social interaction demonstrates how understanding evolves from one's participation in various environments, and is directly or indirectly influenced by these social interactions. Thus, the truth an individual creates, discovers, or attains becomes so from the interactions that occur within and across various communities (Wertsch, 1991). This is no more evident than with the "truths" one experiences in the context of religion.

As in the vignette, religion provides a distinct argument for the constructivist nature of learning—but an even stronger line of reasoning for a social constructivist theory of learning. One develops knowledge from his or her experiences, and learns as he or she creates networks of interrelated knowledge (Bransford, Brown, & Cocking, 2000), most directly through social interactions when confronting novel experiences. However—as with religion—consistencies, and inconsistencies, occur due to the social context of an interpreting group. For example, members of a single faith share perceptions of topics such as their image of God, prophets, after-life, and sin; yet different communities have different common conceptions. Thus, understanding

exists from interactions within various communities, and people negotiate their perceptions through corresponding conversations and experiences. From a Sociocultural Theory research perspective, the unit of analysis for the vignette would not be the individual's construction of knowledge, but rather an investigation of the interactions within the learning community and how these contributed to a negotiation of meaning, which occurred within the unique environment and through the cultural capital each participant draws upon during the experience.

A Critical Theoretical Response.

Critical Theorists would be less inclined to focus on students' disequilibrium or even sociocultural aspects regarding the religious differences, but rather the power dynamics involved and the reasons why Jewish ways of knowing are unfamiliar to them. The students have been socialized into a world in which their ethnicity (European American) and religion (Christianity) have been privileged. Critical Theorists may view the students' cognitive, social, and emotional reactions through the lenses of their social identities and how these have influenced not only what they have considered as the norm, but also *how* they think about themselves and others who are different from them. Their thoughts reflect their *raced,* and likely *classed,* and religious ways of knowing and epistemological stances. While agreeing with Piagetian analyses which view the students as active constructors of their own knowledge, Critical Theorists (like socio-cultural theorists) hold that the students' understanding and thinking processes do not reflect only individually constructed notions, but also indicate metanarratives that they have processed via books, media, and other social experiences

As a result of the surrounding politics, schools will always have political struggles concerning the meaning of democracy and whose culture is legitimate (Apple, 1992). So Critical

Theory would focus on the political nature of schools and why information about religious diversity has been excluded in the students' educational process. For instance, Critical Theorists would question why have some young women not (knowingly) met a Jewish person? Hence, Critical Theory problematizes the invisibility of diversity in curriculum and the privileging of White, male, and Christian hegemony. We could go further and argue that inherent divisiveness in educational and social settings in society influences students' thought processes; thus, creating uncritical and unquestioning students who assimilated information from the status quo, seemingly not filtering any information that did not fit the "norm." Unlike Constructivism, which focuses on individual thoughts (albeit others and social actions are included somewhat peripherally), Critical Theory holds that knowledge is not neutral or something that is pursued on a purely intellectual or cognitive basis. Rather, it is a political reality which reflects some people's, but not others', truths.

From a critical perspective, students need to be able to understand and deconstruct structural inequities that reify religious stereotypes and inequities if they are to become teachers who effectively use culturally relevant pedagogy with their students. Macedo (1994) introduced the concept *emancipatory literacy*, which involves students becoming knowledgeable about their own histories, experiences, and the culture of their everyday environments. Also, students must be able to discern the dominant culture's codes and signifiers, and to criticize the logic of arguments that underpin their everyday activities. The art of explicating, analyzing, and assessing these arguments and logic is essential in critical thinking.

Concluding Remarks

Echoing van Glasersfeld's (1996) assertion that no theory can be all things to all people, we conclude by suggesting that educators must read broadly versus within one theoretical or philosophical stance. From a Critical Theoretical framework, we acknowledge that education can serve various political and cultural interests, including socialization, social control, assimilation, domination, liberation, and/or transformation. (King, 1991). Therefore, it is important for educators to navigate divergent theories, principles, philosophies, and ideologies as well as foundational arguments put forth by various epistemological stances. Theories that will be most useful for practitioners in the 21st century will have to be dynamic and elastic. The applicability of any theory will lie in how well it explains multiple, co-existing, and sometimes contradictory, realities.

[1] Congruent with Critical Theory's emphasis of voice, I chose to write this section in first person (Author Three). I recognize that I am intimately and subjectively involved in my Critical Theoretical preference.

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[ii] African American Language is a systematic, rule-governed system that is governed by distinct phonological, syntactic, semantic, and pragmatic principles. It is also referred to as "Black English," "African American English," "Black English Vernacular," "Ebonics," and a host of other names (Author, 2012; 2013).

Running head: CONSTRUCTIVIST LEARNING IN RESEARCH METHODS

Comparing Constructivist Learning Assignments in Research Methods Classes

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Abstract

Baccalaureate degree programs in numerous college majors require that students cultivate a working knowledge of research methodology. A popular constructivist learning assignment in research methods classes is the student-developed research project. This paper introduces constructivist assignments using two alternative learning approaches (case-based instruction and journal writing) in a social research methods course designed for human services majors. On comparative measures of learning gains and students' attitudes toward assignment completion, results favor both case-based instruction and journal writing over the research project as well as journal writing over case-based instruction. Findings are discussed in the context of constructivist pedagogy.

Comparing Constructivist Learning Assignments in Research Methods Classes

Successful completion of a course in research methods is vital to future baccalaureate graduates in various disciplines who plan to conduct their own original research (Ball & Pelco, 2006). This matter is of particular relevance to those undergraduates who aspire to attend graduate school. It is also important to college graduates who need to make informed decisions about research findings as a consequence of their professional responsibilities and development (Zablotsky, 2001). However, the challenging nature of this course's technically complex content often renders it difficult to sustain high levels of student interest and motivation and to provide meaningful learning experiences (Ball & Pelco, 2006). Consequently, some instructors attempt to supplement traditional lecture-text research methods classes with more constructivist learning assignments. Constructivist learning is an active process that supports students' metacognitive and critical thinking skills through personalized knowledge creation and transfer to real-life environments (Mayo, 2010).

A popular constructivist learning strategy in research methods classes is the student-developed research project that may include the research proposal and/or original student research (Marek, Christopher, & Walker, 2004). Through one or more these research projects, students gain experience outside the confines of a lecture-heavy course that relies on students memorizing research terms and definitions. As an example, in teaching psychology research methods, Ball and Pelco (2006) discussed the use of a group-project approach that integrates elements of problem-based learning as a way to foster research problem-solving and reasoning skills. However, these researchers pointed to limitations when asking students to complete multiple student-developed research projects over a semester-long class. One shortcoming is the possible need for preliminary class time spent instructing students on group processes conducive

to cohesive team collaboration. Another drawback is the likelihood of logistical strain placed on an instructor in overseeing multiple student research projects at one time.

Beyond students developing, conducting, and presenting (orally and/or in writing) one or more original research projects throughout the semester, are there alternative constructivist approaches for teaching students the applied components of research? One such approach involves the use of what I term the *"Live" Research Case Analysis* (LRCA). In this written assignment, students identify and evaluate the elements, methods, and stages of social research, as depicted through a refereed journal article that functions as a reference case. Another alternative to assigning student-developed research projects is a narrative journaling assignment (both autobiographical and biographical in nature) that I call the *Applied Research Log* (ARL). In their logs, students keep an ongoing written record of the times throughout the semester that they observe social research concepts being applied in the world around them.

In this paper, I will compare the research proposal, LRCA, and ARL as term-long constructivist assignments in different sections of my own social research methods classes. In addition to offering comparative student-performance measures, I will present the results of an attitudinal questionnaire administered within each class section as a means of comparing students' perceptions of these constructivist learning assignments. This investigation represents the first time that constructivist alternatives to the student-developed research proposal have been systematically examined in the context of teaching undergraduate research methods.

Method

Participants

Participants were 50 college juniors and seniors enrolled in one of three sections of a course,

Research Methods in the Social Sciences, for which I served as instructor of record. These course sections were offered over three consecutive semesters at a public state college in the southeastern United States. There were 29 females and 21 males who ranged in age from 21 to 62 years ($M = 26.83$). Ninety-six percent of participants were part of a baccalaureate-degree program in human services in which this research methods class is a graduation requirement. Remaining participants were completing a baccalaureate degree in business and opted to enroll in this class as an approved elective course of study.

Design

I used a multilevel three-group design to compare the target constructivist assignments. Over three semesters, I randomly assigned intact classes to one of three conditions. In the Control condition, 15 students completed the research proposal. In the second condition, 17 students completed the LRCA. In the third condition, 18 students completed the ARL. There were no statistically significant differences among these three groups on the basis of age, gender, or GPA. Except for differences in the above types of learning assignments, all efforts were taken to keep course content the same across conditions.

Instructional Methodologies

Research Proposal. In the Control condition, I asked students to write a minimum 10-page research proposal (not including the title page, figures, tables, and appendices) that addressed a problem or concern faced by an actual or fictitious social services agency or embedded within a social issue, policy, or program. A 150-250 word preliminary proposal that sufficiently described students' intended topics was due early in the semester. This document included a broad supporting rationale for what problem a student planned to examine and how it would be investigated. Full research proposals, due in the final week of the semester, signified 25% of the

final course grade.

Students followed APA style guidelines in completing this assignment. The constituent components of the research proposal, in sequential order, were: title page; abstract; statement of the problem (purpose of the study, objectives); literature review (topic or problem area, underlying social and behavioral theory, supporting research methods identified in the relevant literature, research hypothesis); methodology (subjects, research design, and proposed data collection); proposed data analysis/program evaluation; projected timetable for research completion; a minimum of eight scholarly references cited in both the body of the report and a separate reference section; and any ancillary materials.

"Live" Research Case Analysis. At the beginning of the semester, I provided students in the LCRA condition with a copy of an instructor-selected, peer-reviewed, and research-anchored journal article. This article formed the foundation for a written assignment that each student completed.

Using the article as an *in vivo* case study in research methodology, I presented students with a series of research topics regarding the article's content. Organized into corresponding subheadings, students discussed and critiqued the article in terms of the instructor-predetermined topics listed below. Within the overall framework of the assignment's intended purpose, the specific parameters of the assignment were flexible enough so that subsequent research-methods instructors could customize the nature, breadth, and depth of the topics to be addressed, contingent on a given course's instructional focus. I informed students that not all topics might apply to the content of the chosen journal article. Moreover, I afforded students latitude to identify and address additional research topics that were not specified upfront.

1. Underlying theoretical model (positivist, interpretive, critical, pragmatist)

2. Literature review (depth, breadth, quality, flow, and scholarly nature of references)
3. Hypotheses:
    a. null
    b. alternative (directional, non-directional)
4. Variables:
    a. independent, dependent, and extraneous
    b. conceptualization of variables
    c. operationalization of variables
5. Participant selection and assignment:
    a. participant sampling (probability, nonprobability)
    b. sample size
    c. sample's demographic characteristics
    d. participant assignment to conditions (random, nonrandom)
    e. adherence to applicable code(s) of ethics (e.g., risk of harm, privacy, informed consent)
6. Instrumentation:
    a. instruments used for data collection
    b. rationale for instrument selection
    c. absence of bias
7. Research design:
    a. descriptive (e.g., case study, observational/archival, survey)
    b. experimental (field, laboratory)
    c. confounding factors (threats to both internal and external validity)
8. Measurement:

a. approach (quantitative, qualitative, mixed)

b. levels (nominal, ordinal, interval, ratio)

c. validity

d. reliability

9. Data analysis:

a. descriptive statistics

b. inferential statistical tests

c. qualitative measures

10. Discussion, conclusions and recommendations:

a. discussion of findings

b. conclusions reached by author(s)

c. limitations of the study

d. implications for future research

I asked students to follow the sequential order of the subheadings as shown above, and to clearly label each subheading in completing this written assignment. There was a seven-page minimum requirement; however, there was no maximum page limit. The assignment, which counted as 25% of the final course grade, was due near the end of the semester.

Applied Research Log. In the ARL condition, I asked students to keep an ongoing record of the times throughout the semester that they observed concepts relevant to social research methods being applied at school, home, work, recreational environments (e.g., gyms, restaurants, vacation destinations), in the media (e.g., TV, radio, movies, videos, books, magazines, newspapers) and in scholarly publications (e.g. refereed journal articles, peer-review books). At times when they found one of these research principles in action, I recommended that

students make a note in their respective logs, including the date, the source, and a brief description of the event/situation in which the concept was applied.

In order to guarantee their privacy, I assured students that the content of their log entries would be kept in confidence. Nevertheless, I encouraged students to exercise appropriate discretion in their self-disclosure. Although none selected this option, I allowed students the opportunity to complete a traditional research proposal in place of the ARL.

Completed logs consisted of 40 numbered entries. Each entry consisted of the following three subheadings: (a) Date, (b) Source, and (c) Research Application(s). A minimum of eight entries must include one or more supporting scholarly reference citations.

Students generally adhered to APA style guidelines in completing this assignment, with the exceptions that they were asked to (a) boldface type all research applications; (b) single-space within entries and double-space between entries; (c) use horizontal page layout; (d) include no more than two entries per typed page; and (e) cite reference citations immediately after each applicable entry rather than in a separate reference page. These variations from standard APA style were intended for general ease of readability and grading.

To sensitize students to the correct format for completing this assignment, at the start of the semester I distributed an instructor-composed document containing several fictitious sample entries. Two illustrative examples—typed here for convenience in vertical instead of the horizontal page layout required for this assignment—are shown below.

Example #1:

Date	Source	Research Application
01-22-16	Journal article (Smith, 2016)	In an article that discusses how scientific knowledge constantly fluctuates in relation to changes in American society (Smith,

		2015), the author describes an instance where a social researcher uncovers favorable views in a survey examining governmental financial involvement in caring for the elderly when surplus governmental funds are available. However, in a more budget-conscious time in American society, the author of this same article discusses how yet another social researcher finds conflicting survey evidence in which views toward governmental financial involvement in caring for the elderly are less positive. This shift in survey respondents' attitudes toward the same topic reflects changes in the prevailing society, which in turn demonstrates that **provisional knowledge** is limited to current research-validated perspectives and thus is subject to change over time.

Reference citation: Smith, H. L (2015). Provisional knowledge opens the door to scientific progress. *Journal of Human Behavior in the Social Environment, 9*, 18-42.

Example #2:

Date	Source	Research Application
01-28-16	TV advertisement	I watched a TV commercial in which a well-known female actress made the claim that she had lost nearly 100 pounds by simply following a trademarked meal plan. Although this meal plan might have been connected in some way to her weight loss, she did not mention other possible **mediating** or **intervening variables** such as exercise, diet pills, or bariatric surgery that might have been equally if not more so implicated in her dramatic weight reduction. This example illustrates how the popular media may rely on **correlation** in making grandiose advertising claims when, in fact, correlation does not offer a direct measure of cause-effect relationships among variables.

Completed logs, which constituted 25% of the final course grade, were due at the end of the semester. In grading completed logs, I assessed the *accuracy* with which students correctly applied research concepts to the sources and scenarios that they offered in their logs. I also assessed the relative presence or absence of sufficient *variety* across each student's log entries. To this end, I permitted students (a) no more than 15 research applications derived from material within a designated unit of course coverage; (b) no more than three entries from a single research-application category (e.g., validity of measurement); and (3) no exact-duplicate applications.

Results

Objective Testing of Learning Gains

The dependent measure used in objective testing of learning gains was scores on the comprehensive final exam for the course. This exam consisted of 50 scenario-based, conceptually applied, multiple-choice questions. I selected questions from test-bank items to minimize the possibility of experimenter effects in creating this exam. In the interest of both test security and alternate-form test reliability, I exercised appropriate care in matching questions on content and level of difficulty in the process of selecting items for random inclusion on three different-but-comparable exam versions (one for each of the three conditions in the present study). The means and standard deviations for student performance in each condition are Control (M = 74.02, SD = 10.64), LRCA (M = 81.08, SD = 8.81), and ARL (M = 86.97, SD = 7.25).

I used an independent-groups analyses of variance (ANOVA) to compare student performance on the dependent measure across the three conditions. The results are F (2, 47) = 8.67, $p < .001$, indicating that there were some significant differences between means. By way of

post hoc analyses, I calculated a series of independent-samples t-tests for three different pairs of means (Control versus LRCA, Control versus ARL, and LRCA versus ARL). The calculations are Control versus LRCA t (30) = 2.05, $p < .05$; Control versus ARL t (31) = 4.14, $p < .001$; and LRCA versus ARL t (33) = 2.17, $p < .05$, which indicate that (a) students in both the LRCA and ARL conditions significantly outperformed those in the Control and (b) students in the ARL condition significantly outperforming those in the LCRA condition.

Questionnaire Data

As a more subjective measure of learning gains, I also gauged students' perceptions of completing either the research proposal, LRCA, or ARL with an anonymous questionnaire that integrated a 5-point Likert rating scale (*not at all effective* = 1 to *highly effective* = 5) with several questions about the respective assignment to which students responded narratively. I asked students to numerically rate the experience of completing the corresponding constructivist assignment in terms of how effectively it (1) encouraged thinking outside the classroom; (2) increased the relevance of social research methods to real-life events; (3) promoted intellectual challenge; (4) stimulated creativity; (5) improved understanding of social research concepts; and (6) heightened personal interest in the subject matter. I also asked students to comment narratively on what they liked best and least about the assignment in question. Moreover, I requested that they indicate if they would recommend that assignment to other students and to provide their suggestions for improving the specified assignment in the future.

I used independent-groups ANOVA (df = 2, 47) to compare student perceptions regarding each of the surveyed items across the three conditions. In all instances, I found statistical significance at $p < .01$ or $p < .001$. The means, standard deviations, and f values for each condition are shown in Table 1.

Insert Table 1 about here

Following the one-way ANOVA calculations, I applied a series of independent-samples t-tests to three different pairs of means (Control versus LRCA, Control versus ARL, and LRCA versus ARL) in order to discover which means differed for each surveyed item. The resultant *t* values show that students rated the LRCA over the research proposal in relation to improving their understanding of social research concepts. However, beyond this statistically significant outcome, I observed no statistical differences between these two conditions on any of the other surveyed items. In contrast, when comparing students' perceptions of the ARL relative to both the research proposal and the LRCA, I found statistical significance for all surveyed measures. The results of all independent group comparisons are summarized in Table 2.

Insert Table 2 about here

Students' narrative comments support their consistently positive numerical ratings of the ARL assignment. Over 95% of participants in the ARL condition indicated that they would recommend this assignment to other students. In response to what students liked best about this assignment, the vast majority stated that it facilitated critical thinking and an appreciation for the practical applications of social research concepts. One student went so far as to declare the ARL as the "best college assignment that I have ever completed." Another student stated that the ARL "showed how important understanding social research can be in gaining a better understanding of the 'comings and goings' of life." As might be expected, a major criticism of this assignment

was the perceived workload associated with its library-research component.

At variance with students' overwhelmingly favorable perceptions of the ARL, students' narrative comments about the LRCA and research proposal were moderately-to-considerably less positive. Only about 35% of students in the LCRA condition indicated that they would recommend this assignment to other students. This number fell to 20% in the Control condition where students completed the research proposal. When asked what they liked best about the LRCA, nearly two-thirds of respondents cited its usefulness in increasing comprehension of the social research process. Nonetheless, over half of the LRCA group criticized this same assignment for its tediousness, and nearly the same number of respondents said that they would not recommend it to other students. Other than a few isolated remarks about its general applicability to learning, students in the Control condition did not voice comments about the most-attractive feature of the research proposal. In fact, 60% of the Control participants suggested eliminating the research proposal assignment in future research-methods classes.

Discussion

Viewed as a whole, the findings of objective testing of learning gains in tandem with analysis of students' perceptions of completing one of the three assignments in question favored both the LRCA and ARL over the research proposal in the broad framework of meeting the academic requirements of a social research methods class. Assessment of learning gains favored the LCRA over the research proposal. Student responses on the attitudinal questionnaire suggest that the underlying value of the LRCA lies in its ability to improve students' understanding of social research concepts when compared to the research proposal. Even so, the LRCA did not compare favorably to the ARL either through student-performance measurement or students' recorded perceptions; nor did it outshine the research proposal on any item assessed within the attitudinal

survey. On the other hand, the ARL assignment surpassed both the LCRA and research proposal in terms of objective measures of knowledge acquisition. Moreover, in contrast to the relatively tepid student perceptions of the LRCA and largely negative perceptions of the research proposal, students viewed the ARL assignment with uniform positivity.

Beyond conclusions drawn from examining students' responses on the attitudinal survey, open speculation can be ventured about why students found a research proposal less gratifying than the other two constructivist assignments explored in the present investigation. Are the performance expectations inherent in a research proposal too steep for most undergraduates to meet successfully? Do undergraduate students view the parameters involved in completing a research proposal as too restrictive in terms of free expression of ideas? Do undergraduates consider a research proposal too hypothetical in the absence of hands-on original research? This final question, in turn, begs follow-up lines of inquiry. For example, is original student research pedagogically justified at the undergraduate level, particularly at institutions where post-graduate study may not be the long-range goal for the majority of students? That possibility considered, is it preferable for undergraduates to take a research *methods* class first (without the overriding expectation of writing a research proposal), and then take a subsequent research *applications* class in which they actually complete a full research project under the watchful eye of the instructor?

Despite the overall evidence in support of the LCRA and ARL assignments relative to a research proposal, tangible differences exist between these two constructivist learning approaches. The LRCA assignment stems from an extensive history of using case-based instruction (CBI) in the undergraduate classroom as a constructivist springboard for developing students' applied reasoning skills (Mayo, 2010). Among the disciplines in which CBI is firmly

entrenched are psychology (Mayo, 2002, 2004a), teacher education (Floyd & Bodur, 2005; Spencer, Freund, & Browne, 2006), business (Pariseau & Kezim, 2007), nursing (Kaddoura, 2011), and science (Camill, 2006). In comparison, the ARL has its roots in the well-established constructivist tradition of narrative journal writing in the undergraduate college classroom (see Mayo, 2010). In the human-services-allied discipline of psychology alone, autobiographical and biographical journaling that incorporates narrative reflections of life experiences has long evidenced a facilitating impact on learning in a variety of classes, including psychology of adjustment (Mayo, 2003a) and introductory (Finke & Davis, 1988; Mayo, 2003b), developmental (Clinchy, 1995; Mayo, 2001), and applied (Grasha, 1998; Mayo, 2004b) psychology.

Consistent with the aims of constructivist teaching and learning, over two decades ago Clinchy (1995) called for undergraduate educators to more seriously entertain students' life narratives in the face of misguided assumptions that such heuristic tools are limited in educational scope and utility and thus do not qualify as valid evidence of learning. The collective results of the present study corroborate Clinchy's recommendation, along with the aforementioned classroom findings on student journaling. In doing so, the current results favor increased use of journaling assignments in research methods classes. Additional research on the pedagogical efficacy of using journaling projects in teaching research methods will help to further clarify and extend the present findings.

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Table 1

A Comparison of Student Perceptions of the Research Proposal (Control), "Live" Research Case Analysis (LRCA), and Applied Research Log (ARL) in Social Research Methods Classes

Questionnaire Item	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*
	Control (n = 15)		LRCA (n = 17)		ARL (n = 18)		
1. Thinking outside classroom	3.67	.62	3.94	.33	4.38	.49	8.973*
2. Increasing real-life relevance	3.51	.55	3.86	.69	4.47	.32	13.620*
3. Providing intellectual challenge	3.55	.98	3.97	.73	4.40	.43	5.551**
4. Stimulating creativity	3.33	.79	3.61	.88	4.26	.57	6.751**
5. Improving understanding	3.48	.36	4.01	.59	4.43	.29	19.692*
6. Heightening personal interest	3.19	1.03	3.44	.62	4.55	.25	19.007*

Note. Questionnaire items are based on a 5-point rating scale ranging from 1 (*not at all effective*) to 5 (*highly effective*). Independent-groups analyses of variance (df = 2, 47) compared student perceptions regarding respective surveyed items in the Control, LRCA, and ARL conditions.

*$p < .001$

**$p < .01$

Table 2

Group Comparisons of Student Perceptions of Learning [Research Proposal (Control) v. "Live" Research Case Analysis (LRCA), Control v. Applied Research Log (ARL), and Control v. ARL]

Questionnaire Item	*df*	*t*	*p*
1. Thinking outside classroom			
Control v. LRCA	30	1.564	.1283
Control v. ARL	31	3.676	.0009*
LRCA v. ARL	33	3.097	.0040*
2. Increasing real-life relevance			
Control v. LRCA	30	1.571	.1265
Control v. ARL	31	6.254	.0001*
LRCA v. ARL	33	3.387	.0018*
3. Providing intellectual challenge			
Control v. LRCA	30	1.385	.1761
Control v. ARL	31	3.323	.0023*
LRCA v. ARL	33	2.138	.0400*
4. Stimulating creativity			
Control v. LRCA	30	0.942	.3538
Control v. ARL	31	3.922	.0005*
LRCA v. ARL	33	2.609	.0136*

5. Improving understanding			
Control v. LRCA	30	3.016	.0052*
Control v. ARL	31	8.400	.0001*
LRCA v. ARL	33	2.697	.0109*
6. Heightening personal interest			
Control v. LRCA	30	0.843	.4057
Control v. ARL	31	5.429	.0001*
LRCA v. ARL	33	7.020	.0001*

Note. The rating scale for the questionnaire used to measure student perceptions is anchored at 1 (*not at all effective*) and 5 (*highly effective*). Independent-samples t-tests compared three different pairs of means (Control v. LRCA, Control v. ARL, and LRCA v. ARL) on each surveyed item.

*S = statistically significant

Co-Teaching Special Education Credential Candidates about Reliability and Validity in a Blended Classroom: A Promising Instructional Practice about Natural Variation and Error

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Abstract

Literacy in data, statistics, and assessments is important for future special educators who need to be able to select, administer, score, interpret, and report results. However, there are multiple barriers to building such skills. Such barriers include math and statistics anxiety, access to trained professionals, and experience with assessment materials. In rural settings, assessment and data literacy for special educators can be an extra challenge when other special education colleagues are not available to assist in assessment, data analysis, or interpretation of results. To address these needs of our future special educators and to overcome barriers of anxiety, access, and experience we employed constructivist-based activities. Using this constructivist approach, we co-taught the concepts of reliability, validity, and variation in a blended classroom. In this descriptive paper, we detail this promising practice, describe the importance of modeling new pedagogical methods for new special educators in rural settings, and share student comments on the approach.

keywords: assessment literacy, constructivist practice, online teaching

Co-Teaching Special Education Credential Candidates about Reliability and Validity in a Blended Classroom: A Promising Instructional Practice about Natural Variation and Error

Introduction

"Assessment and Evaluation in General and Special Education" is a required course at California State University, Chico for credential candidates who seek special education certification in California. The course examines "standardized tests in general and special education; use and interpretation of standardized test results; development and use of teacher-made techniques for assessment; principles of curriculum-based assessment; and consideration of cultural and linguistic diversity factors in assessment" (CSU, Chico). Inherent in this special education course on assessment, and explicitly taught, are the concepts of classroom data collection, assessment validity and reliability, and variation in data. Accordingly, this course is at the intersection of data literacy (Mandiancah & Gummer, 2012, 2013), assessment literacy (Inbar-Lourie, 2013; Stiggins, 1991, 2002; Popham, 2011; Webb, 2002), and ethical decision-making (Messick, 1989). There are three main purposes to this article. First, we wish to highlight the need for effective data literacy instruction in special education teacher preparation. Second, we wish to detail a lesson on data literacy that replaces traditional direct instruction with a constructivist approach. Third, we wish highlight how these approaches can function in co-taught and blended online courses to meet the need of our large, rural region. Originally, the promising practice presented in this essay was neither conceptualized nor implemented as a research study. We simply report how we re-designed the instruction to address a larger need in assessment and special education teacher preparation. Nonetheless, this article contributes to the existing literature on special education teacher training by applying constructivist practices to assessment and data literacy. In this article, we begin by reviewing the challenges of teaching assessment

and data concepts to credential candidates and students in general. Then we provide an explanation of constructivism as an ideal approach to teaching special education credential candidates about assessment and data literacy. Next, we detail a psychological measurement lesson based in constructivism as a promising practice. Subsequently, we relate some feedback from our students about this practice. Finally, we detail some limitations about the practice, and describe implications for potential, future research.

Assessment in Special Education

The ability to read, interpret, and use standardized assessment data is vital to teachers (AFT, 1990; Mandinach & Gummer, 2013; Salvia, Ysseldyke, & Bolt, 2012; Wise, Ehrenberg, Leibbrand, 2010). General classroom teachers tend to view assessment as having two or three general purposes: improving the learning/teaching process, student accountability, and school accountability (Brown, Lake, & Matters, 2011; Remesal, 2011). None of these conceptualizations of assessments specifically recognize the purpose of identifying the special needs of students. For special educators, these abilities must expand to choosing and administering appropriate assessments for their students and making high-stakes decisions based on that data (Mandinach & Gummer, 2013)[1]. This ability is even more relevant to rural special education teachers where collaboration with other special educators is limited or access to a licensed school psychologist is sporadic (Clopton & Knesting, 2006).

In order for these abilities to be sound, teachers and especially special educators must have a solid understanding about basic measurement and statistics principles (McMillan, 2000) and be able to interpret and communicate results (AFT, 1990; Brookhart, 2011). Specifically,

[1] In California, an Educational Specialist Instructional Credential authorizes the holder to conduct education assessment (CCTC, 2015).

teachers must understand somewhat abstract concepts such as validity, reliability, and variation (both natural variation and variation due to error) (Brookhart, 2011). However, research has shown that, in general, students of statistics do not learn what is planned by professors (Garfield, 1995), that implementing these practices in schools of education is difficult (Mandinach, Gummer, & Muller, 2011), and that there is often a mismatch between policy and practice regarding assessment education in teacher preparation programs (DeLuca & Bellara, 2013). Additionally, due to various constraints, assessment courses (including the one detailed in this article) are only one semester long, which may be insufficient to develop appropriate conceptual understanding of data and assessments (DeLuca & Bellara, 2013).[2]

Even though these concepts are vital to assessment administration and interpretation of data, credential candidates have difficulty understanding the technical merits of an assessment--especially sound design (McGee & Colby, 2014). They can have a difficult time understanding how these theoretical and statistical concepts apply to practice. They also have difficulty understanding how variation affects reliability, which in turn affects an assessment's validity. Furthermore, negative attitudes of statistical concepts can get in the way of learning (Nolan, Beran, & Hecker, 2012). These difficulties with learning statistical concepts may be a result of instruction. Although theoretical, mathematical, and statistical concepts are daunting to students, they can still be approachable and comprehensible (Franklin & Garfield, 2006; Aliaga, et. al, 2005; McGee & Colby, 2014). However, in practice, assessment and statistics instruction can be

[2] Although there is research to demonstrate that students do not learn what is expected from statistics instruction, there is notably little research to what extent students learn and understand the basic measurement concepts that underlie statics and assessment. Anecdotally, we note that students can relate to the concepts of reliability (reliable friends), validity (a legitimate argument), and variation, but they do struggle with these concepts as applied to educational assessment or how they relate to each other. This would be an area for future research.

"dry" and lecture based. Hassad (2011) was the first to report on pedagogical approaches in statistics courses. He found that instructors in the United States tend to use more traditional, "behaviorist" approaches to statistics instruction. Unfortunately, it is unknown to what extent professors of special education assessment courses take similar approaches. Hassad noted that instructors in math and engineering were more likely to use traditional methods than were those instructors in behavioral sciences. In semesters prior to implementing the promising practice described below, the course addressed assessment and statistical concepts in a traditional, behavioristic approach. In order to make these concepts comprehensible and applicable, we chose to use a constructivist approach to learning and teaching these concepts (i.e., embedded view: Quinton & Smallbone, 2005; action-oriented: Hart & Bond, 1995) that adhered to guidelines of AFT, NCATE, and GAISE. This constructivist, activity-based approach is important because these approaches can help students understand concepts better than direct instruction alone (Jones, 1991, as cited by Garfield, 1995).

Constructivism

Learning is an active, natural, and social process that results in a relatively permanent change in understanding or behavior. Constructivism is a paradigm of learning that embodies these active, natural, and social processes (Holt-Reynolds, 2000, Perkins, 1999; Philips, 1995). Broadly, constructivism is an umbrella term for several theories that purport that students must build or construct new knowledge upon their existing knowledge through experiences, and instruction must support that building process (Duffy & Cunningham, 1996, p. 171). However, constructivism is not an instructional method; it is a theory or philosophy of learning. Many student-centered instructional/pedagogical methods such as discovery learning and cooperative learning are based on principles of constructivism (Bruner, 1961; Steffe & Gale, 1995; also see

Harris & Graham, 1994). Therefore, constructivism provides a useful framework for teaching credential students about validity, reliability, and variation for several reasons: building knowledge, modeling and experiencing instructional techniques, and promoting a growth mindset.

First, from a constructivist framework, professors/teachers do not want to assume that students have *specific* prior background knowledge or *specific* experiences with the selected statistical and mathematical concepts. However, it can be presumed that students do have some experiences upon which new knowledge can be built. For example, it may be safe to assume that students have implicit statistical knowledge about natural phenomena such as weather patterns or the natural variation in human height. Additionally, it is well known that due to their own experiences, many classroom and pre-service teachers suffer from math anxiety[3] (Harper & Daane, 1998). Constructivist approaches in math pedagogy have helped reduce math anxiety and improved self-efficacy in teachers (Alsup, 2004) and teacher self-efficacy is positively correlated with successful constructivist instruction (Nie, Tan, Liau, Lau, & Chua, 2012).

Second, a constructivist framework is important to pre-service educators and special educators in general. Specifically, new special educators need to have models of instruction that demonstrate understanding of what a student does and does not know prior to instruction. Previous research has shown that teachers who have constructivist philosophies about learning are more likely to utilize student-centered activities in their own classrooms (Hasweh, 1996; Kagan, 1992). Furthermore, pre-service teachers can change to and develop a student-centered constructivist philosophy about learning during their credential (teacher education) coursework

[3] Note: Some researchers indicate that statistics anxiety is a separate, but a related concept (Cruise, Cash, & Bolton 1980). However, as Schacht and Stewart (1990) note, both math anxiety and statistics anxiety evoke the same dreadful feelings regarding mathematical computations.

(Pilitsis & Duncan, 2012). Unfortunately, there is less research on whether adopting these philosophies leads to the same application in special education settings. However, it is known that a constructivist approach to instruction is useful for students with learning disabilities (Ellis, 1997). Additionally, a constructivist approach is of greater benefit when integrated with more behavioral methods of instruction, which are common in special education settings (e.g., modeling, direct instruction) (Steele, 2005). However, in order for candidates to implement constructivist lessons in their own placements/schools, they need to experience such lessons and have models of the practice. Unfortunately, many pre-service educators and candidates in certification programs may not use the principles of constructivism--alone or in combination with traditional behavioral instruction techniques-- because they do not have the knowledge, experience, or resources to do so (Grossman, Smagorinsky, & Valencia, 1999). This is important to note. Pre-service teaching experiences combined with content knowledge constitute what a pre-service teacher brings to his or her classroom (Leko & Brownell, 2011). Beginning teachers have indicated that learning about a methodology or theory is insufficient; they need active opportunities to experience and implement these concepts or techniques (Bishop, Brownell, Klinger, Leko, & Galman, 2010). Thus, it is important for credentialing programs to offer opportunities for pre-service teachers to learn about *and experience* constructivism as it would be applied to a special education setting (Leko & Brownell, 2011).

Third, utilizing a constructivist framework is consistent with modeling a growth mindset for students. A "growth mindset" is a philosophy or belief that individuals can increase their intellectual and other capabilities through various supports and modifications (Dweck, 2006). Conversely, a "fixed mindset" is the idea that intelligence and capabilities are fixed traits. It has been repeatedly demonstrated that students with a growth mindset outperform students who have

fixed mindsets (Dweck, 2008; science: Blackwell, Trzesniewski, & Dweck, 2007; Chemistry: Grant & Dweck, 2003; science: Dar-Nimrod & Heine, 2006; math: Good, Rattan, & Dweck, 2007- via Dweck, 2008). Research also has consistently demonstrated that having a "fixed mindset" negatively impacts teacher attitudes, perceptions, and outcomes for students diagnosed or labeled with a learning disability (Gutshall, 2013; Osterholm, Nash & Kritsonis, 2007). Therefore, a growth mindset is essential in special education. Employing a constructivist framework in combination with a growth mind set can help individuals overcome their fears of math/statistics (Lee & Johnston-Wilder, 2017).

Promising Practice

As indicated in the Introduction, there are three primary purposes of this essay. The first was to highlight the need for effective data literacy instruction for future special education teachers. Given the need to develop assessment/data literacy while simultaneously battling math/stats anxiety in special education credential candidates, there is a need to develop and utilize instructional methods that promote growth, understanding, and success. Additionally, there are documented benefits of utilizing a constructivist approach to building conceptual understanding/knowledge, reducing math anxiety, and promoting a growth mindset. Thus, the second purpose of this article is to detail a lesson that we developed and implemented. The lesson focused on three statistical/psychological measurement concepts that are important to understanding assessment in special education settings. The three concepts were: validity, reliability, and variation.

The Course, Students, and Professors

Course. The two sections of "Assessment and Evaluation in General and Special Education" detailed in this essay and in the following activity were co-taught (Anastasiou &

Kaufman, 2010) at CSU, Chico. The two sections were "blended" into one class such that the credential candidates had the option to participate in the live classroom, participate synchronously online using Blackboard Collaborate (Blackboard, Inc. Washington D.C., 2015, Versions 9.1 SP8/SP13), or participate asynchronously online via the Blackboard Collaborate archive. This flexibility met the needs of our students in our largely rural service region.

Students. Forty-seven credential candidates, who had student teaching placements in a special education setting, enrolled in the course as a program requirement. Typically, 24 students attended the face-to-face session and about 12 students logged-on to participate synchronously, but remotely. The remaining students attended class asynchronously by watching archived video and posting comments to discussion boards. For this and similarly structured blended courses on our campus, seats in online sections are primarily reserved for students placed in remote, rural school settings.

Professors. One of the co-teaching professors has expertise and experience in special education and special education law. The other professor has expertise and experience in assessment and assessment design. Both professors have been recognized locally or regionally for their exemplary online instruction.

The Lesson and Activity

To address the learning needs of our credential candidates and to utilize the teaching and technology resources available, we adapted and synthesized two learning activities (Froman, & Owen, 1990; Garfield, Zieffler, & Lane-Getaz, 2005). The core of the lesson required our credential candidates to build a simple database by collecting and analyzing data in class. We adapted the activity to incorporate the 5 "E"s of constructivism: engage, explore, explain,

elaborate, and evaluate (see Bybee, et al., 2006). Due to space limitations, we feature just one of several constructivist lessons used in the course.

Lesson objectives. The lesson had three main objectives/purposes. 1) Candidates would be able to construct an understanding of validity, reliability, and variation as applied to assessments in education by collecting and comparing real data. 2) Candidates would be able to explain the importance of proper assessment administration to ensure quality data collection. 3) Candidates would experience and reflect on a lesson based in constructivism through course activity and discussion.

Materials. The lesson required a variety of tools for measuring length (i.e., classroom rulers, metal and cloth tape measures, yard sticks, elastic ribbon, string) and access to an online spreadsheet (e.g., Google Spreadsheets). We also created a worksheet to help guide students through the steps of data collection, data recording, and the calculation of basic statistics.

Activity sequence. As indicated above we adopted the 5E Model for this lesson. Thus, the lesson's activity sequence had five sections: engage, explore, explain, elaborate, and evaluate.

Engage. We began the lesson by engaging the class in a general discussion about measurement. To initiate that discussion, we asked specific but open-ended questions pertinent to assessment in special education: "How do we know if a student qualifies for special services? How do we measure students' abilities? How do we know which assessment to use? How do we know if the data are good (of high quality)?" These questions were difficult for students to answer. To facilitate the discussion, we asked students similar questions regarding common measurement tools: "How do we measure length? How do we know which measuring tool to use? How do we know if the measurements are correct?" Our discussion also addressed

concepts of precision and reliability. For example, we asked students to indicate which tool would best for measuring a variety of objects and *how* did they make that decision. This brief discussion lead to the main activity of the lesson: collecting data from two sources using a variety of tools.

Explore. Next, the students explored the nature of quality data collection by actually collecting data. In this version of the activity (based on Garfield et al., 2005), we told the students that we were interested in finding the average head circumference of the class. We also indicated that we wanted to determine whether the head of one of the professors was average. So, we instructed the students to collect data on head circumference. Specifically, we had each student measure both the circumference of their own head and the head of a professor. (One professor was selected for head measurements while the other facilitated the course by monitoring progress and answering questions.) There were a variety of measuring tools available in the classroom (i.e., inflexible ruler, flexible ruler, measuring tape, elastic ribbon, and string), but each student only had one measuring tool to use to collect data. It is important to note that prior to data collection neither the professors prescribed nor did the students instigate a standard procedure for measuring head circumference. This ambiguity in procedure was by design and will be discussed later. Students were then asked to record both the size of their own head and the head of the professor in the online spreadsheet.

In this blended online classroom, mounted classroom cameras video recorded the measurements made by in-person students. So, both synchronous and asynchronous online students were also able to measure vicariously the head circumference of the professor. Online students also collected and recorded data on their own heads. To be sensitive to the needs of rural students (Koch, 2007) all materials (i.e., activity handouts, PowerPoint handouts, data sets, etc.)

were posted online in advance of the class meeting. By the end of the data collection, we had about 36 different observations about the one professor's head circumference. We also had 36 different observations for the different student head circumferences —one observation for each student.

Explain. After collecting data, we instructed the students to explain the communal data set. Specifically, using the shared online spreadsheet and a set of guiding questions, students were expected to describe and graph the distribution of the data set (shape, center, and spread) on the two variables of interest: the professor's head circumference and the students' head circumference. The students also calculated basic statistics (mean, median, mode, and standard deviation). Many students quickly realized that their values for both variables varied, but varied in different ways (i.e., the standard deviation for the professor's head was smaller than the standard deviation for the students' heads). At this point, both the professors circulated around the classroom and guided student thinking through questions and elaborations (i.e., "Why do you think there is variation in the students' head sizes? Why do you think there is variation in the head sizes for the professor? Did the professor's head actually change sizes? Why do you think the standard deviation for students' heads is larger? Why is *that* the right answer [regarding differences in variation]?"). These questions were purposefully ambiguous. We wanted to determine whether students could differentiate between "true" variation from variation due to measurement procedures and error. Specifically, using a think, pair, share technique, the students were expected to explain why there was variation for both variables and elaborate on how the variation was different between the two variables.

*Variation due to error***.** Students determined through calculations and class discussion that their measurements for the professor's head should be the same for every data point (given

the professor only has one head and that is unlikely to change sizes). However, their measurements were in fact not the same. They also identified reasons why the measurements were different--even though they should be the same. For example, students indicated that 1) the tools used to measure the professor's head were different, 2) the procedures for measuring the head (i.e., location around the head) were different, 3) the unit of measurement was different (i.e., some used metric, others used standard), and 4) the level of precision was different (i.e., rounded to the nearest centimeter or half centimeter). These discoveries and revelations lead to a discussion regarding the importance of using appropriate/valid instruments to measure student ability and following the protocols described for reliable test administration.

Natural variation. Students also expressed that data can vary naturally (i.e., head size varies naturally due to genetics). Students were able to explain that most variation in students' head circumference was due to natural variation. Students also articulated the need to know the difference between natural variation and variation due to error. As noted above, the students were not expected to nor asked to use a standardized method of measuring head circumference (i.e., above the ears, above the eye brow, etc.).

Elaborate. Next, there was a follow-up discussion of the activity. The discussion occurred both live, in-person and via discussion boards for asynchronous students. This discussion allowed the students and professors to elaborate on the process, findings, and conclusions. Specifically, students were able to connect reliable data collection to the validity of a measure. For example, students were able to determine that without a standardized administration process, it would be impossible to determine whether variation occurred due to nature or due to error. Consequently, credential candidates deepened their understanding for standardization in assessment administration. Students were able to evaluate the quality of the

data and the interpretation of the analysis based on their data-collection procedures. Together the professors led a conversation about the necessity of quality data and how various assessment tools in special education require different methods in measurement. The professors coupled this discussion on measures, data collection, and interpretation to psychological measures used in special education.

Evaluate. Finally, at this point in the course, the credential candidates began training to administer commercially available assessments such as the Woodcock-Johnson III (Woodcock, McGrew, & Mather, 2001) or Brigance Inventory of Early Development III (Brigance, 2004; French, 2013). Consequently, one of the main evaluations of student learning in this course is based on the selection and administration of one of the aforementioned assessments under the supervision of a cooperating teacher in a school setting.

Student Feedback

Although this article merely presents a promising practice and is not intended to be a research study, we felt that it was important to provide student feedback to help us evaluate this application of a constructivist approach to data literacy in a co-taught, blended course. Student feedback on the course was provided via student evaluations of teaching (SETs). At our university SETs are collected every semester. No items on the surveys were designed specifically for this article on constructivist approaches in co-taught blended course. Therefore, this feedback reflects the unprompted responses of students regarding the concepts addressed in this article. SETs were reviewed from semesters prior to and after implementation of constructivist activities. In semesters prior to the implementation of constructivist activities and co-teaching in a blended learning setting, SETs indicated that the professors knew the course content but that "assessment is a somewhat boring subject. Pep it up somehow." Another student actually

suggested “more hands-on activities.” Students also indicated a desire for more class time on content.

After the implementation of the constructivist activities, SETs indicated positive changes to course engagement. Many students acknowledged that the professors were “well-prepared” and “very knowledgeable” about the content. Students also stated that constructivist instruction and activities “encouraged deeper thinking and learning” and “collaborating.” Several students indicated that such collaboration activities were “great,” “hands on,” and “model(ed) good teaching practices.” The process was “interesting and relevant” and one student indicated that he/she “felt a part of the class, even though (he/she) took the course online.” An additional student indicated that the process was “vital to (her/his) understanding of complex ideas presented in the textbook.” Most importantly, students realized that the activities “makes (them) think about our answers even if they are right.” The minimal negative feedback about the course was specific to the blended nature of the course and unrelated to the constructivist approach.

Conclusions and Limitations

Special education credential candidates need to have a strong understanding of assessment and data literacy. They need this strong understanding in order to select appropriate assessments, collect quality data, and make high-stakes decisions. However, there are clear challenges to helping special education credential candidates develop that strong understanding of assessment and data concepts. Specifically, credential candidates need assistance in overcoming math/statistics anxiety (e.g., Harper & Daane, 1998). A constructivist approach can ameliorate those issues by making the content relevant, personal, and hands-on (Alsup, 2004; Ellis, 1997; Leko & Brownell, 2011; Nie, et al., 2012). A constructivist approach is just as important for instructors as it is for students. Instructors who use a constructivist approach to

instruction need to know their students and adjust teaching/content to the students' level and ability. Although this approach can take additional time, it can help promote a growth mindset (e.g., Lee & Johnston-Wilder, 2017).

This promising practice demonstrates that using a constructivist approach to data and assessment literacy in a co-taught, blended course is possible. However, there are additional challenges when instruction is asynchronous and remote. When instruction is asynchronous and remote, it is difficult to assess in real time what a student knows and how to modify instruction to meet the student's level/ability. When instruction is asynchronous, there is a delay between a student's question and an instructor's response. That delay can lead to a student feeling frustration with a course or with course content. Conversely, when asynchronous communication is prompt it can lead to more individualized instruction and feedback.

Historically, statistics and assessment courses are content-centered and lecture-based. However, it appears that professors of statistics are likely to embrace "reform" methods once they are exposed to and have experienced them, but many have not been exposed to these methods (Hassad, 2011; Zieffler, Park, Garfield, delMas, & Bjornsdottir, 2012). Similarly, professors "teach the way they were taught" (Oleson & Hora, 2014). Utilizing those methods can limit learning, understanding, learning attitudes, and concept retention (e.g., Bulstrode, Gallagher, Pilling, Furniss, & Proctor, 2003; McManus, Dunn, & Denig, 2003). [This is not to say that professional educators do not use better methods that are constructivist. Unfortunately, there is little data on the approaches they do use—especially regarding assessment and data literacy.] More pertinently, without training, a classroom teacher's own personal experience in elementary and secondary schools influences instructional and assessment practice (Richardson, 1996; Siegel & Wissehr, 2011). Therefore, it is important to expose teaching credential

candidates to new, constructivist pedagogical methods regarding data and assessments—even if the approach needs to be asynchronous.

Given the limitations of the lesson presented in this article and the lack of solid data on current teaching practices regarding assessment in special education teacher preparation, there are several suggestions for future research. First, there is a need for the field to have a baseline account of the current practices of special educator preparation regarding statistics and assessment. Second, it would also be useful to know what special education teacher candidates know about basic measurement before and after their training. Third, an experimental or quasi-experimental design using the detailed practices in this article could help determine the extent to which constructivist practices reduce statistic and math anxiety in special education teacher candidates. Fourth, such a study could also determine the extent to which constructivist approaches affect mindset in special educators. Finally, given the need of special education teacher candidates to see *and experience* models of constructivist practices, future studies should examine how well experiences in teacher preparation program lead to transfer in a teacher candidate's future classroom.

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Teaching Pre Service Teachers about Close Reading through Constructivist Practices

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Abstract

Pre-service teachers frequently enter teaching from a traditional educational background where textbook reading, lecture, notetaking, and tests were the primary methods used for teaching and learning. While these approaches might have worked for them, such limited pedagogical practices will not suffice for their students whose learning styles will require more active engagement. Constructivist teaching approaches, where the focus is on the learner, students control their own learning process, knowledge is seen as dynamic, and process is as important as product, are much more conducive to learning. In order for pre-service teachers to embrace constructivist teaching practices they first need to experience constructivist learning through the perspective of student. Two teaching and learning approaches that model constructivist philosophy are the use of sticky notes for reading, and silent reading discussion. While both of these practices are relatively simple, they are each powerful facilitators of learning. Once pre-service teachers have experienced the effectiveness of constructivist practices, they are ready to apply constructivist principles to their own students.

Teaching Pre Service Teachers about Close Reading through Constructivist Practices

I stumbled into Constructivist teaching and learning during my early years as an educator while teaching a high school Social Problems class. There was neither text for the class, nor resources from previous classes. As a new teacher, I leapt into action, gathering material, creating lessons and activities, making decisions about what was important for the students to learn. I was energized; a great deal of learning was occurring: all by me. After a few short weeks, I had an epiphany: "The Person Who Does the Work is the Person Who Does the Learning". Since I was doing all the work and making all of the decisions, I was doing all of the learning. Students did what they were required to, took tests, and moved on without any investment in the learning process or the material.

Knowing that something had to change, I asked myself what I wanted learning to look like in my classroom. Aspects I deemed important were that learning should be active, collaborative, inquiry based, and reflective. Delving into learning theories, I discovered that constructivist teaching and learning philosophy exemplified my goals and objectives: focus is on the learner, students control their own learning process, knowledge is seen as dynamic, and process is as important as product. I found a philosophical home.

Constructivism is a theory of learning which emerged from the teachings of such progressive educators as John Dewey, Piaget, Vygotsky, and Bruner. While there are different types of constructivism, such as Cognitive (arising from Piaget's work) and Social (growing out of Vygotsky's research), for the purposes of this paper a general description of constructivism will be used: "an epistemological view of knowledge acquisition emphasizing knowledge

construction rather than knowledge transmission and the recording of information conveyed by others." (Applefield, 2001, p. 37).

Preservice Teachers

Transferring my enthusiasm for constructivist teaching and learning practices to preservice teachers required, of course, teaching about constructivist practices through constructivist teaching practices. I chose the following constructivist principles of learning as focus points for my lessons:

- Constructivist learning is an active process that results from exploration and inquiry where learners link previous information with new ideas to construct new knowledge and understanding.
- Constructivist learning is a process of discovery strengthened through authentic experiences.
- Constructivist learning is contextual, requiring relevancy to learners' lives.
- Constructivist learning is a social activity facilitated by shared inquiry, collaboration, and cooperation. (Alesandrini, 2002; Applefield, 2001)

For many of my students, this was the first time they encountered nontraditional teaching methods. Preservice teachers often come to teaching from a traditional background where lecture, notetaking, and tests were all they knew of the process of learning. My primary interaction with pre-service teachers occurs in courses dedicated to teaching literacy across disciplines. This situates all students who are going to teach grades six through twelve in the same courses. With math, science, art, world language, history, and English students learning

and working together, it is an advantageous mix receptive to learning new approaches to teaching.

Guiding pre-service teachers, who tend to find their own content area fascinating and uncomplicated, through the process of facilitating their own students' literacy in a given discipline requires shepherding them through the complexities involved in comprehension of text. No matter the content area, students must be able to investigate the meaning of text, determine what the text says explicitly, discern central ideas and themes, make inferences, analyze interaction and development of ideas and individuals, and assess how point of view and perspective shape a text.

In order to accomplish the deep comprehension entailed in these skills, students need to know how to read a text closely (Boyles, 2013; Fisher D. , 2013). The task I set for myself was to facilitate pre-service teachers' understanding of close reading through a constructivist approach.

Close Reading

A key element in the College and Career Readiness Anchor Standards that is important for and applicable to all content areas is close reading. While not explicitly mentioned in any of the Reading Standards for Literacy in all subjects 6-12 (Wisconsin Department of Public Instruction, 2011), a careful inspection of these standards reveals the necessity for students to thoroughly engage with the text in order to examine the meaning, provide textual evidence to support analysis, and analyze the author's choices of vocabulary and textual structure.

The Partnership for Assessment of Readiness for College and Careers (PARCC) describes close reading in these terms:

> Close, analytic reading stresses engaging with a text of sufficient complexity directly and examining its meaning thoroughly and methodically, encouraging

> students to read and reread deliberately. Directing student attention on the text itself empowers students to understand the central ideas and key supporting details. It also enables students to reflect on the meanings of individual words and sentences; the order in which sentences unfold; and the development of ideas over the course of the text, which ultimately leads students to arrive at an understanding of the text as a whole. (2012, p. 2)

Simply reading a text multiple times, does not constitute, nor necessarily generate, close reading. As Brown and Kappas (2012) point out, "Close reading is an instructional strategy that provides modeling and guided practice of the skills and strategies needed to independently read increasingly complex text and apply newly acquired knowledge in text-based demonstrations of deep understanding" (p. 9). Students need to work with the content, approaching it from various perspectives and with distinct objectives. For example, the first time a student reads a text it might be from the perspective of looking for connections the reader can make to the text. The second time a reader approaches the text, it might be from the perspective of responding to questions posed by the teacher, questions generated from the first reading, or ideas that came out of a small group discussion.

Selecting the Text. The first decision when embarking on teaching students the art and craft of close reading is where to start. The answer resides in the text itself. According to Brown and Kappas, teachers need to know "when and how to make use of Close Reading in strengthening students' reading, furthering students' independence, and deepening their reading comprehension" (2012, p. 2). Not all text or reading assignments are appropriate for close reading. Text suitable for close reading should provide students with complex material wherein they can read analytically, thoroughly, and methodically. For students in my Literacy in Content

Areas courses I have used a variety of texts including: *Too dumb for complex texts?* (Bauerlein, 2011) and *If you teach – you teach reading* (Spencer, 2008). Both of these texts stimulate students' to ask questions, discuss openly with their peers, and evaluate their understanding of what they read.

Student Ownership. Motivation, engagement, and relevance are fundamental to students' learning (Guthrie, 2007). Assignments where students have some control over their learning are more valuable experiences than assignments where students feel that they are expected to find the one right answer. When students are allowed to analyze a text and determine what is meaningful, it increases their engagement with the material, strengthens their motivation to succeed, and encourages them to take ownership of their reading (Paul & Elder, 2006).

Discussion, with a peer or in small groups, where both speaking and listening are essential can be a significant element to the process of close reading. Talking with peers improves students' engagement with text (Cazden, 1988; Fall, 2000). As students share their findings from multiple readings, analyze one another's observations, and return to the text for clarification and confirmation, they are reinforcing their understanding and enhancing their comprehension skills.

Evidence. A final consideration of any assignment is what the students are to do with the knowledge and understanding they have just gained. While a standard test might satisfy a teacher's need to determine what students learned, that is not a satisfactory method for the effort students have put in to a close reading assignment. Therefore, consideration should be given for students to demonstrate what they have learned beyond a paper and pencil exam. Possible alternatives include a poster presentation, a five or six slide PowerPoint, or a Wiki page. Not

only do these options provide a means for students to demonstrate their understanding, they also provide a venue for sharing their knowledge with peers and individuals beyond the classroom.

Constructivist Approaches to Instruction That Promote Close Reading

The teaching strategies presented below are constructivist in nature, conducive for close reading of text, and have the following features in common:

- Students are active inquirers engaged in making meaning through authentic learning experiences.
- Students make the determination regarding what is meaningful in the text by connecting to previous knowledge as well as their own lives.
- Students actively explore new ideas through inquiry on their own and through collaboration and cooperation with their peers.
- Students enter the text on multiple occasions with different perspectives or goals in mind during each reading.

Sticky notes. Close reading requires that students slow down their reading, paying close attention to the text, and that they go back into the text to refine their understanding. Easing students into this process can be accomplished through a variety of methods. A seemingly simple yet effective tool to accomplish this goal involves the use of sticky notes. Assigning students the task of locating pieces of text that resonate with them has a two-fold objective: giving students a purpose for their reading and providing them with a way to make connections with the text.

One technique is to have students locate the following: something about which they have a question, an area where they make a connection (text to text, text to self, or text to world), a third piece of text that is a surprise (meaning it was something they did not know before), and a

final piece of text upon which they want to make a comment or observation. Students are to write just enough on each sticky note to jog their memory along with the page number from the text.

Observing the gradual release of responsibility model, teachers need to demonstrate what they expect from the students by first reading a short passage of text and pausing to point out a place where the teacher might have a question, a connection, a surprise, or observation. Continuing to read, the teacher may ask the students to indicate when they have something to share by raising their hands. After students are ready to share, the teacher can either have students share with a partner or with the whole class being sure to remind the students to indicate the specific part of the text with which they are connecting.

Part two of this strategy involves discussion. Students are placed in carefully selected small groups to discuss their findings with one another. Referring to their notes, students revisit and analyze the text supporting their conclusions with textual evidence. Depending on the teacher's goals there are several ways for students to manage the discussion. If the most appropriate approach is chronological, students can work through the text pausing for discussion at each point where one of them has a sticky note. If the teacher is more interested in students analyzing the text, students may start by each sharing their questions, working their other notes into the discussion as appropriate. If the teacher's goal is to be sure all students have an equal voice in the discussion, students can take turns choosing which of their sticky notes to share. No matter what approach is used to generate discussion, the students will be learning to analyze the text to determine what it says explicitly, to make inferences based on their own and other's observations, and to use text to support conclusions.

By circulating while students are discussing, the teacher will be able to determine how well students are comprehending, what issues seem to be of importance to them, and what

questions need to be addressed. The teacher can use this information to make a decision regarding the next step. Possibilities include a whole class discussion where each group contributes main ideas, further readings to supplement the class' knowledge, a written assignment as an individual assessment, or students could create a visual representation of their understanding either individually or in small groups. After students are comfortable with this approach, sticky notes can be used as homework in preparation for discussion the next day.

The effects from using this strategy are manifold. Students enter text with a purpose, they gain experience in citing text to support their conclusions, they practice the skills of speaking and listening, and they make connections to what they are reading. Other benefits of using sticky notes for discussion are that all students are prepared and every student participates, thus eliminating the situation where the same handful of students dominates discussions.

I routinely assign sticky notes for readings, particularly if I plan on having students discuss in small groups. In the Children's Literature Course I teach, students created six sticky notes for a chapter in their text on Traditional Literature. Placed in groups of four, students shared their questions, connections, surprises, and observations while I roamed the room listening to their conversations and jotting down questions and interesting comments. At the end of their discussion, each group created a poster representing what they viewed as the key ideas they took from the reading and the discussion. They shared the posters and conducted a question and answer period for each poster. The final evaluation was a two page paper focusing on an aspect of traditional literature they believed pertained to themselves as future teachers. In their responses, students demonstrated their understanding of the history of traditional literature and provided ideas for how they would incorporate these selections in their teaching.

Pre-service teachers responded enthusiastically to sticky note assignments. When a reading assignment was given without the sticky note task, students asked that sticky notes be assigned. Their reasoning was that with sticky notes everyone was prepared and that their discussions were richer and more detailed.

The approach of using sticky notes to guide student learning epitomizes aspects of constructivist learning in that students are in charge of the learning process. They are actively involved in constructing their own understanding by connecting previous knowledge and experiences to new information. Shared inquiry, collaboration, and cooperation reinforce the process of discovery as students exchange ideas and perspectives with one another.

Silent conversation. Not all discussions about text need to be spoken. There are several versions of silent conversations that encourage students to share their thoughts with one another while also supporting productive textual analysis. The rules for silent discussions are simple: no talking and everyone must contribute. Silent conversation on big paper is an especially fruitful tactic. For this approach the teacher selects several pieces of text rich in thought provoking ideas and powerful vocabulary securing each piece of text on large sheets of paper. It is necessary to have several sets of the chosen texts so that students can work in small groups consisting of three or four pairs. Students in each group need to have different colored writing implements so that their comments can be distinguished from one another's.

For round one, students start out in pairs at one of the large sheets of paper. Each silently reads the text and then makes observations in writing about the content of the text. Students can comment, ask questions, make connections, etc. They can underline parts of the text they refer to or draw lines to the text. They are encouraged to respond to each other's writing, as long as they remain silent. The teacher determines a set amount of time for each round. When there is about

one minute left, the teacher tells the students to complete what they are writing and prepare to move to the next paper within their group.

For the second round, the students read the text and the comments left by the previous students. They then add their thoughts on both the text and the other students' comments. This continues until each pair has returned to the text on which they started. After reading all of the comments left by other students, each group gets together to speak to one another about the text and the experience. The teacher may then choose to conduct a whole group conversation or have the students do a "wall walk" where they look at the other groups' work before creating individual responses. The response can take many forms such as an essay, a poem, a letter, or a drawing.

This type of conversation can lead to multifaceted and multilayered observations as students read and comment on one another's thoughts. Students who might normally sit back and not participate may find this form of discussion less intimidating. As each person has the opportunity to respond to other's remarks, ideas flow and new perspectives are generated.

Figures 1 & 2 provide examples of the flow of pre-service teachers' thoughts regarding text focused on education as they practiced this strategy before student teaching. What might have been an ordinary reading assignment given perfunctory attention, became instead a lively interactive experience that enriched the participants beyond a solitary reading of the text. The lesson's purpose was two-fold: to focus the students' attention on educational issues while experiencing the power of silent conversation in preparation for working with their own students.

When the pre-service teachers were asked about their experiences with the silent conversation strategy, they replied that they would never have gotten so much out of the readings on their own. Several students admitted that had the readings been assigned as homework they

would have skimmed each piece without understanding the complexity involved in the writings. Indeed, the conversations continued as students left the classroom and ideas were revisited during subsequent class periods.

Silent reading exemplifies constructivist principles throughout the assignment. Students are actively engaged in constructing their own interpretations of the readings by making connections to previous knowledge and experiences. They are also involved in recording their thoughts and ideas for their peers to read and respond to while remaining verbally silent. After examining others' perspectives, students engage in open conversation with one another as they continue to refine their understandings of the readings.

Pre-service Teachers Teaching

After a few weeks of participating in constructivist teaching and learning practices from the standpoint of student, it was time for pre-service teachers to take on the responsibility of teaching. Their assignment was to teach a lesson in their discipline that incorporated literacy skills. While it was not mandatory that they teach from a constructivist perspective, the pre-service teachers invariably chose to draw on constructivist approaches when they were teaching. Their lessons emphasized the process of learning and reinforced the importance of collaborative inquiry based discovery. Consequently, the students were actively engaged and in control of their own learning, thus, reinforcing constructivist philosophy and strengthening students' appreciating for constructivist teaching and learning.

One of the students, who will be certified to teach History, chose a form of silent conversation for her lesson using political cartoons and quotes dealing with the period of reconstruction after the U. S. Civil War. After a brief introduction, she divided the students into

four teams with each team containing three groups having two students in each group (a total of 24 students). After explaining the process, she set them around the room to silently puzzle out and analyze the cartoons and quotes. Each team moved from one poster to the next reading and adding their ideas. Once each team had completed the silent part of the lesson, they were allowed to speak to each other within their teams before the conversation was opened up to the entire class so that all could share their understandings. This resulted in rich conversations populated with such phrases as “I did not know”, “What did you mean when you wrote?”, and “what made you think that?”. Several of the students in this class are also seeking certification in History. These students responded with surprise and delight that such an engaging lesson could engender new knowledge and understanding about a topic they thought they already knew.

Conclusion

The way to prepare pre-service teachers to employ constructivist teaching approaches in their own practices is by teaching them through such approaches. By experiencing the effectiveness of constructivist teaching, the efficacy of such methods will become discernably evident. By demonstrating how two constructivist approaches, sticky notes and silent conversations, can facilitate the challenging process of teaching students the art of close reading, pre-service teachers will be more apt to make constructivist methods a prominent part of their own teaching.

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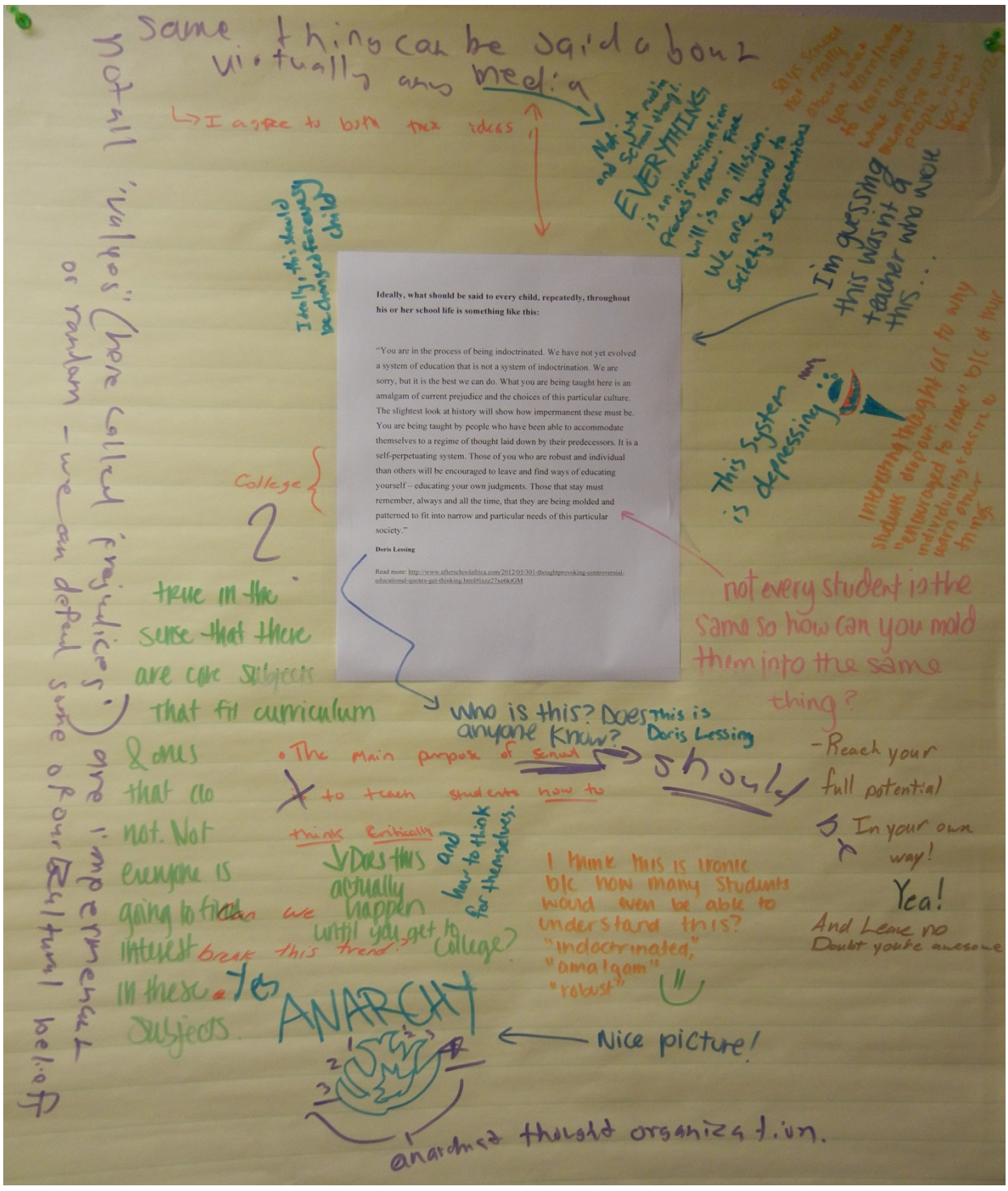

Figure 1: Silent Conversation

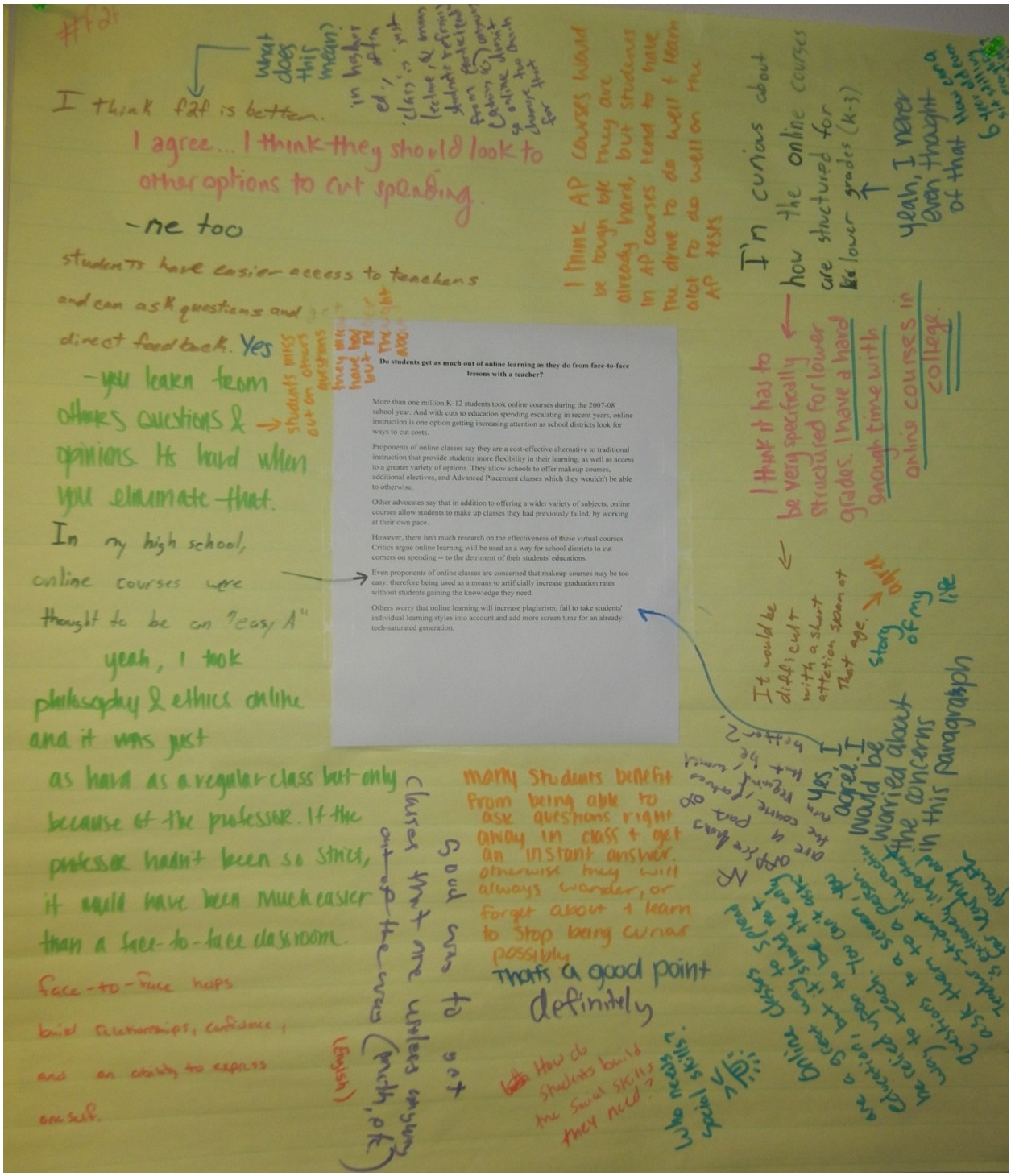

Figure 2: Silent Conversation

Constructing Historical Understandings through Creative Writing

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Abstract

In this study, preservice teachers applied principles of Constructivist teaching to extend their own professional development and their own understanding of history while preparing instructional materials for primary grade children. Teachers use historical fiction in their classrooms to engage students in subject area content, especially social studies content that would otherwise be difficult for their young learners to grasp. Using stories about children struggling with challenges situated in historical settings provides an opportunity for teachers to expose students to a lot of important information about historical events, however, this approach is used less often with adult learners. While conducting action research to identify ways to engage primary grade children, these preservice teachers discovered ways that they can make history and other content relevant to their future students and increased their own content knowledge of historically significant events and people.

Keywords: history, elementary education, historical fiction, Constructivist approach

Constructing Historical Understandings through Creative Writing

Social studies teachers in all grade levels use historical fiction in their classrooms to engage students in content. Reading and listening to stories about children with whom the students can identify can help them to comprehend difficult concepts. Stories about youngsters struggling with challenges situated in historical settings provide an opportunity for teachers to expose students to a lot of important information about historical events and encourages students to create their own understandings that are relevant to them in unique ways. As a former primary grade teacher, I understood that situating an engaging story in a historical context helps elementary students connect what happened in the past to aspects of their own lives. It seemed plausible, given the positive effect of Constructivist methods that Lord (1997) found with college students, that this approach would work well with my pre-service teachers who needed a deeper connection to the social studies content knowledge in order to become effective inclusive early childhood teachers prepared to work with all children ages birth through grade three. Their task was to write a short historical fiction text to help young children understand a historical event or important person. My intention was to model how to support learners to build their own understandings of the content while addressing the need for these for the teacher candidates to increase their content knowledge of history.

Introduction

This study examines the effectiveness of this creative writing assignment on helping these future teachers extend their own understanding about history and the social sciences and about teaching young children and learning. A Constructivist approach (Pelech & Pieper, 2010) was used throughout the social studies methods course. Preservice teachers were actively

involved in the process of gathering information about historically significant people and events and then in working to make this content meaningful to preschool or primary grade children. Each college student wrote an original story designed to meet the needs of real children, while seeking support from classroom teachers and university faculty and reflecting on their own processes and products.

A mixed-methods approach was used to identify learning gains of these future teachers. Quantitative data include a retrospective pre- post-test and qualitative data include focus group responses and content analysis of the teacher candidates' work. Gains were reported in their own understanding of historical events and in their ability to identify issues that teachers must consider before implementing a similar approach for making history relevant to young students in their future classrooms.

Procedure

First, I briefly describe some of the methods used in our university laboratory classroom to guide our future teachers to help young children to construct their own understandings of concepts in the history, geography, economics, and civics strands of social science. Then I explain how I supported these future teachers in applying some of the principles of the Constructivist approach while they created original historical fiction to engage young children in learning about past events. Finally, the results of the study and issues that need to be considered before using this approach with preservice teachers or children are discussed.

The Constructivist Approach of the Course and the Writing Assignment

The course, Instructional Practices in Social Studies for Young Children, is a required course for Inclusive Early Childhood Education teacher candidates. Offered in the fourth year of a five year pre-professional teaching program, the course objectives include providing future

teachers with opportunities to explore and practice various pedagogical approaches in the social sciences. The Constructivist approach of the methods course, wherein students are actively engaged in the process of making meaning from their own experiences (Brooks & Brooks, 1993), both with children and with the content, is a key component of the success of the teacher preparation program. Candidates learn first-hand how using real materials and providing rich experiences support young who are children constructing their own understandings of the world around them. It is important to mention here that this methods course is not specifically intended to teach candidates the social studies content. Candidates are concurrently enrolled in coursework for their content major, interdisciplinary studies, wherein they take courses in history, science, math, and the humanities. Likewise, those content courses are not designed particularly for preparing early childhood teachers, and the instructors primarily focus on the content of their particular discipline rather than on pedagogy. Program candidates have some flexibility in their selection of specific content major courses and consequently come to the social studies methods course with various levels of background knowledge in the social sciences. Some candidates have a strong background in United States history, while other candidates meet only minimal requirements in this content area. This inconsistent level of content knowledge was evident to me through discussions and informal formative assessments and precipitated the creation of the assignment that is the focus of this study. As a Constructivist teacher myself, I reflected on some of the foundational questions provided by Wiggins and McTighe (2006). What do these candidates need? What's working? What authentic experiences can I provide? I recognized that my methods class could be the environment wherein the candidates could create a greater understanding of history by delving into their area of need while developing learning experiences for the young children. To realize this goal, I generated a

topic list for this creative writing assignment intentionally aligned with the state learning standards, Virginia Department of Education Standards of Learning (SOL) (2009) for primary grades or Virginia Foundation Blocks for Early Learning (2013) for preschool, thus giving the candidates opportunities to explore certain content that they are responsible for teaching in early childhood classrooms in this state. While I described the assignment and presented the topics early in the semester, the final writing assignment was due until the end of the semester. There were several other small assignments that candidates completed in the interim that supported this final project.

The course. During the first few weeks of class, we explored how to prepare engaging learning environments for young children. Candidates conducted a type of action research, observing children in their early childhood field placements and noting the topics of the children's conversations, misconceptions that the children held, and the materials that were appealing to them. This information provided the core knowledge they needed to understand the needs of the young children. This core knowledge is essential to the Constructivist teacher. A little later in the semester, the future teachers designed activities for children and shared them with their classmates, an approach that I refer to as a "clinical experience" for the pre-service teachers. They led their peers in the activities that could be used with young children. The university students created 3-D maps with blocks in the block area, exchanged salt and gold in a dramatization of a market in ancient Mali, and voted on issues in mock elections. Each workshop and lesson presentation included a reflective component during which time the candidates provided the lesson presenter with feedback and made connections between what they did, what content they learned, and how these experiences would support young children's constructions of history and of their physical and social environment. The interactions with raw

materials and critical reflections are central pedagogical Constructivist learning theory methods (Brooks & Brooks, 1993).

The creative writing assignment. For this assignment, these future teachers were asked to create works of historical fiction to engage the young learners in their K-3 field placement classrooms. To introduce the assignment, we first discussed some of the concepts that they and children could learn by reading fiction. Some of the examples mentioned by my all-female class included *Little House on the Prairie* by Laura Ingalls Wilder *and Anne of Green Gables* by L. M. Montgomery. We discussed how through these stories, children learn about life long ago. They shared that in their field placements, all in public school classrooms grades preschool through third grade, cooperating teachers were reading fun, historical fiction about George Washington and Martin Luther King, Jr. We discussed what made the stories work. They identified two important characteristics, a character that was close to the same age as the children and colorful and interesting illustrations. Next, I created a list of important historical events, based on the state standards for the primary grades in which our candidates would be licensed to teach. Each candidate selected a topic for their writing assignment. Table 1 provides a list of topics from which the candidates could select. A wild card option was also available for candidates who wanted to write about a person or event not on the list.

[INSERT TABLE 1 ABOUT HERE]

The instructions to the candidates were to write a short, fictional story based on the topic that they selected. They were to consider the components of developmentally appropriate practice (Bredekamp & Copple, 2009) for children with whom they would share their story. Essentially, the preservice teachers were to make sure that the story was engaging, contained accurate historical content, and connected in some way to children's

real life experiences. After writing their story, they were required to share their story with their cooperating teacher, get feedback, and make changes as appropriate. After having the story reviewed by an experienced teacher, the future teachers shared their stories with children. They could read their story to a whole group or a small group of primary grade students. After reading the story, students completed a reflective paper sharing what they learned about children, teaching, and themselves as a professional. The reflection also asked the preservice teachers to explain how they might change the story if they were to share it again.

On the due date, along with the story and their reflections, candidates submitted a short pedagogical statement. The statement included: the historical event or person's name and the purpose or learning objective of the story; the intended age group and how the candidate considered the audience's previous experience, age, and development when writing the story; how they used feedback from the cooperating classroom teacher and peers; connections to the state standards and the related National Council for Social Studies themes; how other content areas such as language arts, math, science, art, and music, are related; how the story would fit into a sequence of instruction (e.g. engagement, exploration, extension, expression); and a set of between five and ten open-ended questions at various comprehension levels to guide children through a discussion of the story and to encourage higher level thinking skills. The assignment was scored using the rubric found in Appendix B.

Results

Each pre-service teacher candidate submitted an original story about a historically significant event or person and a companion paper with the required components. Stories varied in length and included several types of images. The assignment required at least one image to accompany the story, which was intended to be read aloud. Some authors created elaborate illustrations, some drew simple stick figures, and others used photographs that they found on websites or resource books. About half of the authors presented their story in a paper book format, with a few lines of printed text and an image on each page. Others had their story typed on a single page, on a series of PowerPoint slides, or posted as a video on the web. The stories were wonderfully creative. Some authors used attention-grabbing strategies to engage students such as stepping into a time travel machine to go back in time to meet Helen Keller, meeting a visitor from another planet who was asking about earthly events, and falling asleep on the school bus and dreaming about touring Mt. Vernon and talking with George Washington. The authors took care to check facts, even when they were already familiar with the historical event or person about whom they were writing.

The discussion questions generated by the authors demonstrated that they were able to apply what they experienced in the university classroom setting to their own teaching in the field. When I modeled strategies that teachers use to establish a Constructivist learning environment, I would routinely started our class discussions with divergent questions such as, “How could you make this lesson more inclusive for all learners?” or “How can you help young children understand that George Washington and Abraham Lincoln were not contemporaries?” We reviewed Bloom’s taxonomy and discussed cognitive load in a context of child development. When examining the papers submitted by the preservice teachers, I found that their questions

were of different levels and when they did use lower level knowledge or comprehension level questions, those questions were typically followed by a higher level ones asking the students to explain or justify their answers. For example, one author generated this question, "What is a Doric design?" that required students to recall a definition, and then followed up with a prompt that required students to describe visual effect and respond to, "What kind of sculpture would you put in a temple and why?" Many lower level questions were intentionally written at a level to assess student mastery of the state learning standards to which the assignment, lessons, activities, assessments and data collection plans were intentionally aligned. Samples of the questions that were submitted with the historical fiction are found in Table 2.

[INSERT TABLE 2 ABOUT HERE]

Learning Outcomes

Each work of fiction provided an opportunity for all of the various stakeholders —the children, the cooperating teachers, the preservice teachers, and me— to learn something new about history. Of course, one major purpose of the assignment was to create instructional materials to help primary grade children grasp historical content, and much of the content in the stories was new for the young children. They learned about sign language and braille while enjoying a story about traveling back in time to meet Helen Keller, for example.

While this current study focuses on the creative writing assignment impact on the preservice teachers, it is worth mentioning the impact on the students and the cooperating teachers in the field placement classrooms as well. The data candidates collected on student learning provided evidence that most young students met the learning objectives (e.g., students will define Doric architecture) that were identified in the assessment plan component of the prepared lesson plans. In their reflective papers, preservice candidates

shared that the feedback they got from cooperating teachers and from each other helped them to refine their work.

Cooperating teachers and building a community of practice. The workshops and presentations presented in the university lab classroom, and described earlier in this article, addressed all of the social science strands, however, these experiences were shared only with other pre-service teachers and the course instructor. The pre-service teachers had a full-day practicum field experience in an early childhood classroom one day each week, providing opportunities for them to share their story ideas with their cooperating teachers. This sharing was an important component of the historical fiction writing assignment. It provided an opportunity for the pre-service teachers to share their stories and discussion questions with their cooperating teachers and to get their feedback, thus creating a community of practice (Lave & Wenger, 1998). As the in-service teachers read the historical fiction text prepared by the pre-service teachers, they attended to the content and the needs and interests of their students, and they reflected on their own practice. The cooperating teachers worked with the candidates to implement meaningful learning experiences and rich environments for the young children. An important principle of holistic Constructivist approach (Bacon & Bloom, 1995) is working collaboratively with faculty and with peers.

The potential benefits to the teachers included opportunities for them to purposely observe their students while working with another teacher and to advocate for developmentally appropriate practice in early childhood education. The benefits for the teacher candidates included having a shared understanding with their cooperating teachers regarding the appropriate curriculum for young children and getting additional support putting their action research into practice in a real-world setting.

Peers. The original plan was for the authors to share their stories in the university classroom and provide peer feedback, but severe winter weather closed the university several times and class did not meet for two weeks. Sharing the stories with each other was an important component of the planned learning experience, and so the alternate strategy was for the authors to record themselves reading their story and post the link to their recording on our learning management system, Blackboard™. The authors could choose the method of recording that they preferred. Many narrated a PowerPoint presentation and several posted audio or video recordings on YouTube and shared the link. I assigned four classmates to listen to each story and provide feedback to the author. We had previously discussed in class how effective feedback is timely, specific, and constructive, and I reminded them of these guidelines when I gave them three prompts to which they were to respond. The prompts were: "Something new that I learned was…", "A compliment I would like to share is…", and "A question that I have is…"

Analysis of the peer feedback response data reveals that most of the pre-service teachers' learning during the peer review process was of discrete facts or details that they claim that they did not remember learning earlier in their academic careers. Dates and locations were often reported as something new learned from reading the stories that their classmates wrote. It was expected that content intended for children under eight years old would not be especially enlightening to these young adults, however a couple of misconceptions were addressed. For example, one student shared that she thought Christopher Columbus was the first European to explore the east coast of the North American continent. Another said she thought Helen Keller was born blind.

Pre-service teachers. The stories and the feedback from classmates and cooperating

teachers, as well as from the pre-service teachers themselves, comprise the data that provide a window into the minds of these future teachers and how they think about the past events.

Quantitative data from the retrospective pre- post-test. About seven months after the course was over, I began collecting pre-service teacher self-reported data on the impact of the creative writing experience. There were two reasons for the delay. First, it allowed enough time to pass so that the candidates would be at a point in their program of study that they would know for certain that their choice to agree to participate or not to participate in my study would not have any impact on their grades or progress in the teacher education program. The second reason was to allow the college students time to complete the content area courses in the social sciences. I thought that they might have a better understanding of the content and a clearer recognition of historical context and thus be able to evaluate more accurately what they had learned during the process of creating their own fictional work. I administered a very brief paper-pencil anonymous retrospective pre- post-test to measure perceived gains in knowledge of the historically significant event or person. A total of 26 of the 30 class members completed this 5-point assessment by responding to a pair of questions. (Two of candidates chose not to participate in the study at all and two had left the program.) Figure 1 provides the instructions and questions.

[INSERT FIGURE 1 ABOUT HERE.]

A two-tailed paired t-test was used to compare the retrospective pre- and post-test results. The distribution of scores are plotted in Figure 2. The gray boxes make up the middle half of all scores (the second and third quartiles) with the median score dividing the two middle quartiles. The whiskers represent the range of the upper and lower 25% of all scores. The average scores

are indicated with red circles. The difference between the pre-test and post-test scores (36.2%) was statistically significant using the two-tailed paired t-test: $t(25)$, $p < 0.001$. The magnitude of this difference has a very large effect size (Cohen's $d = 2.27$). This large effect size means that there was a tremendous gain in self-reported understanding of historical content between the time they started writing their stories and when they finished them. Recall, however, that because pre-test/post-test analyses have no control group, they tend to have lower validities. We need to be cautious if making inferences with regard to the cause of any changes in the class' learning, however, when responding to the questions, it was clear to the respondents that the intent was to for them to consider the impact of the creative writing activity on their learning.

[INSERT FIGURE 2 ABOUT HERE.]

Qualitative data from the focus group. All but two of the participating pre-service teachers participated in one of the two focus groups held during the semester following the course with the creative writing assignment. Six questions were addressed, and the results could have implications for how we prepare our teachers to teach young children about historical events.

1. Where did you go to find reliable information about the historical event or person? Content analysis of the responses that preservice teachers shared fell into three categories: digital, print, and people. They relied heavily on websites for their research on historical content, but all of the authors used more than one source for information. I was pleased to see that they used some discernment in selecting websites and primarily used domains with the .gov and .org extensions instead of relying on .com and .edu. Other popular sources of digital

information included Public Broadcast System (PBS) programs and YouTube. Print sources included college texts from history courses, children's books, teacher manuals with standards, particularly the preschool standards known as the *Foundation Blocks for Early Learning* (VDOE, 2013), and the *Virginia Standards of Learning* (VDOE, 2009) for grades kindergarten through grade three social studies and history. People who served as resources included cooperating teachers and university professors.

2. How did you make the content interesting or engaging for young learners? The authors used several techniques to engage their young learners, accessing the principles of developmentally appropriate practice (DAP), especially by relating the story to some meaningful previous experience. Three approaches emerged from the analysis of their responses to this question: story elements, character attributes, and activities. Some authors added some familiar, modern elements such as computers and television to their stories. Another approach was to add elements of fantasy such as time travel and alien beings to help to make an event that happened long ago suddenly accessible today. Another approach with a nod toward DAP was to tell the story from the child's perspective, creating characters who were the same age as the intended audience. Animals were also featured as main characters, telling stories through a likeable perspective. Some authors made their stories more appealing by incorporating hands-on opportunities, such as instructing those who were hearing the story to clap or make predictions. Rhyme and other kinds of poetry were incorporated into stories as well. See Table 3 for the responses provided in each of the three categories of engagement techniques.

[INSERT TABLE 3 ABOUT HERE]

3. Did you have any particular models in mind? Which ones? Many of the preservice teachers used some of their own personal experiences with fictional texts as models for their creations. A few of them mentioned that the *Wayside School* series by Louis Sachar and other weird stories were a source of inspiration. Naturally, autobiographies and biographies provided models as well. Recognizing the power of repetition for young children, repeated pattern language books were another natural choice. *Brown Bear, Brown Bear* by Bill Martin served as a model for at least two stories. Table 4 provides a list of the combined responses from the two groups. As responses were shared and recorded in the focus group sessions, other focus group participants indicated by nodding or voicing words of agreement that they had also used the same approach, but frequency data were not collected.

4. How did writing the fictional story help you to learn more about the historical event? The focus group responses to this question fell into three themes: pedagogy, content knowledge, and pedagogical content knowledge. Candidates shared how they had to simplify some complex ideas for the young children, realizing that they did not need to include everything that they learned during their research on the historically significant person or event in the story for children. One preservice teacher explained, "It really made me think about what were the important topics to teach." They shared that during the process of researching and writing their stories they identified some of their own misconceptions and how important it is to do fact checks. It was through the process of comparing information gathered from multiple sources that the pre-service teachers constructed their own understanding about how the same event or contributions of an individual can be interpreted and valued differently depending on the perspective of the source. On author shared that she discovered that the arrival of Christopher

Columbus in the New World, for example, is not observed the same way in American Indian communities as in communities with large Italian-American populations.

5. Do you think that third graders would enjoy writing historical fiction? All candidates said "yes" or indicated agreement. Then they anxiously provided ideas that the classroom teacher would need to consider. Based on their own experiences, they predicted that it would be a challenging task for third graders and they had several suggestions for how they would address these challenges. They shared that they would expect to need to provide lots of scaffolding, that the third graders would need many more experiences with other historical fiction and biographies so that they would have many models from which to be inspired. They suggested that the teacher could provide an outline, prompting the children to address various story elements. Finally, they were emphatic that the teacher should let children select their own topics. Their final comment to me on this question was how important it would be for the teachers to place more emphasis on process than on the product.

6. How could you assess how much the young children understand about past events by examining their stories? Analysis of the responses to this question reveals three types of criteria that they as teachers would examine to evaluate student learning of historical content: the story content, the story language, and the story structure. Criteria related to story content included looking for accuracy, the absence of errors, and misconceptions. In other words, these future teachers believed that if their students had correct facts in their stories, that there was evidence that the students had learned the content. Evidence of student learning related to story language included the use of past tense and appropriate vocabulary. They shared that use of the past tense would demonstrate that their students understood that the event happened in the past. The final criteria, story structure, included elements in the story that demonstrated that events happened in

a particular sequence and that events are related. A demonstration that students understood cause and effect was considered important evidence that the students had mastered the learning outcomes for a particular historical event. They quickly added that they also had other evidence of student learning from their discussion questions and that having more than one source of information was good.

Conclusion

This mixed methods study revealed some of the benefits of and challenges in supporting pre-service teachers, who often hold misconceptions about the social studies content themselves, to grasp difficult concepts in history and to make it accessible to young children. These future teachers recognize that young children can learn from materials that are engaging and appropriate for their age. I learned that pre-service teachers need many opportunities think about how young children with real, albeit limited, experiences construct understandings about some important and abstract content in the social sciences. As a professional interested in teacher preparation, it was encouraging to know that our future teachers continue to learn and construct their own understandings of historic events while preparing lessons for their students and that they are aware of the necessity to be thoughtful about what content is meaningful for young children and to be careful in checking facts.

I had the opportunity to teach this course again just this past semester, and I included this assignment with a couple of modifications. The first change was to offer the preservice teachers a choice of working alone or with a partner. This decision was founded on the Constructivist principle that we learn through engagement with peers. This teacher education program is delivered using a cohort model and the candidates know each other well by this point in their academic career. This learning environment allowed them to comfortably make a decision to

work with another person. All but one person chose to work with a partner. This change required me to monitor the contributions of each partner, but it worked well. Candidates openly shared how their partner helped to develop ideas and supported the creative writing process. The second modification was to have the authors present their stories to their peers in a class meeting, the original presentation format that was pre-empted by the severe winter weather the first time I used this strategy. The day we shared our stories had an air of celebration, not only because it was the last class before their undergraduate graduation, but also because authors had the opportunity to share their original work with their peers, people who were long-time friends and professional colleagues as well as classmates who also had stories to share. They read their works of historical fiction, displayed illustrations and supporting images, and shared the *other* story—the story about how the children engaged with the tale, what the youngsters liked, and how well the young listeners could respond to their questions. These spot-on student responses were the data that the authors needed to provide evidence that they had made an impact on student learning. For these future teachers, it was this evidence that they valued most of all and that would carry them confidently into graduate school and student teaching.

Tables and Figures

Table 1
Samples of Historic Topics Selected by Preservice Teachers

Topic	Topic
Competing in the Olympics of Ancient Greece	Contributions of George Washington
Paying market taxes to the king of Ancient Mali	Contributions of Martin Luther King, Jr.
Building the Parthenon	Contributions of Abraham Lincoln
Building the Colosseum (Rome)	Contributions of Rosa Parks
Griots telling stories in Mali	Contributions of Thurgood Marshall
Christopher Columbus sails to San Salvador	Contributions of Thomas Jefferson
Juan Ponce de Leon arrives in Florida	Contributions of Cesar Chavez
Jacques Cartier arrives in Canada	Contributions of Helen Keller
Christopher Newport arrives in Jamestown	Contributions of Susan B. Anthony
Pocahontas meets the Englishmen	Observing Veterans Day
Signing the Declaration of Independence	Observing Memorial Day

Table 2

Sample of Questions that Candidates Generated for Primary Grade Children

Topic	Questions of different levels
Building the Parthenon	What does an architect do? Why do you think he chose this city? What is Doric design? What is a visual effect? What kind of sculpture would you put in a temple and why?
Jackie Robinson	What is integration? What does it mean to be non-violent? How would you have responded if you were in Jackie's position?
Veterans Day	Do you know anyone who has served in the military? What do you think a Veteran is? What are ways you think people can serve in a war? How can our class honor and celebrate Veterans this year?
George Washington Carver	Was it a good or a bad thing that baby George was found and returned to his slave owner, Mr. Carver? Why? What is special about the fact that George went to college? What are some ways that George's scientific work still affects us today?

Table 3

Responses to the Focus Group Question "How did you make the content interesting or engaging for young learners?"

Modern or fantasy story elements	Story character attributes	Interactive activities
Space travel	Aliens meeting children	Call and response
Television and video are part of the storyline	Main character is a child similar to the children hearing the story so they were "putting on the shoes of someone else"	Making predictions during the reading of the story
Time travel	Main character or narrator is an animal	Clapping and tapping
High quality pictures	Story told in first person voice	Story asked questions (questions are embedded in the story instead of being separate from the actual story)
	Character knows things that the children hearing the story know	Children asked to close eyes and imagine themselves in another place
		Incorporated rhyme and limericks

Table 4

Responses to the Focus Group Question "Did you have any particular models in mind?"

Wayside Schools
Weird Stories
Pattern books
Primer and pre-primer books like the ones they are using in reading groups
Brown Bear, Brown Bear [mentioned in both focus groups]
Biographies and autobiographies from the Reading Center, a resource on campus with childrens' books [mentioned in both focus groups]
Leveled books
I didn't have any models in mind

Below you will find a pair of questions, PRIOR and AFTER. To better understand your personal learning, please answer both questions. Circle your response.

My understanding of the historical event
PRIOR to writing the story:
Poor Fair Good Very good Excellent

AFTER writing the story:
Poor Fair Good Very good Excellent

Figure 1. The retrospective pre- post-test administered to teacher candidates after the social studies methods course and candidates had completed their upper level coursework in history. Paper and pencil format. N = 26.

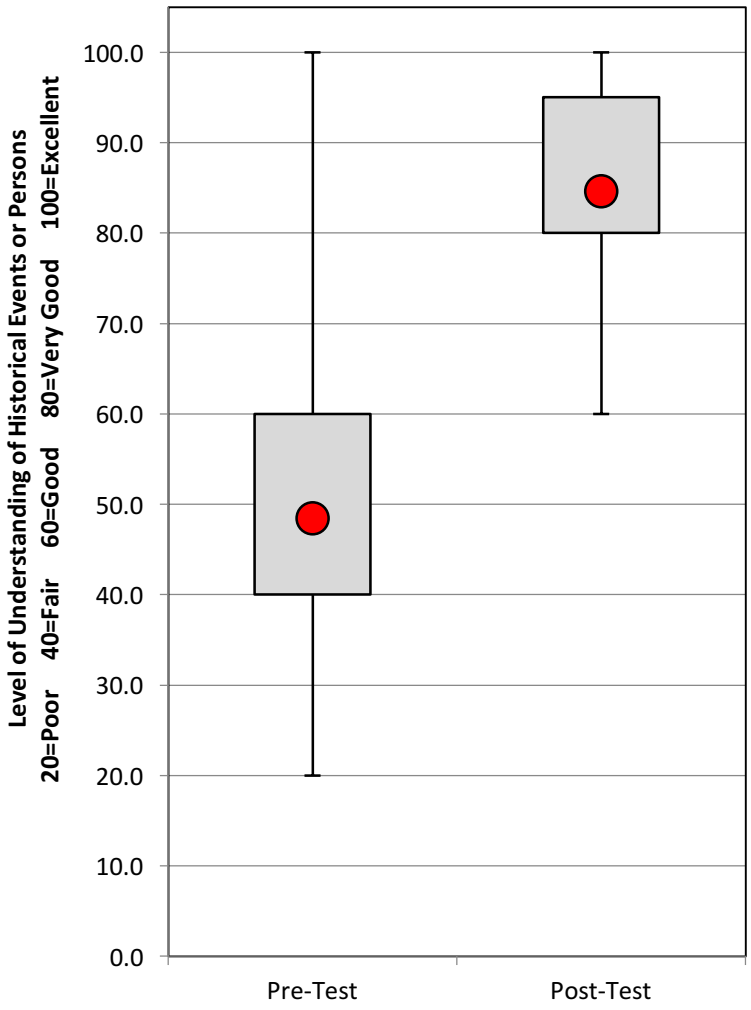

Figure 2. A two-tailed paired t-test was used to compare the retrospective pre-and post-test results of pre-service teachers' understanding of historical content. The difference between the pre-test and post-test scores (36.2%) was statistically significant, indicating that there has been a tremendous gain in self-reported understanding of historical content. The whiskers represent the range of the upper and lower 25% of all scores. Average scores are indicated with dots. Boxes make up the second and third quartiles. N = 26.

Appendix A: Directions for Assignment

Write a Story

In class you will select a topic. You are to write a short story (fictional) based on that topic. You will need to identify the intended appropriate age group for your story. You might consider the age of your practicum group, but you do not need to. Remember the components of DAP and make sure your story is interesting, engaging, and related to children's real life experiences. Share your story with your cooperating teacher and get feedback. Make changes that you feel are appropriate. Share your story with some children. A whole group read-aloud may provide you with the most meaningful experience, but a small group is fine. On the due date, you will share your story with our class. Your presentation should include at least one visual (e.g., a picture that could go under the document camera, a PP slide, a poster, a handout with graphics) and at least one way for the audience to participate (e.g., sing a song with you, act out a motion, call and response, rhythm). Along with your story, submit your own reflective paper including the following:

1. The historical event and the purpose of the story
2. The intended age group and how you considered that when writing your story
3. The VA SOL or Foundation Blocks addressed and the related NCSS theme
4. How other content areas (language arts, math, science, art, music) can be related
5. How the story would fit into a sequence of instruction (impression, extension, expression)
6. A set of questions to guide children through a text-based discussion of your story

Appendix B: Rubric for Scoring Assignment

JAMES MADISON UNIVERSITY	*IECE 464 Performance Assessment Scoring Rubric – Write a Story*			Date _____	
Candidate name			Title of story and grade level of audience		
	Not Submitted	**Not Acceptable**	**Acceptable**	**Exemplary**	**Points**
Addresses Theme 20	Story does not address identified VA SOL standard or the NCSS theme 0-5	Story somewhat addresses the identified VA SOL standard or the NCSS theme 6-15 points	Story clearly addresses the identified VA SOL standard and the NCSS theme 16-19 points	Story addresses the identified VA SOL standard and the NCSS theme in a developmentally appropriate way (engaging and related to children's experiences). 20 points	
Historical Content 20	Errors in historical content 0-5	Mostly accurate historical content, but important components missing 6-15 points	Includes accurate content and generally covers the historical event 16-19 points	Accurate content presented in a context that helps students to understand how the event related to other important historical events 20 points	
Discussion Questions 20	Missing questions 0-5	Questions require recall or memory 6-15 points	Some questions require students to do more than recall facts 16-19 points	Questions are of many levels, some requiring students to use critical thinking or other higher level cognitive processes such as categorizing, synthesizing, or evaluating 20 points	
Responses to Feedback 10	Missing feedback from cooperating teacher 0	Shares feedback from teacher 1-5 points	Reflects on feedback from teacher, describing how it was helpful 6-9 points	Reflects on feedback from the cooperating teacher, describing how feedback was used to improve the story, the questions, or both 10 points	
Reflective Paper 30	Paper missing 0	Paper mission some components 1-15 points	Paper describes the purpose of the paper and the standards 16-29 points	Paper includes purpose of the story, the intended age group, how age was considered during writing, how other content areas are related, how the story would fit into instruction. 30 points	

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Fostering Curiosity and Imagination: Creative Arts in the Classroom

Joanne Lanciotti Emery

FOSTERING CURIOSITY & IMAGINATION

Abstract

This article is a further consideration of the workshop, *Creative Arts in Classroom: Ideas and Techniques for Exploring the Arts,* which was presented at the 2015 Association for Constructivist Teaching Conference at Kean University. The workshop focused on the process of integrating the arts within the regular classroom curriculum. The key to appreciation and application of the arts is the cultivation of a growth or an imagination mindset, an attitude that is both curious and resilient. By incorporating the arts into the classroom, teachers and students worked together to construct knowledge and gain deeper understanding. Various techniques were described for including visual arts, music, movement, drama, and storytelling.

Guided imagery and learning to look closely were essential skills taught to young students. The ability for teachers to nurture students' personal artistic talents was also important in building awareness of an imagination mindset. Through movement, drama, and storytelling, students were able to collaborate, solve problems and express what they had learned. As part of a multicultural study of Cinderella, students were also challenged to design shoes and castles. Such artistic endeavors helped students to develop what psychologist Mihaly Csikszentmihalyi termed flow or optimal experience. Teachers were instrumental in providing a creative space where students were encouraged to take risks and think beyond the box. Through creative arts experiences, students became intrinsically connected to the curriculum and engaged in learning.

Keywords: growth mindset, curiosity, imagination, creative arts, flow

FOSTERING CURIOSITY & IMAGINATION

Introduction

Over the years, when speaking about integrating the arts into the classroom, I have frequently been met with a bit of resistance, especially if my audience considers themselves as not possessing artistic ability. Many people continue to think of artistic ability as something special, a rare activity that is only bestowed upon a few unique individuals. In my view, art is part of personal identity. It helps to cultivate critical thinking, express ideas, and foster joy. In his 1940 essay, "Time and Individuality," John Dewey stated, "Art is not the possession of the few who are recognized writers, painters, musicians; it is the authentic expression of any and all individuality." (Dewey, 1990) Thinking about art in this way makes a whole world of possibilities accessible to children. They do not have to try to fit in the math box or the literature box, the science box, or the art box. Children can view themselves as having multiple talents and interests with which to investigate.

This article details the many ways in which classroom teachers can integrate creative arts-based strategies in their teaching practice, which will in turn foster their students' curiosity. The inclusion of the creative arts and design thinking enhances active engagement and increases student motivation. I further explore how the cultivation of imagination mindset allows children to ponder questions, which are personally relevant, and encourages them to take risks. This focus on developing students' imagination mindset makes learning a dynamic process and is

key to constructing an innovative classroom culture. By tapping into students' natural curiosity, the classroom becomes a studio for inquiry and investigation in which the teacher and students co-create a year of learning.

Constructing Curiosity

Teachers can nurture curiosity by creating an open space to ponder, wonder, and question. By honoring students' questions, teachers facilitate learning, which is relevant and motivates students to question further and seek out possibilities pertaining to any subject. To be curious and to question is intrinsic to learning. Warren Berger in his book, *A More Beautiful Question,* quotes research scientist John Seely Brown who explains that "…if you're comfortable questioning, experimenting, connecting things – then change is something that becomes an adventure. And if you can see it as an adventure, then you're off and running." (Berger, 2014, p. 28). This adventurous spirit reminds me of a time when one of my young three-year-old students was outside playing. He suddenly looked up at the sky and was enthralled by the presence of the moon. He could not take his eyes off the moon and wondered why it was out in the daytime. In his experience, the moon only came out at night, and now all that he had come to know about the moon and sky was in question. That was an important moment for him as a learner, and it was an important moment for me as a young teacher. I could have patted his head, given him a cursory answer, and brought his attention back to something tangible like the sandbox. Instead, I listened and encouraged his questions and helped him to better understand the workings of the universe. Indeed, this young boy's curiosity sparked weeks of learning

about the nature of the sky for all his classmates. We read numerous books about the moon, created a moon surface, made a mural of the phases of the moon, and even built our own lunar explorer. Teaching is at its most effective when it promotes risk-taking and relentless experimentation, which is the true heart of constructivist teaching. When teachers and students start asking open-ended questions such as: What do we want to learn? Why do we want to learn it? How will we go about learning it? How will we show what we've learned? – They co-construct an atmosphere of curiosity and investigation. This approach affords multiple avenues for learning, giving teachers and students freedom to learn in a personal, creative, and active way.

Imagination Mindset:

In *Mindset: The New Psychology of Success,* Carol Dweck explores the notion of growth versus fixed mindset (Dweck, 2007). Dweck defines fixed mindset as the belief of people who regard intelligence as having a finite number of traits, whereas people with a growth mindset view intelligence as being able to develop over time with effort and persistence. When people have a growth mindset they become motivated to learn and obstacles don't stop them. Artists usually have this growth mindset; they are able to view learning as a challenge, which is worked through creatively. When considering growth mindset, I was reminded of the traits I believe all creative artists possess. I call this ability to think outside the box, *imagination mindset*. In my experience, artistic people maintain a strong belief in their ability to create. They are tenacious when solving a problem, view the world with childlike wonder and curiosity, and are able to hold ambiguity in their

hands suspending judgment. That is, artists are people who are willing to fail. And when they fail, they fail forward, learning from their mistakes.

In the classroom, students need both structure and freedom: the ability to explore ideas within a framework and the freedom to express ideas and new learning in various ways. Beginning with an imagination mindset, the teacher acts as a facilitator, supporting students' play and work. Learning is viewed not as a structured set of skills, but as a whole world of information to discover, and skills are practiced within the creation of that world. Students are encouraged to take risks and ponder new approaches to problems. Project-based learning allows for integration of the arts and content areas so that deep meaning and enduring understandings can be developed.

Art and Visualization

When first integrating the creative arts into the curriculum over three decades ago, I used the visual arts as a vehicle to begin the process, because it was an area with which I was most familiar. As an early childhood teacher, it was easy to put art supplies in little hands and watch them create wondrous places and fantastic creatures. As the prolific abstract artist, Wassily Kandinsky once said, "The creation of the work of art is the creation of the world." (Kandinsky, 1994, p. 373) Young children were skilled in mixing fantasy with reality; it was a completely natural process for them. As children mature, however, they often lose touch with their ability to imagine. In order to support students' natural imagination mindsets, teachers can provide ways in which to make learning visible.

FOSTERING CURIOSITY & IMAGINATION

Guided imagery is one technique for bringing ideas to life. Richard De Milne, in his book *Put Your Mother on the Ceiling,* offers teachers many imagery scripts, which he calls "games" to develop students' visualization abilities. When done systematically, visualization exercises increase student awareness and helps to create deeper understanding by using one's own "mind's eye." (De Milne, 1955) When students learn to make images in their heads, they become more aware of possibilities. By sharing their imaginings, children begin to understand the many perspectives their classmates can have visualizing the same scene. These exercises not only stretch creative muscles, they also connect students to each other and help form a foundation of collaboration. Teachers can further develop visual acuity by asking students to look closely at paintings and photographs, noticing everything they can. Regular practice viewing art enhances analytic skills. Students need time to consider questions such as: What do you notice? What makes you curious? What can you conclude? They need space to share their wonderings with their classmates to develop deeper comprehension.

A number of years ago, I had the good fortune to teach third grade at the Dalton School in New York City, where I was encouraged to integrate art into the existing curriculum. Each month, we would study different visual artists and take field trips to the various city museums to view their work and discuss what we noticed. After reading about the artist and viewing his/her art, the children returned to the classroom to create personal masterpieces. During one of these classroom studio sessions, I set out a still life with colorful flowers and a deer skull, since we were exploring the art of Georgia

O'Keefe. I set out pots of paint and paper, encouraging students to create what they saw. One of my students, Matthew, who had limited experience with mixing paint, became engrossed in the activity. He dipped and blotted moving from one pot to the next, eventually announcing that he had discovered a new color: dark muddy chocolate brown! He was so excited by his discovery that he gave each of his classmates a sample of his new color, and they in turn added his color to their palettes. That day, Matthew began to see himself in a new light, as someone who could create color and form out of simple materials. He was the inventor of dark muddy chocolate brown! Georgia O'Keefe explains, "I found I could say things with color and shapes that I couldn't say any other way – things I had no words for." (Reily, 2009, p.379). During the rest of the year, Matthew continued to explore color and form, and was not afraid to get messy in the process of artistic discovery. It is for this very reason that including art into the classroom is important for making learning both visible and relevant. The process of reading, viewing, and inventing allowed all my students to think of themselves as creators. They began to investigate various creative avenues of expression.

Movement and Music:

As I worked to integrate all aspects of the arts into my teaching, I stretched myself beyond my personal comfort level into the world of movement and music. I wanted to cultivate my students' inherent love of movement and foster an atmosphere for exploring both the real and imaginative worlds. A truly engaged classroom is a place where students are in motion: reading, thinking, planning, problem solving, designing, and constructing. Project-based learning allows children to use their natural affinity for movement and apply it when examining subjects of interest.

FOSTERING CURIOSITY & IMAGINATION

One investigation into movement that I have done with elementary students is an in-depth study on inventions. We read about inventors, their unique inventions, and the process by which people create new ideas. During this study, students created real and imaginary inventions. An integral part of introducing this study was an activity called "Human Machines." During this activity, children worked in small groups (three or four children per group is ideal) to create a unique machine. First, they thought together about the type of machine they wanted to create, then they thought about how that machine might look using their bodies. One person got into a position and then others joined her, gradually linking up to make a whole machine. They used the motion of their arms, legs, heads, and torsos to create a machine that moved, and then they added sounds to accompany their movements. When the group was done perfecting their machine, they presented it to the rest of the class, telling the name and purpose of the machine and showing how it worked. Movement is such an important part of student understanding. Children can read and write and wonder, but it is the trying and doing that allows them to fully comprehend ideas and concepts.

This was best illustrated to me a number of years ago, when I taught second grade. Although, I gave my young learners many creative arts experiences, true music integration was more difficult within the sphere of the classroom. My students had formal music education classes twice a week in which they learned both voice

and instrumental skills. As with the visual arts, I wanted music to be a daily practice in my classroom in order for students to gradually deepen their understanding.

Although I was not a musician, I realized the importance of holding all children's musical investigations in high esteem, and I thought of ways to honor them and connect music to our classroom culture. As Carolyn Hildebrandt asserts, "…teachers do not need special training to foster creativity in music. The only thing we really need is an interest in children's music and a willingness to listen to their songs." (Hildebrandt, 1998, p. 72). I began to develop my own intrepid spirit when creating musical experiences for my students. During that year, I deliberately found space in the day to add music: playing recorded music that reflected what the children were learning, collaborating as a class to compose lyrics about taking care of the earth, scheduling musical show-and-tell sessions in which students showcased their instrumental and vocal explorations, and integrating musical activities into content areas.

I created an invention station in a small corner of my classroom packed with various recycled materials, where students were encouraged to design and build. In addition to creating imaginative machines, the children made a variety of string, wind, and percussion instruments. The building of instruments entailed both free exploration and direct instruction. By constructing various musical instruments over many months, my students experimented with sound and progressed from producing various noises to creating music. In its simplest form, the children made string instruments with rubber

bands and milk cartons or created tambourines with paper plates to aluminum pie pans and dried beans. While working on their musical instruments, students began to collaborate, making several iterations, and finally coming together to perform in duets, trios, and full bands. Children began to problem-solve and naturally integrate what they were learning in science, social studies, and reading into musical lives. These open investigations were the foundation of whole class instruction: we created rain sticks while studying the rainforest, constructed panpipes while learning about Andean culture, and built water xylophones while experimenting with sound and pitch. Music and movement were two more tools children could access to better understand the world around them. What had been natural play in early childhood needed to be deliberately nurtured and developed during the elementary years. Step-by-step, the children began to see themselves as composers and choreographers – creators in the dance of life.

Children need a firm foundation on which to grow their wonderings; they need a consistent place to practice. In her book, *The Creative Habit*, choreographer Twyla Tharp describes the need for the artist to have a routine, a starting point from which creativity flourishes. She explains how the great composer, Igor Stravinsky did the same thing every morning when he entered his studio to work: "He sat at the piano and played a Bach fugue. Perhaps he needed the ritual to feel like a musician, or the playing somehow connected him to musical notes, his for the day. Perhaps it was nothing more than a simple method to get his fingers moving, his motor running, his mind thinking music. But repeating the routine each day in the studio induced some click that got him started."

(Tharp, 2006, p. 16-17) It is during this intentional practice that children question, experiment, and fully explore their craft. By consistent practice, students begin to perfect the foundation of their creative identities.

The interconnection of music and movement reminds me of the story of Gillian Lynne described by Ken Robinson in his book, *The Element: How Finding Your Passion Changes Everything.* Robinson explains that as a young girl growing up in the 1930's, Gillian was thought to have a serious learning disorder, and school officials recommended that her mother take her to a psychologist. Gillian's mother complied, answering the psychologist's questions as Gillian sat on a chair listening. When Gillian's mother and the psychologist left her alone in the room, the psychologist deliberately turned on his radio. As the music played, Gillian got up and began to dance. As Gillian's mother and the psychologist watched from the doorway, the psychologist asserted that Gillian did not need to attend a school for the learning disabled. Instead, he proclaimed that Gillian was a dancer, and he recommended that she attend dance school. Gillian went on to become a famous British ballerina and choreographer. She is best known for her choreography of the Broadway hits, *Cats* and *The Phantom of the Opera*. (Robinson, 2009). It is this shift in perspective that is necessary for connecting children with possibilities. By providing students with the opportunity for artistic expression, teachers guide students to explore their personal strengths and passions, becoming authors of creative narratives of their own design.

A Community of Storytellers and Actors: Dorothy Heathcote and Vivian Paley

FOSTERING CURIOSITY & IMAGINATION

Drama and storytelling are dynamic strategies for helping students develop creative narratives and explore artistic identity. The single best way to connect with children is through story. Story is the creative glue that holds all social interactions together. It is through story that people learn about each other and the larger world around them. Everyone has a story to tell and everyone needs an attentive audience. Classrooms are perfect stages upon which to set these stories.

Two influential approaches to storytelling, which have influenced my teaching, are that of the British drama teacher, Dorothy Heathcote and the American early childhood teacher-researcher, Vivian Paley. Heathcote's approach provides children with space in which to carry out the story, creating it as they go along, while Paley's approach focuses on young children's story dictation and dramatization. In Heathcote's approach, the teacher presents a topic or event to the children to explore. This topic might be directly tied to a specific topic the children are learning, but it might also be broader in scope. The children make the decisions as to what the play is about, where the scene takes place, and what happens. The teacher sets the stage for the children to uncover the topic. During this process, the teacher encourages the students to reflect and experiment. By making decisions the students cannot be idle; they must get into the scene, they must act! Students are tasked with putting emotion and meaning together and to work out human interactions upon the stage. Heathcote's method involves working from the inside out. The actors reflect on their feelings and come at a problem in a new way.

As Betty Jane Wagner describes in her book, *Dorothy Heathcote: Drama as a Learning Medium*, "She (Heathcote) does not use children to produce plays. Instead, she uses drama to expand their awareness, to enable them to look at reality through fantasy,

to see below the surface of actions to their meaning… She does this not by heaping more information on them but by enabling them to use what they already know. (Wagner, 1999, p.15) Indeed, student interest holds the whole play together. This method relies heavily on improvisation and spontaneity; events and characters can change in the moment. Students must show confidence, work intuitively, take risks, and involve themselves in the action completely. Heathcote's method brings out what children already know, but don't yet know they know. What classroom teachers think of as activating schema or building students' background knowledge, Heathcote calls "building volume within the student." (Wagner, 1999, p. 16) The teacher continues to have authority and show leadership, even though the children are the ultimate decision-makers. If someone doesn't want to participate, they can sit out for a while until they find a space to join in, and the teacher will find a way for the student to participate, if the student cannot. The one golden rule Heathcote emphasizes is that the actors must *believe*! They must believe in themselves as storytellers, and they must believe in the story that they are setting upon the stage so they can capture their audience's imagination.

The work of Vivian Paley also entails dramatization, however, teachers create the play through the dictation of young children. Paley was a teacher at the Lab School of the University of Chicago, where she did action-research on the importance of storytelling in early childhood. The process is a simple one: students tell their story to a teacher who writes it down in the child's precise language. Then the student and teacher gather classmates to perform the author's story. The event is re-played for the whole class. As Paley explains, "When children play…their play needs to be seen again, heard again on a pretend stage, transposed into a story in their own words." (Paley, 2013, p. 44). Young

children will naturally draw adults into the story of their lives. Three-year-olds have often led me by the hand and brought me into to their dollhouse world, the imagined pirate ship, or the re-creation of their birthday. They often call out, "Can I tell you something? Do you want to know what I found out?" Their natural curiosity spills forth desiring an attentive audience.

Recently, while I was observing a pre-kindergarten classroom, a young girl was upset because she didn't know what to draw. I sat down next to her and asked if she'd like to tell me a story. She was hesitant at first, but then began to tell me a story of a girl named Sally and her dog that run away from home. Sally's mother finally finds the pair and everyone lives happily ever after. When the story was completed, three classmates eagerly acted out the play. During their performance, the once timid author was beaming and asked her classmates to perform her story again. After her story had been acted out for a second time, the author got to work illustrating her story. Now, she had no trouble thinking about something to draw once her story had come to life. By providing such storytelling opportunities and watching them unfold, teachers create a culture where children's ideas are listened to and honored.

Flow: Curiosity, Motivation, and Optimal Learning

When the creative arts are integrated into the regular classroom curriculum, one notices that the teacher is not readily apparent. She is not in front of the room lecturing or at her desk dictating; she can be found working side-by-side with her students. In the creative arts classroom, there is a steady hum of industry: children reading, writing, building, questioning, and problem finding as well as solving. It is an imagination

workshop with a true exchange of ideas, which builds upon each other pushing ever forward and transforming into new possibilities. Whether creating a piece of art, performing a drama, or designing a machine, students and teachers sense what renowned psychologist Mihaly Csikszentmihalyi refers to as flow or optimal experience. Csikszentmihalyi explains, "The best moments usually occur when a person's body or mind is stretched to its limits in a voluntary effort to accomplish something difficult and worthwhile. Optimal experience is thus something that we *make* happen." (Csikszentmihalyi, 1990, p. 3) When children are completely engaged in the classroom activity, they are not worried about how they compare to their classmates. They do not view the teacher as judge or jury. They see themselves as actors in the true sense of the word. They are part of a creative process, responsible for their own learning. The teacher, through curriculum, classroom design, and active engagement, cultivates an atmosphere of deep concentration and reflection. Creative arts, curiosity, and the imagination mindset coalesce to form a place for optimal learning, where understanding evolves and persists.

Conclusion

It is my hope that the creative arts strategies presented here will help teachers transform their classrooms into active studios for learning. In these studios, children are encouraged to follow their curiosity by generating questions and using forms of artistic expression which help them develop unique creative identities. Using creative arts strategies to stimulate divergent thinking will not ensure that all children will grow up to be concert pianists or brilliant painters, but

it will provide students with a solid foundation on which to nurture ideas and bring an innovative sense to any endeavor they choose to explore.

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Keynote Address: Interview with Eleanor Duckworth

Interviewed by. Dr. Andrew Stremmel

Interviewer: It's my honor and pleasure to be able to be part of an interview with Dr. Eleanor Duckworth, something that she had very much wanted to have happen at this conference. You know, our theme is Our Future Lies in the Past: Looking Back at One Hundred Years of Constructivism. Well, between us we just make that hundred years.

Eleanor: (laughs) I make it almost alone.

Interviewer: I wasn't saying that (laughs). So let me introduce Dr. Duckworth first. These are words that others have used to describe her: cognitive psychologist; a keen observer of children's learning; a teacher of teachers; an education activist, theorist, and scholar; a former student and translator of Jean Piaget. Eleanor Duckworth grounds her work in Piaget and Inhelder's insights into the nature and development of knowledge and understanding, and in their research method which she has developed as a teaching-learning approach of critical exploration in the classroom. She seeks to bring a Frierian approach to any classroom, valuing the learner's experience and insights. Her interest is in the experience of teaching and learning of people of any age, both in and outside of school. Eleanor is a former elementary school teacher and has worked in curriculum development, teacher education, and program evaluation in the United States, Europe, Latin America, Africa, Asia, and her own native Canada. She is a coordinator of Cambridge United for Justice with Peace, and she is a performing modern dancer. And just yesterday she tells me she was performing in Boston. And so I think if you notice something on her arm, that's one of the things that can happen as a performing dancer. She also wanted me to mention something she's very proud of. She's now working with the non-profit Critical Explorers.org, which was established by her colleagues who have all been former students. And so with no further ado, I'm going to start.

I'm going to ask you, Eleanor, to talk about the influence that your parents have had on you and your career.

Eleanor: Yes, I'm happy to do that. My mother was a farmer's daughter in Quebec and her mother thought it was important for her daughters to go to university, and so my mother did. She entered McGill when she was sixteen years old and did her degree there. She was a very shy young person. My father lived in Vancouver where he worked for the Canadian Pacific Railroad. He spent at least one winter alone in the woods in the mountains tracing this feed of a stream so they could know where to put the tracks and where to put the bridges. And he worked as a volunteer in the YMCA and then he became committed to the YMCA with an emphasis on the Christian in the YMCA, and committed his life to working with young people. And so he needed to get a university degree to do that, and ten years later than most people who went to McGill to get a degree. So they both were very committed to social justice and peace and that drove both of them and all of their work all of their lives. My mother was a non-professional. When I was little I made a chart of all the things I wanted to be when I grew up, one was a ballet dancer, one was a weight lifter, one was a housewife with lots of committees.

Audience: (Laughter)

Eleanor: So they just, there was no inclination among any of us, myself and my two brothers, to do anything but work for peace and justice the rest of our lives as our parents did.

Interviewer: Thank you. Now I think a lot of people would like to hear this next question and the answer that you give. Describe your first meeting with Piaget and maybe some of the things about Piaget that people maybe don't know.

Eleanor: Well, when I finished my B.A. I wanted to do graduate work in psychology and I also wanted to go see the world. So I applied for fellowships here and there, and I won a Rotary Fellowship for which I am very grateful. It's not a particularly scholarly-based fellowship; it is more for good international relationships. So they chose to send me to Paris because I knew a little bit of French. Paris wasn't a highlight in Psychology in those days, but after all, this was 1957. I'd never heard of Piaget. But when I got to Paris I was given a course. I had majored in Philosophy. I was given my series of courses I was supposed to take and one was by this man named Piaget.

The first day that I went I was swept away with the range of his ideas. I was still really a philosopher in my heart. He was talking that year about how children's understandings of spatial relations—geometry--developed, and how the history of geometry developed, and how the logical structure of geometry developed. The logical structure is the opposite direction of the history. So he was curious about whether children's ideas developed like the history or like the logical development, and he found that it was like the logical development. The broadest ideas are the base, the topological geometry, and the last to come is Euclidean geometry, which is what instructional history came up with first. Anyway, so that was just fascinating to my little philosophical soul.

So after the first class, I sat in the third row. My French wasn't very strong, so I sat in the third row to make sure I didn't miss a word and I was thrilled. And sometime late in the end he stopped me after class and asked what I was doing there, and I told him, and then we went on to a wonderful relationship about that. But he told me later that he noticed me because I laughed at his jokes.

Audience: (laughter)

Eleanor: And he said he put all of his important points in his jokes. So, then I went to Geneva for two years, but that was how I met him.

Interviewer: Thank you. You were given credit for introducing Piaget's methods and analysis to the classroom in the United States' educational research community after World War II. Can you tell us more about that?

Eleanor: That is a huge thing to be given credit for. I might have played some role.

When I left Geneva, I wanted to learn more psychology. I knew that I loved what I was learning in Geneva with Piaget and Inhelder. I knew that all I was learning, if anything else, was just survey courses, so I thought if I was to be a serious psychologist I should learn other things. So I went to Harvard to do so. In Geneva I did all the course work except for the thesis for a doctorate. But I went to Harvard to do a doctorate. And I actually had a horrible experience there and dropped out. And then I needed a job. So I cast around for a job. But by then, a few years after I met Piaget, he had become a very celebrated. I think it was Bruner's report of what was called the Woods Hole Conference--I forgot the name of the book now--it was a short book that he wrote. Inhelder had been at that conference and was presenting the ideas of Piaget and herself, and it got a lot of attention. That really got Piaget's name to the forefront.

My new job was elementary school curriculum development with an organization called The Elementary Science Study…um, no science.

Audience: (laughter)

Eleanor: I knew nothing about curriculum development, nothing about schools except that I had been to some. But they started to be impressed with Piaget and since I had worked with Piaget, I got this job. Besides, in the 60's was sort of, "Do you want a job? Well, here's a job." Those were the days. Really, it was an amazing time.

So there's a conference in I think '63, I believe, where a small group, between 30 and 40 directors of curriculum programs who were like…David Hawkins was the director of The Elementary Science Study. He was a philosopher of science. There were many curriculum programs developed by academics in the field, or lead by academics in the field, and it was a very strong time for curriculum development in many areas. So for the conference he brought Piaget to be with this small group for four days. And David Hopkins asked me to represent him. He had conflicts. And so I went. And it turned out that the translators that had been lined up for this conference were not adequate to it. Their first language was French and it's very hard to translate into your second language. And they didn't know anything about Piaget's ideas and so after their first efforts, which didn't work very well, Piaget asked me to translate. So I spent four days translating languages in both directions all day long. It was the most exhausting four days of my life. But it was a fantastic experience, which brought me then to go to a similar conference in Berkeley, and following was one at Cornell. So I got to go to that one, too. So I was with Piaget eight days translating, and it was a thrill of my own, personally. And I wrote a report of it for my organization, which let me do this, and that thing was called Piaget Rediscovered. I really had my own rediscovery because I'd left him some years before. But it could also have stood for in the United States because he had gotten honorary doctorates from both Yale and Harvard in the thirties. I mean, he was big already in the thirties. My mother studied him when she was at McGill. So it was a bit at that level also, that paper. That paper of ours was well received and got a lot of press, well not press…a lot of readings. So I think that did help and the paper was getting away from the idea that stages are the only important thing in Piaget's work and talking more about power of children's own intelligence to do what they wanted.

Interviewer: Two aspects in the work of Piaget and Inhelder were especially important to you. First, this basic idea of assimilation, in which every person creates meaning on her own while taking any experience into her own schemas or structures or previous understanding. And second is this notion of the clinical interview or clinical method where you engage children in talking about their ideas with the researcher. Can you say more in particular about the power of the clinical method for teachers?

Eleanor: I sure can. It's one of my favorite topics. So I trained in Geneva as a researcher, learning how to talk to kids and finding out what they thought about things. And that took engaging them in thinking about something, so they didn't just talk off the top of their heads, and making them free to say what they thought, and encouraging them to say more.

When I got to the Elementary Science Study, which was a very important move for me also, an important experience in classrooms, because I didn't know any science, right, I wanted to see what the kids were thinking. So my colleagues would give them whatever they were to think about and the kids went to work with each other and their own ideas to do whatever was requested of them, and I went to talk with them about what they were learning. And I found that when I was asking Genevan-type questions, which didn't give away the answers I wanted them to give, they got more and more interested in telling me their thoughts. If I was really interested in their ideas, they wanted to tell them to me. And they started to take their ideas seriously also. So then we got to work with teachers. We introduced, my colleagues had this good idea to introduce teachers to the materials by having them be students learning to use the materials as they were hoping the kids would. And again, I found they were interested in their own ideas as I started to teach as I got into those units that we were developing and I found that teachers also were interested in their own ideas if they were given a chance to think about their own ideas, with materials and with other people's ideas to go along with it. I also found myself totally fascinated by it. I was learning a lot of science by doing things with the materials my colleagues and I were developing, and I would show my friends all the fascinating stuff that we were doing and I found that they liked to talk about their ideas rather than hearing me explain. I mean, I had to hold back from explaining, but once I did that, they really liked it better. So that's led me to think that giving students interesting materials to work with, with lots of potentially grand ideas in them, and asking them questions like a researcher, like a Genevan researcher, got them very interested in the subject matter and very deeply involved with it, providing there was stuff to think about, not just, well like knowledge they could study themselves, but materials in the world that they had to explore. The curriculum developers just chose which materials to start with, which questions to ask, and had other back-up materials for when they would go next. So it's not just sitting and talking off the top of your head, it's a different approach--without telling learners what to think, but instead asking questions like a Genevan researcher, not giving hints. As a researcher it does you no good to give hints on what the answer is before you let them tell you. You have to be very encouraging, make it obvious that you really are interested in their ideas without telling them any particular direction to go.

I have found now over four or five decades that I have been doing this, that that is the best way to involve people in learning--to be in the classroom like a Genevan researcher asking the questions, letting the students get the answers, give their thoughts, then you're very well equipped to know what they're thinking and what needs to happen next. If you don't like what

they're thinking at that moment, or if you…that's not the right way to put it…but if you know they could go more deeply into the subject matter, just keep giving them…The job of the teacher is to have the materials ready to keep the learners having enough to think about. That confirms some of the thoughts, that challenges some of the thoughts, that gives them surprises, that gives them support, that gives them encouragement. The teacher's role is to keep the students in direct contact with the material and ask the questions with a neutral response towards the correctness of the answers. An enthusiastic response towards the fact that they're giving ideas, but not say, "Yes, that's right" or "No, that's wrong." So what I've been doing with my students…in science you can see how that could work, because the materials will give the answers before long. But my students have shown me that it is the case in any subject matter that without correcting, just getting them more deeply into materials of the subject matter, the ideas develop and the students remain deeply involved in their own thoughts and getting their own selves to match what they see in the materials and in each other's thoughts.

So I follow---critical exploration is the name that Inhelder gave to the Genevan approach. Piaget had called it clinical interviewing, and for some reason Inhelder changed it to critical exploration, which most people found a more adequate name. So I followed critical exploration in the classroom, which is a harder thing because instead of one person each time, you have thirty people at a time. But it's also more fascinating because instead of one session, you have many, many sessions on one subject matter with this group of children. So it's a fascinating work to be done and teachers and children learn together. Children (or whatever the age of the learner is--for me, most of my learners are adults)…So the learners are always giving insights into the material that the teacher hasn't thought of before. No matter how long you teach the same thing, people come up with things I haven't thought of before on this subject matter, and everybody wins.

Interviewer: Thank you. Your landmark book, *The Having of Wonderful Ideas,* it's one of my personal favorites. It's one that I always ask my students to read and I'm sure many of you have read that, I've always loved the quote which I found out on the train coming in was not necessarily originally Eleanor's but it's one that has stuck with me a long time, and that is "You don't want to cover a subject, you want to uncover it." In your words, tell me what you mean by that and talk more about how this book has, how you feel this book has influenced the work of teachers and teacher educators.

Eleanor: Those are two questions.

Interviewer: That's right.

Eleanor: "What does one sentence mean?" and another "What does one book mean?" I'm not sure I can answer the one about the book. But, yes, Dave Hawkins quotes this line, you know, "Don't cover subject matter, uncover it" and I quoted him on that. He quotes it from somebody else, who is Victor Weisskopf, who was a physicist friend of his who was around at the time. He was a very humanistic physicist, so very interested in education. David Hawkins himself, as I might have said, is a philosopher of science. His wife (this is not your question), his wife was a nursery school teacher and he learned a great deal about teaching from his wife.

So covering a subject as opposed to uncovering it--I sort of see the way a textbook covers a subject is sort of painted over, sort of, there are all the words, lots of words that hide the depth of the meanings behind them. They are taken too facilely and too superficially explain, so you can't ever get beyond to the subject matter itself. Whereas uncovering it, you just keep finding new things and new surprises.

One subject matter I do with my students all the time is moon watching. This came out of the Elementary Science Study from my experience. I modified it somewhat. So what I have my students do is watch the moon, keep it in a book, write down every time they see it, write down what it looks like, where it is, date and time, and other stuff they wish to. They now, of course, take pictures of it all the time. There's less drawing than there used to be. And then every couple of weeks we get together with what everybody has seen and try to figure out what are the habits of the moon, the moon's movements, essentially. It's a perfect topic, really, because the moon is there and available to almost everybody. There are some places where it's not safe at night to look for it, so that makes it difficult. But then people find that they can see it in the daytime, so that becomes possible. It's good to be able to see it at night, to get more information, but it's not essential. It goes…finding the general habits of the moon is one thing which is fascinating, if you can find its habits in the course of a day or its habits in the course of a month. And then as you get into it you find its habits in the course of a year. But there are all these different levels to be finding out about. You get some insights, and then you get some other insights, and then you go back to the first insights. But putting it all together and figuring out which data you want to present at the end of the year, if we have these. Where is the sun and where is the earth and where is the moon? If the moon in the sky looks like x, it looks like x followed by y, what must be going on up there in the sky? And it's very difficult …that was a poem.

Audience: (laughter)

It's very difficult to do. It takes an awful lot of work putting it together. And I can't remember why we're talking about this. What did you ask?

Interviewer: What properties….

Eleanor: That's right, that's right, that's right. So in the case of the moon, most people haven't even noticed you can sometimes see it in the daytime, and haven't noticed which direction it moves, and all kinds of things they haven't noticed. There's so many things to notice. And everybody's studied it in the textbooks, we all read before what goes around what, and at what speeds, it's all printed up in the textbooks. That's it, essentially.

Interviewer: Thank you, thank you. In the interest of time so that we can have some time for questions, I'm going to kind of end with two questions. I'll ask them one at a time. The first would be, "What would you consider to be the central question of your research over five decades?"

Eleanor: Yes, that's easy. My question is, "How do people learn things and what can anyone do to help them?"

Interviewer: Very good, very good. And then…

Eleanor: Let me say, let me say, at least to my definition of what a teacher, not a definition, my view of what a teacher is, a teacher is someone who has helped somebody learn. Teaching is helping somebody learn. It's not telling. Telling is the least good way to help somebody learn. But often people think, well, I'm not telling them anything, so I'm not really teaching them, I'm only facilitating. No, not telling them anything is the best thing you can do as a teacher. It's hard, it's hard, but finding other ways to get kids into a subject matter is the most rewarding. So yes, what can anyone do to help? That is how I want to be a teacher.

Interviewer: Thank you. I love how you describe yourself as a philosopher and on the train coming over I mentioned that one of my favorite philosophers was Maxine Greene who said, "I am who I'm not yet." And so I want to ask you this one last question, "What would you still like to do or accomplish?"

Eleanor: Well, I'm going to the Critical Explorers organization you mentioned a while ago. We're working hard to get a curriculum in schools and teachers in schools prepared to be teaching this way as much as possible. So we've…I was once asked to make Elizabeth New Jersey a whole school system of this kind of work. I was thrilled by the notion. But the ask was by an acting superintendent and within a couple of months the superintendent came back and it all ended. I was very sad about that. So I tried to redo, recreate that experience. We're working in a Watertown middle school right now. A teacher invited us in. She knew what we were doing. She learned that we had some curriculum on ancient Greece. She was a seventh grade teacher and she had to teach ancient Greece. So she asked for our help. And that's how we got into that school where our one staff person is a historian. We only had enough money for one staff person. She's a history teacher and so she now has been working at that school, this is the fourth year, I think, developing different curriculum, mostly in the humanities, a little bit in science. The curriculum is essential for being able to teach the way I describe, letting the kids…not getting between the subject matter and the kids. Because, as I've already said, you can't just say here's some beans, now do math with them. They sort of have to have some idea of what curricular materials are, and what steps there are. So she's been doing that. There's only one posted on our website which is a middle school curriculum for slavery, on slavery and reconstruction. We've been developing another one, but haven't yet gotten it out there because of little manpower, on the industrial revolution from the point of view of women dairy farmers. You know, what were the consequences for their work when the trades started taking their butter over hundreds of miles away, and where the butter was made in the creamery, and so on. Fascinating. And how did they keep it cold? Who was designing the stuff? It's fascinating material. And there's one the Middle East. And there's another big one, I'll remember it in a minute, I can't remember. So we started with two middle school history teachers, and now in that school we have about 20 teachers involved, and the principal and the superintendent are both very enthusiastic. So we're trying to get enough funding to get other staff people to get into other schools, and also to get the materials written up on the website that we have, because we, this poor one person is doing four jobs full time, so…It's going very well and I hope that we'll be able to get that this month.

Interviewer: Wonderful. Thank you so much. I think there's some time. We'd like to have some questions from you. And so I think there will be a few people walking around with microphones. Kate has one. Yes…

Audience member: Jane Meade-Roberts from Salinas, California. Can you describe the difference… or describe constructivism. Is it a methodology or a theory?

Eleanor: Well, it's not a word I use to talk to…I think it has a broad meaning or different meanings through history. I think basically it's a view on learning--a theory about learning with which I have no…Well, Piaget's view of it, I think Piaget's view…because there's some approaches to constructivism in teaching where you let kids have their own ideas until you really have to tell them the answer. And I think that undoes it. But Piaget, of course, wasn't a teacher. So I'm wrong to say that I'll stick with his view of teaching. I stick with his view of constructivism that is the essence of…anything important is done by the knower him or herself. Other people can be of help, some help, but the work has to be done by the person who knows. You can't put knowledge into people's heads, they have to assimilate it. So I would say constructivism is the theory and there are many people who claim to be doing constructivist teaching and I think that has to be looked at carefully.

Jane: Thank you.

Eleanor: You're welcome.

Interviewer: Anyone else?

Audience member: Can you give us an example of the Geneva method of asking questions?

Eleanor: An example of the Geneva method of asking questions…Well, you know the conservation experiments, I imagine. So let's take the classic glass of water, two glasses of water, and you just make sure, you have to make sure you know the questions you are asking. There are two equal glasses of water, and you pour some in each, and the kid agrees, "Yes there's the same amount in each of these." Then you pour one of them into a tall glass and ask what they think now. And then one of the aspects often is a counter question. Piaget used to say, "Another little child told me that he thinks *this*." I don't use that. I say, "Some people say…" "So some people say"…If the child says, "Yes, they're still the same" the counter question is, "Some people say that there's more here now because it goes up higher. What would you say about that?" And then you just take it, what they say. Or you might say, or if they say, "Well, there's more here now" then you'd say, "Well some people say there's the same amount because it was the same before." So that's one aspect of it. Is that an answer?

Audience member: Yeah.

Eleanor: OK. And that goes on in classrooms all the more easily because usually there are other children in the classroom saying it. It reminds me of a class I once did in the ninth grade with…the teacher was a very fine student of mine, Lisa Schneider. I should say that the staff person in Critical Explorers, her name is Alythia McKinney, she did a totally extraordinary job.

So in this ninth grade class we were looking Piaget's proportions, I think it was coffee, the storage of coffee…I don't think I should go to that…"How milky is your coffee?" was the question. For kids it is usually how chocolaty is your chocolate milk?" But then there were two usual versions, like having them compare two cups and they know how many units of each is in each cup, and they're supposed to decide whether the two cups would taste the same or whether one would taste more milky than the another. And one group, what half these kids were committed to, "They're the same. There's no reason that, you know, because there's only one more of the milk in this one than in that one, otherwise they are the same." And the other ones would say, "No, they're not the same because of this difference." They were really having a big battle with each other and the teacher and I, Lisa and I, didn't have a word to say. They finally said they wanted to know the answer. They asked Lisa the answer. And she said, "Well, I'll tell you what I think. " And they said, "We don't want to know what you think, we want to know the answer!"

Audience: (Laughter)

Eleanor: They didn't want her to tell them what she thought, so she didn't. And they got really grumpy at not being told and when they left, I heard one of the angriest kids say to one of the others, "This is the only class I open my mouth in." Which seemed perfect, because they all had counter arguments for each other and went on and on and on.

Audience member: I'm just curious, I've read your work and I actually taught in Geneva, Switzerland in the U.N. School and folks from the Piaget Institute came and were asking my students questions.

Eleanor: What years were those? What year?

Audience member: 1972. Anyway, I thought it was a wonderful experience for me and now we're in 2015 and I'm very depressed. And I'm wondering what your thoughts are about the country, this country and education, and if it will right itself or, I mean, what's going to happen?

Audience: (laughter)

Audience member: I know it's a big question.

Eleanor: No, it's very sad, it's very sad. Yeah, we're all very sad. And I really don't know what's going to happen. I'm not very optimistic. But it's just going so terribly badly. The one thing that gives me a little hope is, do you know what fair test…?

Audience member: Yeah.

Eleanor: fairtest.org. Monty Neill is the director there. I think it's on fairtest where they post, or it's on, you can find out if you get in touch with fairtest. It has weekly about fifteen new stories about responses to testing, about school systems and teachers and parents and superintendents on rejecting the testing movement, so I do think that's growing, and I do have some hope that before too many more years there will be a…they'll let go of the testing. But it's such a powerful

commercial industry. But you know what? You had…this is sort of…I don't know. One of the questions, I think, was what inspires me?

Interviewer: Yes.

Eleanor: What inspires me is people who are… who strive hard to understand. It's learners I see in classrooms. But it's also people struggling in every part of the world, I guess, enormous numbers just keeping up the struggle and kids learning in classrooms being beaten down often, being elevated often, dutifully struggling. It's not painful struggling in the case of kids, it's enthusiastic struggling, but it's marvelous to see it happen, as you all know, to see kids really working on something until they understand it. And I like to see, although most of my students are adults, it's perhaps even more exciting when you see adults struggling to understand because they have to give up, so much to change an idea that's important to them with this. That has affected many decisions they have made in their lives and in an industry where that wasn't the right basis for those decisions. That can be painful and very inspiring to see people struggle like that.

Interviewer: Any more questions? I think we have time for about, maybe two questions.

Audience member: Thank you for all your inspirational words. This sort of follows the last question, but a little bit more nitty-gritty. So when your adult members come back for their practicum or internship experiences in a typical public school (I know mine come back and I give them a similar message) and they say, "But, oh, we're scaffolding the children. We're doing what we see in the schools, which is basically telling them the answers." How do you counteract what they're seeing so often with the message you're giving?

Eleanor: Well, my students are different from your students. I have very few pre-service teachers, they're not going out to other teachers. They're mostly experienced teachers so they compare to their own work to what they've done. So I don't have quite that problem. But there is the question, "How to do it in the classroom?" which is always, always there, which is becoming more and more difficult given the grip of the testing. So they don't have a choice, teachers don't have a choice. They have to make sure the kids do well on tests. So they have to decide often, am I going to try to help the kids learn or am I going to teach them how to pass the test? And it's a terrible dilemma. People have different responses to it, different at different ages, different grade levels, different testing of a different sort, and different consequences. But some people make a decision, make sure the kids know we're really learning now, but now we'll stop learning and prepare for tests.

Audience: (Laughter)

Eleanor: So they make it explicit, and still try to get enough time for both of those things. Other teachers just keep to the learning and find that with that the kids *do* do better on tests, even though they haven't been trained for the tests. So that's when that works. I think it's…there's some kinds of exams where there's so many specific facts that they're supposed to know that that works less well. But it's just a terrible dilemma for each teacher. I think just as long you bear in

mind the difference between learning and preparing for tests, then you have some basis for making your own decisions for yourself. But it's very, very difficult.

Interviewer: One last question.

Audience member: Before I ask my question, I just want to make a comment to the woman over there who feels sad. One of the things that I've been doing that's been very inspiring, is that I belong to three online chat groups and I attend the comments on Monday with some of the people, and there's this grass [roots] movement among teachers to create change. The way they're helping each other create change is they're connecting people from all over the United States—there's somebody from California and somebody from Canada. There are about, in each of the groups there are about 40 or 50 or 60, I don't know how many people, and they just comment on those sorts of things that get them through the day, because they'll say to each other, "What are you doing? How are you getting around this?"

Eleanor: Can you give us any way to connect with them?

Audience member: Voxer is one of the most important ones…

Eleanor: How do you spell that?

Audience member: VOXER

Eleanor: Dot?

Audience member: Not it's just Voxer, it's an app. You can talk with teachers, and it's really a powerful site. Teachers are talking to each other, sharing ideas. And the interesting thing about this is that they're elementary, middle school, and high school teachers, and yet they're sharing common ideas, common strategies which leads to my question for you.

What would you say would be the most important idea that we, as teachers from elementary through college, that we can bring back to our instruction that would have been influenced by Piaget and Inhelder's work?

Eleanor: I think, I don't know if it's the most important one, but one of the important ones is that kids love to think and they think better when nobody's telling them what they're supposed to think.

Interviewer: Eleanor, thank you for your generosity, your attitude, the gift of your presence here today. I think we're all inspired by your work on the ideas that have been generated over the years. So thank you very much.

Eleanor: Thank you, thank you.

(Applause)