PRESCHOOLERS KNOW, BUT HOW DO THEY KNOW? DEVELOPING A FRAMEWORK FOR EARLY EPISTEMOLOGY DEVELOPMENT

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ABSTRACT

Two areas that are lacking for the purpose of training high-quality preschool teachers; and constructing developmentally appropriate learning standards and curriculum for preschool children are awareness of early epistemic development (beliefs about knowledge and knowing) and understanding preschoolers' cognitive processes during epistemic development. Personal epistemology is an individual's beliefs about the nature of knowledge and the process of knowing (Hofer & Pintrich, 1997). During the past three decades there has been substantial gains in the area of personal epistemology, particularly in college students (Perry, 1970; Baxter Magolda, 1987; Schommer, 1990), adults (King & Kitchener, 1994; Belensky, Clinchy, Goldberger, & Tarule, 1986), and more recently adolescents (Kuhn, 2000; Mansfield & Clinchy, 2002). Specifically, the use of, inquiry, focus groups, and technology during instruction can identify more observable developmental schemes, such as, cognitive processes (theory of mind), social, and emotional views of the child. Knowing how these developmental domains operate harmoniously can provide more meaningful insights about "what" and "how" children begin to conceptualize knowledge and the process of knowing. This ecological and epistemic framework can have implications for early childhood education. This article describes new research and thinking about the epistemology of preschool children and how it might influence teacher training and instructional approaches.

Keywords: Bioecological Model of Human Development, Personal Epistemology, Cognitive Development, Metacognition.

INTRODUCTION

One of the Historic approaches to studies in early childhood education (3-6-years-old) have focused on traditional developmental domains (e.g., motor skills, social, emotional, and cognitive). These studies have been the cornerstone of teacher preparation programs and guide most early childhood practice in the United States. However, as societal and cultural issues change the contemporary needs of early learning (preschool) has shifted to encompass a broader spectrum of interactions and influences on development and learning. Lee and Johnson (2007) argue that the field of early childhood has maintained an allegiance to outdated and limited developmental theories that require updating and broadening. Some literature argues that Piaget underestimated young children and believes that children's ways of thinking are more sophisticated and complex than initially theorized (Flavell & Miller, 1999; Wellman, Cross, & Watson, 2001). Studies by Rochel Gelman and her colleagues have found ways to engage young children in complex scientific thinking using a coherent program that is sustained over extended periods of time. Young children are capable of building progressively on knowledge they gain in a particular domain (Gelman and Brenneman, 2004). The key finding from Gelman's work is that children may be capable of scientific thinking far more complex than most casual observers might expect, and than scholars such as Piaget had considered possible. The professional challenges that this raises for the early childhood field are formidable.

Individuals have to mount new mental structure as well as accumulate relevant data for the structure. The challenge is clear. Researchers and early childhood professionals need to explore the capabilities of young children and develop new ideas on what teachers of younger children should do to ensure all children reach their potential.

Research on the development of cognitive skills has provided fascinating new ideas concerning what young children can do, but very little guidance for adults about how to use this information in caring for young children. Unfortunately, these advances in understanding of children's thinking do not seem to be shaping practice and policy in early childhood. The tremendous gaps between what is known from developmental research and the usual content of curricula and the nature of practice in early childhood settings may inhibit children's ability to reach their potential. (NRC, 2005) The theoretical task is two-fold: to spell out how new mental structures are acquired and to achieve a theory of environment that supports such learning (Gelman & Brenneman 2004). The authors have known for some time that metacognition may facilitate activities such as; reading, writing, and arithmetic. However, some thought and attention should be drawn to a reverse hypothesis. The authors are inclined to agree with Flavell, Green, & Flavell (1995) who suggest that, engaging in such mental activities in school may facilitate children's knowledge and awareness of their own and other's mental lives.

Two areas of study in early childhood education are; (i) awareness of early epistemic development (beliefs about knowledge and knowing); and (ii) understanding preschoolers' cognitive processes during epistemic development. Personal epistemological development in young children is a new but expanding field of research which could influence instruction, and achievement for both teachers and children. These areas investigate how mental structures are acquired and lead researchers toward hypothesis formation of environmental influences.

The basic premises for this paper come from three bodies of work in which the context is supported: 1) The need for understanding of personal epistemology; 2) New research on children's cognitive development and learning; and 3) The need for development of new frameworks of research analysis in early childhood education. The purposes of this paper was to disseminate new research about preschooler's developing epistemologies and to discuss an adapted methodological approach for studying personal epistemology in young children. For the purpose of this work the authors define personal epistemology as an individual's beliefs about the nature of knowledge and the process of knowing (Hofer & Pintrich, 1997) influenced by relationships among individuals who are instrumental in a preschool classroom. This paper will: (i) explain the trajectories of early epistemic development (i.e., early onset, recursion, and suppression); (ii) discuss the impact of young children's developing epistemologies on their broader cognitive development; (iii) use new methodologies to demonstrate the relationship to knowledge and understanding in early learning (i.e., teacher training, instructional techniques, and classroom practices). Faced with the increasing challenges of today's societal and educational needs, it is imperative that a new emphasis be placed on research regarding young children's early cognitive processes and development.

Over the past 35 years, an individual's beliefs about the nature of knowledge and the process of knowing have been conceptualized in a variety of frameworks: epistemological beliefs (Schommer, 1990); epistemological theories (Hofer & Pintrich, 1997), and epistemological resources (Hammer & Elby, 2002). Personal epistemology research was rejuvenated by Perry's (1970), *Scheme of Intellectual and Ethical Development.* Epistemology research has focused on adults (King & Kitchener, 1994; Belensky, Clinchy, Goldberger, & Tarule, 1986), college students (Baxter Magolda, 1992; King & Kitchener, 1994; Perry, 1970; Schommer, 1990) and more recently on development in adolescents (Hofer & Pintrich, 2002; Kuhn, 2000; Mansfield & Clinchy, 2002). Personal epistemology has been positively linked to many constructs in learning and cognition; and found to be an important part of adult and

adolescent learning. In terms of younger children, there is little knowledge about the early onset of epistemological development. There have been efforts to identify a possible pre-dualistic phases of epistemological development through links with theory of mind (Burr & Hofer, 2002), and folk epistemology (Kitchener, 2002). This paper will explore the following questions in relation to this developing field of study.

Research Questions

- What are preschooler's personal epistemologies?

- What are effective methods for studying and identifying preschooler's personal epistemologies?

- What classroom environments and instructional approach support these methods, so that preschooler's words and experiences provide epistemological information?

Some of the challenges to this work are: 1) identifying, interpreting, and understanding early epistemological development; 2) developing methodologies appropriate for young children that still maintain the validity of the construct; and 3) making the connection between pedagogy and epistemological development. One issue is that the authors as researchers attempt to measure the abstract construct of personal epistemology with younger children using the same methods that they measure older, more experienced students; and confuse their lack of language and communication ability with an inability to think more coherently in logical ways or use reasoning skills to express their beliefs.

Admittedly it is a complex and difficult cognitive construct; there is a strong need for its presence in early childhood research and practice (Burr & Hofer, 2002). The issue is further compounded by understanding of Developmentally Appropriate Practice. There have been heated discussions even among early childhood educators in the past several decades regarding some guidelines published by the National Association for the Education of Young Children that relate to *Developmentally Appropriate Practices.* The term "developmental" is ubiquitous in early childhood and is consistent with the field's long history that stresses the

importance of understanding children's development first and foremost (Winsor, 2006). Epistemology of young children and how to study and document this evolution of epistemological understanding is controversial and considered by many as opposing developmentally appropriate practice. The authors propose that young children are capable of higher order thinking skills (i.e., beliefs about knowledge) but they, as researchers methodologically approach it in a developmentally inappropriate contexts.

The authors will look at theoretical influences through two contexts to support our thinking. The first of these is the idea that the study of young children's personal epistemology is possible and the second is an appropriate method of study which includes environmental setting and instructional content and approaches which enhance this work. The authors acknowledge that this research can only offer extrapolated predictions and assumptions because of the lack of awareness and research of early epistemological development (Chandler, Hallet, & Sokol, 2002; Hofer, 2000).

Theoretical Framework

The framework used for our approach incorporates inter- and intra-related characteristics that young children are challenged by during this stage of development: (i) cognitive (i.e., beliefs, theory of mind, language); affective; and social components. The focus on the relationships between the individual's in the child's microsystem and the developmental processes that overlap and parallel children's way of constructing beliefs about knowledge and the process of knowing. This work uses a microgenic glimpse of a larger dynamic personal epistemological perspective. To understand the dynamic aspects of children's epistemology, the framework focuses on the child in an authentic classroom environment and taps into sub-systems that exist in the child's external and internal experience. The authors will demonstrate how parental influences, the teacher's instructional pedagogy, and the child's words convey personal epistemological development; and suggest our interpretation, as well as implications from this research on teaching and learning. In an ecological systems

approach (Bronfenbrenner, 1978) Bronfenbrenner, who was a co-founder of Head Start Programs in the United States believed that the immediate classroom environment is a *microsystem* and reflects relationships that directly impact an individual (i.e., family, peers, teachers); a *mesosystem* is that which directly links to the immediate classroom environment (i.e., a child's home environment); an *exosystem* is that which indirectly links but may affect the immediate classroom environment (i.e., a parent's work, relationship, financial situation); and a *macrosystem* is the much larger cultural context that can impact the classroom environment. A chronosystem is more developmental or contextual capsules of an individual's life experiences that build upon each other. According to Bronfenbrenner's (1989) bioecological model of human development, nature and nurture interact to describe development as it relates to individual differences that are present between cultures, neighborhoods, and families. Personal epistemology research is just beginning to identify connections with other cognitive constructs and to identify similar significances between epistemic understanding and learning with younger students. If the authors accept that during the early evolution of socialization, families and classroom interactions shape the child's behavior and sense of identity then they must also accept that families and classrooms influence the epistemology development of children. A sense of belonging occurs when the child makes accommodations that adapt to the family or classroom; and may consciously or unconsciously commit to performance patterns. The sense of separateness and individuation develops through participation in different group subsystems within different classroom related contexts and in groups that are linked to the Microsystems but are external to the classroom system.

Operationally, the structure of the classroom is seen as the proximity and distance between members in the system. The functionality and dysfunctionality of this proximity and distance are determined on the basis of the developmental stage of the members of the classroom. For example, it is appropriate for a mother to tell a three-year-old to pick up their socks but it is developmentally inappropriate for a mother to tell a twenty-year-old to pick up their socks. It is the developmental level of the child within the context of their family and how it is identified within the classroom context that this study proposed to identify through a family systems framework.

Theoretical Influences

Piaget: Piaget has been one of the most influential researchers in the area of developmental psychology. He was primarily interested in the biological influences of how it is that we "come to know," or what he referred to as "genetic epistemology" (Piaget & Inhelder, 1969, p. 81). Piaget separated humans from other living creatures because of our ability to do "abstract symbolic reasoning" (Smith, 1993, p. 8). According to Piaget (1971), the process of development is carried out in a series of stages, each of which has a cognitive and logical form. Piaget's research deals with children ages 3 and 7; and according to him, these children are in a preoperational stage of development in which knowledge is believed to be intuitive in nature. During this stage of development children begin to acquire representational skills, and their thinking is more conceptual. This is also identified as a time when language begins to develop rapidly. Piaget used the term *egocentric* to describe the self-oriented nature of children's thought processes. He believed that children were limited to using their representational and language skills to understand the external world only from their own developmental stage perspective. Gelman (2000) had similar thinking when she used 2-year-old children to demonstrate differences between essentialism as a philosophical position (i.e., nature of reality) versus essentialism as a folk belief (i.e., nature of people's ordinary belief system); claiming that we are all essentialists (people or groups of people have the same characteristics and they are fixed) in our psychological understanding. The significance of Gelman's research to the current study is the distinction between reality and beliefs. Gelman (2000) reported that essentialist bias emerges at least by 2.5 years of age and maybe earlier.

Piaget identified his concrete operational stage, between the ages 8 and 11, as when cognitive structures change

to logical thinking but depend on simple, unidimensional, concrete ideas. At this phase, children have the capability to consider another person's point of view and consider more than one perspective simultaneously. Piaget argued that children at this stage have the capacity to understand concrete problems, but they are incapable of considering or solving abstract problems and have not become cognizant of the diverse consequences that exist as a result of their behavior. Children during this phase of development acquire the ability to understand principles of conservation, classification, sequencing, and spatial reasoning.

Vygotsky: The major theme of Vygotsky's theoretical framework is that social interaction is fundamental in the development of cognitive development. Vygotsky (1978, p. 57) states; "Every function in a child's cultural development appears twice: first, on the social level, and later, on the individual level". Therefore, he suggests that interactions among individuals and with their environment first occur externally, as interpsychological experience, and then second, within the individual, which he referred to as intrapsychological. Vygotsky argued that all higher-order functions are actually internally manifested initially through external relationships between individuals. This is in direct contrast to the beliefs of Piaget's philosophy of egocentrism and socialization.

Vygotsky considered language and nonlinguistic behavior as the process that begins at birth with external exposure to the words and actions of others, which are then subsequently internalized by the child. It is only after repeated experiences and a gradual mapping of the language and actions of the outside world that a child gains the capacity to become egocentric or autonomous. It is this perspective that lends support to a question such as; can children be assisted by others to be introspective about their thoughts by asking them what their brain is saying to them (e.g., about knowledge, beliefs, desires). Initially young children reflect on their own thinking when engaged in conversation with adults; and then in self-reflection (e.g., private speech). However, there is an intermediate stage when young children experience self-reflection as the voice of their

own brain (Flavell, 2000). Flavell, Green, & Flavell (1995) suggest that this interim phase occurs when children hear themselves talking out-loud to themselves during egocentric, private speech. Vygotsky (1978) viewed language with a cultural, historical, and social lens and believed that development is first facilitated by interaction and the use of language among individuals. Conceptually it is this process that allows learning to occur and precipitates the restructuring of an individual's thought process, and, in a reciprocal fashion, the new thinking thereby impacts language (Wink & Putney, 2002). Although Gelman's (2000) findings are in contrast with our theoretical framework she makes strong speculations about the role of parents and language in essentialist concept formation in young children and how this might impact fixed perspectives in the development of cognitive processes.

Vygotsky's theory also acknowledges the influences of parents, teachers, and peers in terms of cognitive and epistemological development of children which are important aspects of the current study (ecological systems theory will be discussed). Although it was Vygotsky who introduced the influences of language, he failed to elaborate about how language was actually used in the process of teaching and learning. A second important aspect of Vygotsky's theory is the concept of the Zone of Proximal Development (ZPD) in which higher levels of development are attained when children are engaged in intellectual social behaviors (Bruner, 1978). Within the ZPD, it is believed that a child can reach a higher level of understanding and skill within a range of development utilizing either adult guidance or peer collaboration, and this would far exceed what the child could attain independently. Vygotsky is well known for his Zone of Proximal Development in the United States but his thinking about a zone of Advanced Development (ZAD) has largely been ignored in American education. Vygotsky's model is incomplete without the more advanced developmental zone where the child develops a deeper more sophisticated understanding of concepts built on interactions and progression through the ZPD. The Davydov schools in the Russian Federation are based on

this progression of development and children coming through these schools exhibit ZAD levels of understanding. Children in these schools use multiplicative reasoning by age 8 which supports the thinking that children are quite capable of more advanced thinking. In this way Vygotsky's approach is a demonstration of how intentionality and conscious awareness is produced by using socialization as a catalyst for the development of knowledge.

Another assumption the authors question is that children learn best if they experience tasks that are within their cognitive level of development, so that tasks which are developmentally appropriate can be achieved independently or with mild to moderate assistance. Vygotsky (1978) stated, children should be exposed to tasks that were developmentally advanced in order to strengthen intellectual capacity; "Instruction is only good when it proceeds ahead of development (Vygotsky, 1978, p.53)". This approach is an alternative to giving children free rein to construct knowledge independently; and may counterbalance the chances that children will construct misconceptions; which, in turn, increases their opposition to changing their misconceptions.

Relationships to Personal Epistemology. Piaget and Vygotsky are important in developing a framework for children's personal epistemology because of their theoretical contributions to early childhood cognitive development, their support of constructivist instruction, and their profound influences on adult personal epistemological research. Piaget's equilibration process; and Vygotsky's zone of proximal and advanced development stray from the idea that knowledge is fixed and independent of the individual. Instead, they have opened the door to view knowledge as constructed by the individual based on beliefs and experience. Piaget has contributed to personal epistemology through his emphasis on individual cognitive development and meaningful construction (Moore, 2002). Vygotsky has contributed to our understanding of knowledge as being socially constructed, which involves merging experiences and interactions within one's cultural environment (Bendixen, 2002). Other recent research in the field that

has promoted a Vygotskian perspective which views personal epistemologies as being socially constructed and influenced by one's culture and environment (Bendixen & Rule, 2004; Burr & Hofer, 2002; Haerle, 2006; Hofer & Pintrich, 1997). Our approach emphasizes this pedagogical perspective and examines certain assumptions of intellectual development including: (a) Intellectual development is driven from within an individual; and (b) the capacity for understanding is based on cognitive ability. The authors acknowledge that children differ in their innate ability but believe each child has the potential to achieve higher cognitive understanding based on the circumstances of their learning and by the contributions of their environment. They focus on the child's learning not solely as a reflection of inherent ability but also as a dimension of the effectiveness and communication of the teacher and the learner.

Other Influencing Theories

Dewey: John Dewey's idea of experience was tightly connected to the idea of nature but not as "the-world-as-it-would-be-independent-of-human-experience" (McDermott, 1981). Dewey believed that nature is a system of natural transactions that consisted of three parts. Human experience was one of these parts and was not reducible to any smaller form. Consequently, this notion opposed the more strict scientific representations of nature. Although Dewey embraced the scientific method of investigation as a way of thinking, he thought that the existing dualism between mind and body, fact and value, and individual and social, was inaccurate because it made it difficult to apply reason to human actions. Dewey proposed that a way to overcome dualistic thinking was to focus on what we want as an individual and what we ought to pursue. In this format using 'we' grounds our experience in our development and our social history. Extending the scientific method to accommodate practical judgments is similar to the process of collecting facts (Merriam, 2002). In the 20th century, Piaget and Dewey developed theories of childhood development and education that led to the evolution of constructivism and continue to heavily

influence personal epistemology too.

The modern consideration of constructivism is rooted in classical philosophy. It was Socrates who asked his students questions that prompted them to realize the weaknesses of their knowledge. This Socratic dialogue continues to be an important tool in the way constructivism views student learning and understanding of knowledge and uses the environment to create new experiences for understanding knowledge. In constructivism the external world is not rejected; it is merely limited to reinforcing individuals' availability for representing their experiences by reinforcing a scheme or rejecting it. There are two basic principles: (a) Knowledge is not passively received through the senses or by communication but is actively constructed by the thought and social interactions of the individual with the environment, and (b) the function of the individual's cognitive processes is adaptive to the individuals' experiences, not the objective ontological reality (Carpendale & Muller, 2004, p. 113). Constructivism declines to directly validate knowledge by comparing individual truths with the external environment; the primary issue is how an individual experience their world, organize their thoughts, and determine their experience. An inquiry-based approach is associated with helping students to develop higher-order thinking skills and independent learning skills for life-long learning. The progressive approach includes an emphasis on student-centered learning and a constructivist approach to learning. Students should learn to ask their own questions and then become engaged in finding answers to their questions. Most standards being written and adopted include an inquiry-based learning approach.

The authors infer from Dewy's and other work that the instructional context for studying epistemology in young children should be science based in a constructivist classroom. In science related domains the effects of instructional practices support the positive impacts of an inquiry-based instructional approach that emphasizes a supportive, questioning context combined with authentic science activities to capture young children's epistemological understanding and development

(Carey & Smith, 1993; Lederman & Druger, 1985; Solomon, 2007). The authors believe that young children who are taught science using an inquiry-based curriculum are cognitively ripe for exploration of epistemological processes and may develop more sophisticated conceptions about the nature of knowledge through inquiry science environments. Elder (2002) supported this thinking when studying the epistemology of fifth-grade students. He found a combination of naïve and sophisticated understanding present and believed this was due to the types of thinking that inquiry science investigations develop in students.

Minuchin: Salvadore Minuchin (1974) discussed the benefits of incorporating the family system into therapeutic situations; they translate the application from a therapeutic situation into the classroom environment and extend the interactions to include the relationship that the child has with the teacher and their peers. Minuchin (1974) defined the family structure as the invisible set of functional demands that organizes the way in which family members interact and develop patterns of communicating, solving problems, and coping. Repeated interactions establish patterns of how, when, and with whom to relate; and these patterns underpin the system; the authors hypothesize that this same process plays-out in a learning environment as well. Once these patterns are underpinned into the system dynamic or structure it is quite difficult to change the role that has been decided for each individual. This role that is designated to each individual is not a conscious or intentionally verbalized event; it occurs based on how the individual can fit into the system and get their needs met. Therefore, an individual can end up with an unsatisfactory role but cannot necessarily escape the role because the system has adapted to and expects certain patterns of behavior or thought from that individual. If the person or pattern within the system changes in the slightest' the whole system changes automatically; Minuchin (1974) called this the "dance." In this work the authors focus on the inquiry-based pedagogy of the teacher to uncover the children's dance or in this case the epistemological development, that occurs in the reciprocal relationship

between the child an the environment, in which higher-order thinking begins is initiated through the shared thinking and experiences of others within the learning situation. Our thinking with children's personal epistemological development-this dance-is complex and multidimensional.

Summary of Key Points from Theoretical Applications

- Younger students are capable of more sophisticated levels of understanding than traditionally accepted.

- The effectiveness and communication between the teacher and the learner determine the interpretation of these levels.

- The use of inquiry science interactions as the basis for epistemological study allows researcher to identify evolving epistemology in young children.

- The context of the child's interactions with family and educational environments influence the interpretation of children's thinking.

- The development of personal epistemology in children in multidimensional.

Personal Epistemological Beliefs

Historically, the measurement of epistemological beliefs has been a trying and controversial matter (Schommer, 1994; Schraw, Bendixen, & Dunkle, 2002). Researchers in the area of personal epistemology are beginning to notice the importance of social interaction. For example, Bendixen (2002) reported that as college students reflected about their epistemic doubt and belief change they emphasized the role of social interactions in their perseverance over epistemic doubt. Bendixen & Rule (2004) elaborate on resolution strategies as a final component in their mechanism of epistemic change process and stress the importance of social interaction in overcoming epistemic doubt or disequilibrium.

Personal Epistemology: Personal epistemology is generally accepted as being comprised of two dimensions concerning beliefs about the nature of knowledge and the process of knowing (Burr & Hofer, 2002). The nature of knowledge includes (i) the simplicity of knowledge (i.e., the relative connectedness of knowledge); and (ii) the certainty of knowledge (i.e., the

perceived stability of knowledge). The process of knowing includes (i) the source of knowledge (i.e., where knowledge resides, internally or externally); and (ii) the justification of knowledge (i.e., how individuals evaluate and warrant knowledge claims). However, in addition to the dimensions of beliefs just described, there is another widely accepted way of conceptualizing epistemological development, that is, in the form of three levels: (i) absolutism (i.e., simple, dichotomous views of knowledge), (ii) multiplism (i.e., reasoning is more complex and relativistic), and (iii) evaluativism (i.e., views of knowledge focus on evaluation and decision-making among differing views) (Kuhn & Weinstock, 2002). Each way of thinking about epistemological development is distinctly separate. In this analysis the authors use a matrix, how they view the dimensions of knowledge and the developmental stages of personal epistemology as integrated simultaneously.

Originally it was thought that epistemological development began in late adolescence; triggered by the intellectual demands of college (Burr & Hofer, 2002). It is also speculated that researching young children was simply inadvertently overlooked because early researchers in the field had their interests in higher education and not developmental psychology and therefore studied the age group of most interest to them (Hofer & Pintrich, 1997). Most researchers in the field agree on a general trajectory of epistemological development that begins as a type of absolutism, progressing into multiplism, and then finally into evaluativism. Chandler, Hallet, and Sokol (2002) state that this is the same stage progression that appears in most research in personal epistemological development, regardless of who is studied and no matter what the conditions or measure. However, when investigating preschoolers, Burr & Hofer (2002) identified a pre-dualistic or pre-absolutist phase of subjectivity, this phase of subjectivity is thought to be in contrast to multiplistic subjectivity and is in a sense of an egocentric subjectivity that occurs prior to an absolutist epistemological stance.

Flavell, Green, & Flavell (1995) proposes that there are multiple sources (e.g., developmental, religious, cultural)

available to young children for conceptualizing their knowledge and understanding of their own and other's beliefs, but insightfully they suggest that, children's ability to be introspective is most saliently connected to their internal dialogue. This can be viewed from two opposing perspectives: children can tap into beliefs about knowledge through a process of naïve theory construction (Welman, Cross, & Watson, 2001); or through a process of simulation or role playing (Varga, 1992). Flavell, Green, & Flavell (1998) findings support the later due to the constant interaction with others and then reflective time with the self. The current research demonstrates how children might become increasingly aware of their own continuous mental experiences (i.e., beliefs, desires, and needs) through exchanges with others (teacher, peers, researcher), followed by quiet-time or time away from a topic. Identifying changes in children over brief (4 days) lapses of time may support the intermediate self-reflective nature that Flavell et al. (1995) discuss as a development phenomenon that facilitates children's ability to think about their thinking; in this case it may suggest implications for how children begin to think about their beliefs about knowledge.

Other areas of cognitive development have flourished in their investigation of young children (e.g., theory of mind). Theory of Mind (TOM) refers to a developmental milestone in which children begin to recognize that other's perspectives differ from their own. The introduction of the acceptance of young children's personal epistemological development was published in a special issue of *New Ideas in Psychology (2002),* in which they debated the connections between personal epistemological and theory of mind development (Bartsch, 2002; Burr & Hofer, 2002; Kuhn, Cheney, & Weinstock, 2000; Mansfield & Clinchy, 2002).

According to theory of mind research, young children have the capability to consider another person's point of view and consider more than one perspective simultaneously much younger than Piaget had believed. In doing so their thought process becomes more logical, flexible, and organized. Theory of mind development is an area of cognitive development research that

investigates the nature and development toward understanding of the mental world, which refers to a developmental milestone in which children begin to recognize other's perspectives differ from their own. Individual's inner world consisting of: beliefs, desires, emotions, thoughts, perceptions, intentions, and other states (Flavell, 2004). In contemporary research the term theory of mind surfaced from Piagetian literature and with the work of Premack & Woodruff who investigated chimpanzees and their cognitive ability. Woodruff & Premack (1978) defined theory of mind as a system of inferences that can be used to predict behavior by attributing mental states to individuals.

Models of the Influences and Interactions of Epistemological Development

Current research strongly supports an integrated model for personal epistemology (Bendixen & Rule, 2004). The *Dynamic Systems Framework for Personal Epistemological Development* (Winsor, 2005) is quit comprehensive in terms of relationships between parent-teacher, parent-peers, and teacher-peers; this research strictly emphasizes the relationship between the child and teacher, parent(s), and peers (Figure 1).

In this study there is more focus on the child in relationship to the teacher and their peers because they are the constant in the classroom. However, the parent-child relationship is also represented because of the strong connection that is apparent in the child's articulations and
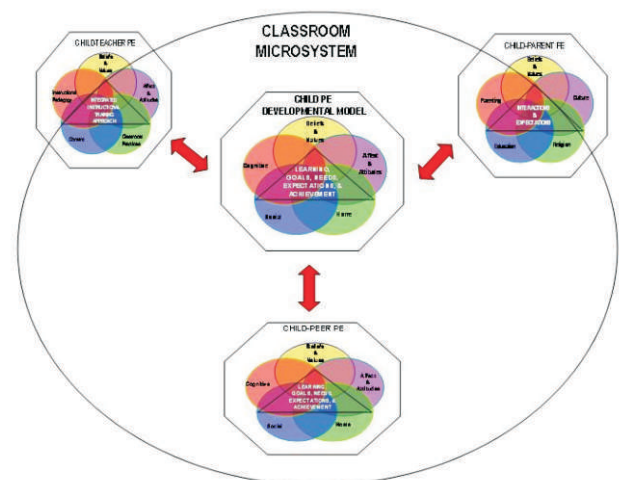

Figure 1. Linear View

behaviors regarding their knowledge. Bendixen & Rule (2004) included peers as a part of an individual's epistemological environment in accordance with Piaget's notion that peers are relatively at the same level of power; and is reflected in Figure 2 by representing that peers are completely within the microsystem indicating that their mesosystems are not considered in the present research. There is no reference to parental influence in the personal epistemology research; however, it is quickly gaining acknowledgement in curriculum and instruction; and early childhood education research.

The framework (Figure 2) represents each child's system; the most closely related factor and the focus of this study is the child's epistemological beliefs. Moving away from the center of the framework, other relevant internal factors are represented and are assumed to be related to the child's personal epistemology(PE). These internal factors include the child's theory of mind (TOM), affect, and language. In addition the internal factors are represented by dotted lines because there is interaction between these internal factors. There are three external subsystems in the framework; parents, teachers, and peers. Each of these are influenced through interactions among cultural, societal and educational environments and experiences.

Language is a complex concept that has several areas

that can be investigated; however, this study utilizes language as a single internal factor because it is thought to be a factor. This study is primarily concerned with the function of language; children use the same system for representing (verbal thought) and communicating (verbal discourse). Affect has also been considered at least theoretically to be important in personal epistemology research (Bendixen & Rule, 2004). The influence of affect on children's personal epistemology, however, has not been considered explicitly. We look closely at very young children and how their cognitive ability and interactions with peers may provide information about their epistemological development.

The Early Childhood Epistemology Study

Focus

This study is focused on the child at the center of the system model. Data was interpreted based on the relationships and interactions that the children articulate and demonstrate with the components in the microsystem (i.e., parents, teachers, peers).

Setting

The setting for this research was a University lab school in the southwestern United States. There are fifteen classrooms in the facility. The children who attend the lab school are 2 weeks to 6 years. The school is a diverse public school; therefore the students are a mixture from families in the community (low socioeconomic), children of students attending the university (single-parents), and children of faculty/staff at the university. Beginning at age 3, the lab school has two or three classrooms for each age level. Students are placed at a level based on age first. Then they are assigned to specific classrooms based on the teacher's understanding of the needs of individual children and the group dynamics of their classrooms. Each classroom has evenly distributed ability (low to high) students. Each classroom has one teacher and 3 to 4 student aides (undergraduate students) in the classroom at all times. If there is ever a problem in a classroom, teachers know that they can call for additional assistance from one of the other classrooms. The classroom for this study (Beetles) had 25 students; 14 female and 11 males.
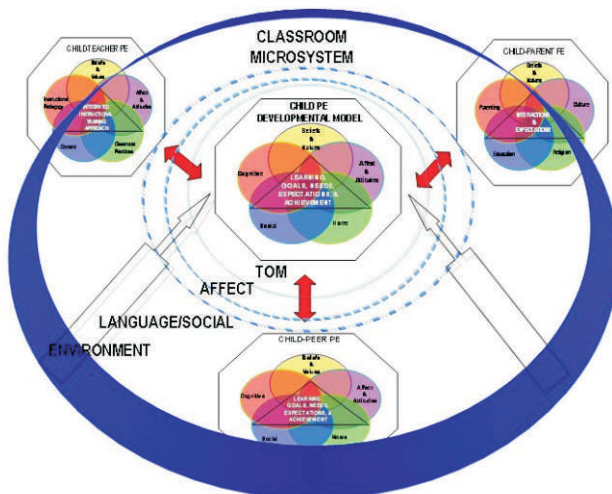

Figure 2. Dynamic System Framework for Classroom Personal Epistemological Development

Participants

The participants for this study were 20 students, their ages ranged from 3-years and 1-month to 4-years and 6-months. The gender of the students was counterbalanced, 10 female and 10 male. There were no selection criteria for the study; participation in the study was based on parent informed consent; therefore the student's ability ranged from high to low. The teacher was a 43 year old female veteran teacher, Miss Rose. She had taught at the elementary level in the public school system for 16 years. Miss Rose has been at the lab school for nearly six years at the time of this study. She was working toward her master's degree, attending night classes at the university.

Materials

There were no outside materials brought into the classroom by the researcher. All materials which were used in the classroom were part of Miss Rose's instruction and were provided by her. This insured an authentic learning environment and utilized materials that the students were familiar with from the classroom or that the Miss Rose was familiar with and represented typical instruction for this group of children.

Research Methods

Identifying characteristics of preschool-aged children's personal epistemology entailed using two classroom instructional approaches: (i) inquiry-based whole class instruction (one lesson at the beginning of the school day, 25 minutes) and (ii) discovery small groups (5 each day following the whole class instruction, 15 minutes each). These instructional activities were observed by the researcher and notes and checklists were completed during the observation. Due to the high levels of activity not all pertinent information could be recorded through observation, therefore all activities were video-taped and audio recorded. The inquiry-based whole class instruction had two cameras and each of the five discovery small groups ran simultaneously in a round-robin fashion; each group had an independent video- and audio recorder. In addition, the researcher conducted individual interviews with each student and the teacher and peer focus groups (also video-and audio-recorded).

Observation of Inquiry-Based Whole Classroom Instruction: There were two weeks of consecutively observed lessons (daily). Each instructional lesson consisted of a collaborative large group activity that lasted 25-to-30 minutes. The inquiry-based lesson took place on the floor in the center of the classroom. It is led by the teacher but there is also a teacher aide for every three children. The teacher aides are present for any late arrivals, behavioral issues, restroom breaks etc. that arise during the instruction. The observations of the lesson were used as the context/catalyst for the child-participant interviews and the peer focus group, as a way of tapping into the child-participants' understanding of the current lesson's theme and their beliefs about knowledge and knowing related to that theme. Simply, questions for the child or teacher interviews were constructed from the instructional observation. If the child or the teacher contributed an epistemic statement that warranted follow-up questioning it would be asked in a later individual interview.

Child-Participant Interviews: There were two weeks of semi-structured individual interviews with each child-participant and they did not exceed 10 minutes per child at any one time. Each child-participant was interviewed at least two times per week but some children were interviewed up to five times per week. The number of times a child-participant was targeted for an individual interview was dependent on the context and events during the classroom instruction that week. All interviews were video-taped.

Teacher-Participant Interviews: There were four semi-structured teacher interviews; Mondays and Fridays of each of the two weeks of data collection. The teacher had to complete a demographic for and two epistemological measures for the teacher selection process. Results from the analysis of this information were used to construct some of the questions for the initial interview. At the beginning of the week, the interviews were based on how she decided on the lessons for the week, her objectives, anticipated problems, possible solutions to

anticipated problems, benefit to the students, and assessing the students. The interview on Fridays again came from the instruction and addressed any follow-up and reflection questions from the interview at the beginning of the week. The interviews were 60-90 minutes (Mondays before school and Fridays after school. All interviews were video-taped.

Child-Participant Focus Groups: The focus group activities were facilitated by the researcher and were framed around two weeks of classroom instruction. Each child-participant was active in six focus groups during the study (introduction, two pre-instruction, two post-instruction, and a conclusion). Each of the focus groups consisted of three child-participants and the researcher. The introduction and conclusion focus groups were implemented to set group rules and provide closure to the activity, however, questions were posed and the child-participants actively participated. The pre-instruction (Monday before instruction) and post-instruction focus groups (Friday after instruction) followed group rules, they began with a structured question by the researcher and each child-participant would answer, then follow-up questions would be asked and the format gradually became less and less structured, where not every child-participant would respond systematically and the discussion veered further away from the original question but maintained the same general idea.

The questions in the focus groups probed personal epistemological reasoning and beliefs (Kuhn, Cheney, & Weinstock, 2000). The script for the interview and focus groups was strictly based on the classroom instruction that was taking place at the time. Some of the questions were probing for elaboration of cognitive processes and the participants' own real-life experiences. Specifically, the questions were related to the four dimensions of epistemology previously described: simplicity and certainty of knowledge in reference to the nature of knowledge; and source and justification of knowledge relating to the process of knowing (Hofer, 2001.) There were two weeks of focus groups and each week was based on the theme-of-the-week for the instructional lesson.

Instructional Themes

Week one of instruction was centered on farm animals and week two focused on plants and their growth. The focus groups served two purposes; (i) to attend to a smaller group of children and (ii) to build on what and how the children were thinking about the topic. During the focus groups children were asked questions based on their discussions during the instructional lesson (Table1).

Analysis

Adaptation of Methods for Young Children Coding Scheme. The coding scheme for this study was developed using inductive (individual statements that were believed to be relevant were coded) and deductive (dimensions of knowledge and developmental levels were coded) reasoning (Table 2). The statements were used to frame a content analysis by obtaining

Week One: Farm Animals	Week Two: Plant Growth
1. What kind of animals are farm animals?How do you know this?	1. Do you like plant? Why? Where do plants grow? What do they need to grow?
2. Where do you think you could find farm animals? How do you know this?	2. Why do you think this? Do plants have feelings? What feelings Do they have? How do you know this?
3. Have you ever been on a farm? What kinds of things did you notice while you were there? What kinds of things might you expect to see on a farm?	3. Are there good plants and bad plants? What do they do good? What do they do bad? How do you know this?
4. What do you think is the most interesting thing about farm animals? If you could change anything about an animal, what would you change? What it be like?	4. What makes plants grow? How do you know this? If you could be a plant, what kind of plant would you be? Why? Do you think it is okay for farm animals to eat plants? Why? Why not?
5. Do you think a dog can be a farm animal? Why do you think it can or cannot be a farm animal?	5. Do all plants grow at the same speed? Do all plants grow to be the same size?
How do you know this?	Why do you think this? Do you have a Plant? Tell us about it?
6. Why do you think cats have kittens and dogs have puppies? Why do you think that? How do you know this?	6. Is a flower a plant? Why or why not? Why do you think this? Do you like flowers or plants better? If you could be a flower what kind of flower would you be? What kind of plant would you be? Why?
7. Why do you think farm animals all get along so well? What experiences have you had with animals getting along or not getting along? What did you do? Why?	7. What happens when plants die? How do You know this? If you had to talk to a Plant for it to stay alive, what would you say to the plant? Why?

Table 1. Sample Questions from Peer Focus Groups

	Certainty of Knowledge Is knowledge stable or unstable?	Simplicity of Knowledge Is knowledge simple or complex?	Source of Knowledge Is knowledge internal or external?	Justification of Knowledge Does the individual evaluate the knowledge claim?
Absolutist Objective view of Knowledge	If two students are arguing about something at least one of the must be wrong.	I think teachers should focus on facts rather than theories.	I think children should always listen to their parents.	I am going to do what I want to do because I know what is best for me.
Multiplist Subjective view of knowledge	Every student has equally valuable contributions and their opinions should be heard.	Some tasks require basic factual knowledge but other times we need to have a deeper understanding of concepts.	At home I listen to my parents but when I am at school I listen to my teachers because they know what is best for me at that time.	In some situations ignoring a students behavior is more productive but other situations require time out.
Evaluativist Shift between objective & subjective views of knowledge based on the warrant of the knowledge claim	The best way to learn about global warning to present several theories & allow the student to decide which is best based on their knowledge & experience.	The more you know about a topic the more there is to know.	I think children should be able to question their parent authority.	Being an effective teacher means that you consider the individual students needs and apply what you have learned from books, experience, & others.

Table 2. Deductive Coding Matrix

relationships among individuals in a group through discourse and content analysis; and observation (Bogden & Biklen, 2003). Initial indexing of the transcripts guided the focus of the analysis (Frankland & Bloor, 1999), for this process the authors used complete sentences or a statement that was indicative of one thought. Each sentence or thought was assigned to a category: (1) epistemological, (2) affective, or (3) social. Levels and dimensions for each category were chosen for coding the data to make systematic comparisons within and between the groups.

Each of the three categories was then coded bi-directionally by level and dimension. Epistemological dimensions were identified as: structure of knowledge (i.e., simple versus complex), certainty of knowledge (i.e., stable versus unstable), or source of knowledge (i.e., internal versus external) and on three levels: objective (i.e., absolutist, personal "true" perspective), subjective (i.e., multiplist "True" perspective), or evaluative (i.e., integrated subjective and objective perspective with evidence). Affective dimensions were categorized as high, medium, or low; and at a level of positive or negative. Social dimensions were categorized as independent (i.e., individual or original idea), dependent (i.e., a collaborative idea or built upon a peer perspective), or combination (i.e., integrating their own idea with the idea of a peer). Inter-rater reliability checks occurred between the researcher and two trained volunteers to verify consistency of coding the levels and dimensions.

Analysis of Data

This section discusses the use of the constant comparative method of data analysis that took place in conjunction with data collection. The constant comparative method (Bogdan & Biklen, 2003) is recommended for research designs that incorporate multiple data sources (Bogdan & Biklen, 2003) and is consistent with analyzing case study data (Strauss & Corbin, 1998).

In this study, the constant comparative method allowed for many accommodations which reflected the purpose of the study: (a) it assisted the researcher in identifying preliminary individual and group traits throughout the data collection phase; (b) it provided opportunities to construct specific in-depth questions for each of the child-participants; (c) it made preliminary patterns in the data visible so that gaps could be easily identified, targeted, and probed during future data collection; and (d) because of the recursive nature in the design of the study, comparing the data continually maximized the researcher's ability to build strength and richness to the questioning (i.e., use the child's own words to get him or her to elaborate about a specific topic), compare individual and group data (i.e., probe a topic more deeply when patterns or themes were identified for and individual or group interaction), and link theory to individual and group epistemologies as patterns and themes began to emerge (i.e., preparing a line of questioning according to current developmental and

epistemological theories) (Figure 3).

This study spanned two weeks of whole class instruction, and data was reviewed daily as a function of the constant comparative method. Whole class instruction and center activity data were collected daily, and peer-focus groups occurred on Monday and Friday each week. Individual interviews for each child-participant occurred at least one time per week but could have occurred as many as five times per week. The number of individual interviews depended on three main issues: (a) the child-participant's level of engagement in the whole class instruction, (b) the researcher's subjective nature of inquiry based on the research question (more so during initial data collection), and (c) characteristic and traits identified in previously analyzed data (progressively dominant as more data was collected).

Each week followed the same format, for each of the six participants, as a means to inform the researcher how to proceed in terms of: (a) individual interviews, (b) concentrating on a specific method of data collection, and (c) formulating more in-depth epistemological questions.

There are six steps that Bogdan & Biklen (2003) recommend for use in constant comparative data analysis. Using this as a guideline, the preliminary data analysis steps during data collection adhered to in the current study are described next in more general terms, followed by specific examples. There were two weeks of data collection; each week was exactly the same format with two exceptions: (a) The topic of instruction was different each week; therefore, the center activities were changed to reflect the nature of the instruction, and (b)

Figure 3. Constant Comparative Model for Data Analysis

the number of individual interviews was different because it was based on the child's level of engagement or contributions. All interactions were videotaped and observational checklists were used for each phase of classroom instruction.

Step 1

Whole class instruction was generally 30 minutes each day and was video-recorded. Center activities lasted one hour, of each of the six participants during his/her involvement in the center activity of choice. Individual interviews were generally 10-20 minutes each and included the researcher and one child. The interviews and peer focus groups took place in a private area connected to the classroom. Each focus group was approximately 20 minutes. The pre-focus groups occurred on the Monday or Tuesday morning prior to the instruction, and the post-instruction groups were on Friday afternoons.

Step 2

Each day the video was reviewed, and field notes were amended to reflect observations that were not fully addressed during the observation in real-time. Field notes and checklists from the whole class instruction and center activities were transcribed. Individual interview videos were reviewed on the same day as the interview occurred; however, the number of interviews fluctuated from participant to participant and varied from week to week. Peer focus groups videos were immediately reviewed by the researcher; notes were taken and transcribed by the researcher for planning the next week's focus groups. This immediate preview of the data helped prepare for the next day of data collection in terms of: (a) identifying specific words or ideas children used most spontaneously and with ease, (b) identifying how they associated the instructional information to their own experiences, (c) identifying which context (individual, group, or 1-on-1 with the teacher or a peer) each child seemed to provide the most epistemological thinking, and (d) identifying which peers were drawn together and observing their social interactions. This information was essential for the researcher to make decisions about how to proceed with constructing questions and where to narrow the focus of the investigation the following day.
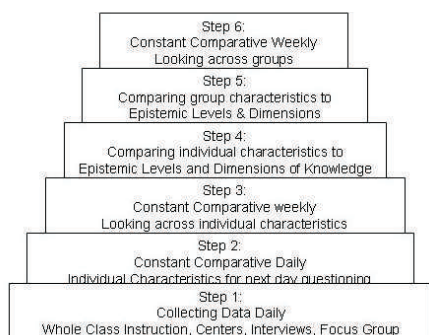
The questions pertained to contributions or interactions during the whole class instruction or center activities' observations as a way of probing the child-participant to elaborate on his/her statements. This included reminding the child of his/her own words using one of two methods: 1) verbally reminding the child-participant what was said and asking specific follow-up questions or 2) visually reminding them by showing a video clip of the specific instance that was being referred to and asking a series of related questions.

A peer says something about medicine and he says, "Medicine is not good for children." {Tone of Voice Change} "Only when mommy and daddy tell us to."

To demonstrate how the constant comparative analysis assisted the researcher in identifying areas of strength and pinpoint reoccurring characteristics that may exist, the transcripts were reviewed and specific questions were later used in an individual interview format with this child-participant. In this case the researcher verbally reiterated the statements the child had made separately; the following are some of the researcher's questions. "You said that you had to go to the doctor and get a shot but that you still feel sick. Can you tell me more about how you feel sick?" "What was it like for you to go to the doctor?" "What was the best part, and why?" "What was the worst part, and why?" "You said that we go to the doctor so we can feel better. How do you know that the doctor makes us feel better?" "You are very observant. You noticed that Joe's dad brought him to school. How did you know his mother was sick?" "What happens when your mother is sick?" "What changes for you when your mother is sick?" "You said that medicine is not good for children. Why do you think medicine is not good for children?" "Do you think that is always true?" "Can you think of times when it is good for children to take medicine?" "You said that it was okay to take medicine when your mommy and daddy tell you to take it. When do they tell you it is okay to take medicine?" "You seemed very sure when you said it was okay to take medicine when your mommy and daddy said it was okay. Do you think they are always right?" For this particular question the researcher showed the child a brief video-clip of the whole class instruction when he made the

comment. The question was to tap into the cognitive as well as the affective aspects of the response. Then a series of questions continued, "Who is usually more right, your mom or your dad?" "What other things do your parents tell you it is okay to do?" "Do you always listen to what your parents say?" "What happens when you do/don't listen to your parents?" "Why do you think you do/don't listen to your parents?"

Also, because the children related *Where the Wild Things Are* to their knowledge about rules and discipline, this opened the door for moral questioning that was appropriate for their developmental level. For example, it became possible to ask what they know about the difference in the rules at home versus their rules in school and "getting in trouble" at home versus at school. Evaluating their response to such questions lead to hypothetical questions such as giving a scenario about a boy who does not listen to his parents regarding a bedtime and is tired the next day at school, then asking "what do you think his parents should do?" or "what do you think his teacher should do?" This type of question requires complex thinking skills and evolved from preliminary analysis of previous data. It definitely was not an initial question but instead was constructed by knowing information about the child's current epistemic ability.

Questions like this may not always be appropriate for all preschool-age children; however, given the content of the lesson and the subsequent questioning of individuals and groups in the current context it was constructed and proved to be an appropriate question tailored for the purpose of the research question. There is no agreed upon format of questioning for preschool epistemology, so it was imperative to identify how children associate new information to their prior knowledge to ask appropriate age level question in a manner that they can relate to and answer in a way that demonstrates their epistemologies. The exploratory nature of the study required constantly evaluating the data and assessing the trustworthiness of the statements and going back to the source and asking more questions that would allow the child to elaborate upon his/her knowledge.

The process of reviewing the field note transcripts and

watching the videos facilitated the constant comparative method. In this step the individuals and groups were compared primarily to themselves more in isolation. This allowed the researcher to collect data each day and review the data to inform the next day's data collection and so on.

Step 3

At the end of each week, field notes and checklists were updated, and/or videos had been transcribed. A closer more in-depth review of the data occurred at this time in which notes and preliminary traits were compared across individuals to obtain a more general perspective about the preschoolers' epistemologies. Looking across the individuals at this point allowed for pre-planning activities for the next week. The main idea here was to look at the range among the child-participants to be able to coordinate individual and group tasks that corresponded to the theme of the week but also to work within the individual and group ability level. At this point many things had to be considered: (a) language ability, (b) cognitive ability, (c) social skills, (d) behavior, and (e) interests. This process continued to be in-line with the constant comparative method in terms of previewing the growing data in order to target specific characteristics, plan appropriate activities, and construct questioning pertaining to the theme and the activity that would tap into the individuals' and groups' epistemologies. This provided a glimpse into potential areas to probe the children's epistemologies in more depth and to identify strong and weak areas; it also directly influenced the semi-structured interviews and the focus groups.

Initially, the preliminary analysis set up a broad foundation and over time distinctively separate hierarchical characteristics such as: (a) areas of interest (i.e., cartoons, toys, movie characters), (b) levels of attention or engagement, (c) amount of detail and associations (i.e. drawing comparisons to family, personal experiences, peers), (d) problem-solving and decision-making (i.e. strategies, understanding, need for redirection), (e) patterns of behavior (i.e., mimicking, facial expressions, non-verbal gestures, animation, coping skills), (f) social behaviors (i.e., eye contact, cooperativeness, sharing,

influence of/on peers, curiosity), (g) use of language (i.e., ability to answer questions, ability to answer questions, spontaneity and relevance of responses to topic). Ultimately, over the course of the study certain characteristics became targets that influenced what type of activities worked best, whom to question, what to question, which method to use, and how frequently to question. Responses to these questions during an individual interview were later compared to other statements from the same child, as well as other child-participant's responses, and if there were even vague categorical similarities (i.e., family, peers, associations, interests, imagination) then the researcher developed a set of questions to be discussed among the three child-participants in the peer focus group activity at the end of the week.

Step 4

The constant comparative method allows for the design of the study to be somewhat malleable. The researcher has the ability to adapt the study and questioning to address the research question. Therefore, once specific characteristics have been identified and questions that address these characteristics have been implemented, this step begins to look at these identified characteristics in relationship to the epistemological developmental levels (i.e. absolutist, multiplist, evaluativist) and the dimensions of knowledge (i.e. simple, certain, source, justification). Characteristics that are apparent during the data collection are preliminarily assessed in two ways: (a) if they are epistemologically meaningful, and (b) how they could be labeled epistemologically. This allowed the researcher to develop specific epistemological questions that are modeled after adult epistemological surveys but that address the interests and abilities of preschool-aged children. This approach contributed to tapping into their epistemologies in more depth by scaffolding previous actions/responses with their own words and interests to more clearly identify epistemological strengths and weaknesses. For example, a child-participant frequently talks about Transformers; therefore, questions are tailored around what he already has disclosed that he knows or takes interest in. This more direct line of questioning

provided a more visible link to his multiplistic perspectives and captured simple, certain, and source of knowledge dimensions. He was able to make associations independently between the *Wild Things* (monsters) and Transformers (toys). However, after direct questioning, he was able to elaborate upon his knowledge and understanding to Power Rangers (cartoon characters), then further compared the "powers" of each to determine that some of the Transformers and some of the power rangers are "bad guys" and fall more in-line with monsters than others. This led to another line of questioning regarding which ones they like/dislike and why. Using his affective responses, he demonstrated his knowledge regarding fear and his knowledge of following rules and being a "good person." Detailed questions which integrated their individual characteristics with an epistemological focus demonstrated a deeper level of intellectual power.

Step 5

This step is similar to step 4. The difference is that rather than prepare epistemological questions for an individual interview, this step addresses the characteristics of the group and allows the researcher to design even more direct and in-depth epistemological questioning for the post-instruction focus group. Taking preliminary findings from classroom instruction, center activities, and individual interviews and transferring them to the focus groups provided further reliability and validity to the interpretations. The recycling of child-participant knowledge provided insights into the following areas: (a) the consistency of each child's epistemological thinking of the instructional content or according to an identified theme or pattern, (b) comparisons of the individual child-participants epistemic ability, (c) assessment of peer group ability, (d) identification of the hierarchy within the group to see which individual characteristics led to more sophisticated epistemologies, and (e) the social dynamics of epistemological thinking. By using constant comparative analysis, comparing individual's responses was beneficial for tapping into areas of knowledge that were pertinent to the children and connected with their experiences. This allowed the researcher to identify the

strongest characteristics and epistemological levels and dimensions of knowledge from the week and incorporate them into the post-instructional focus groups for each group. Using the constant comparative method it was possible to look across the individual child-participants to scaffold their strengths so that theoretically all members of the group had an equal vantage point. This proved to be a beneficial collaborative activity that yielded a greater amount of knowledge from their personal experiences and prior knowledge. For example, taking a consistent response that reoccurred with each individual throughout the week such as (for the family theme), "I love my mommy and daddy" (or some form of the same). Every child demonstrated a non-verbal gesture (hugging themselves) in conjunction with the statement. This same behavior was addressed in an individual interview context, but each response varied slightly; therefore, it was introduced again in the focus group to see how they would respond collaboratively. This technique yielded several interesting observations regarding the importance of personal experiences, prior knowledge, and social interactions.

Step 6

This step is very similar to step 3. The difference is that comparisons were made across groups rather that across individuals. Looking across the groups provided for more reliable and valid interpretations because it allowed the researcher to double check on identified characteristics, investigate new characteristics, and continue to search for embedded developmental levels or dimensions of knowledge. This filtering of group data occurred for the focus groups weekly.

Narrowing the data in such a manner made it possible to characterize each child-participant's epistemic thinking in relationship to previously identified traits (i.e., family, peers, affective dispositions, creativity, good/bad decision-making, ability to follow direction, on/off-task) and behaviors (ability to change, role as leader, autonomous, animated, eye contact) as a means of constantly using the children's words and actions to investigate their epistemologies more deeply and more clearly.

All observation notes and audio-recording was transcribed and entered into Atlas-Ti; qualitative analysis software used to organize and code all data. Video-taping was analyzed for nonverbal and behavior indicators; and coded separately from the discourse analysis but was later combined for content analysis. A separate category for nonverbal epistemological behavior was created. For instance, a child may have shrugged their shoulders or nodded their head for agreement or disagreement. Another way they communicated 'what they knew,' was to make gestures with their body which indicated they had some information or would make sound effects to indicate information. This information seemed especially important with this age group because of the critical period of language development they are experiencing. Also, it was important because a pattern began to develop in which many of the children would initially respond or communicate nonverbally and wait for approval before beginning to use there words. This vulnerability or need for approval of their knowledge was especially interesting.

Results and Discussion

The themes and patterns among individuals; and within and between groups that emerged are discussed in this section. The five general themes that emerged from our analyses were: 1) Epistemological Beliefs are Multi-dimensional, 2) Influences on Multiplist and Absolutist Beliefs, 3) Group Dynamics, 4) Affect, and 5) The Role of Peer Groups in Evaluativism. In this section we also discuss patterns and use examples of the participants' statements, and include our interpretations of the findings with links to the literature on children's personal epistemology.

Categories

To proceed with a description of the results it is important to describe the dimensions and levels of our coding scheme in more detail. As the authors stated in the previous section, each of the three categories (epistemological, affective, or social) was coded by level and dimension. Epistemological dimensions were identified as: structure of knowledge, certainty of knowledge, or source of knowledge, and on three levels: subjective, objective, or evaluative. Affective dimensions were categorized as high, medium, or low; and at a level of positive or negative and social dimensions were categorized as independent, dependent, or combination.

Beliefs about the *structure of knowledge* pertained to the relative connectedness of knowledge. The structure of knowledge could be viewed as simple (perhaps linear) versus complex (multi-dimensional or integrated). A person with an absolutist (objective) view of the structure of knowledge would believe that knowledge is just a collection of unrelated facts, concepts, or constructs. Beliefs about the *certainty of knowledge* pertain to thinking about whether or not knowledge is stable or unstable. For example, a person with absolute (objective)-certainty of knowledge beliefs would view knowledge as certain and stable, while a person with a multiplist (subjective)-certainty view of knowledge would see knowledge as uncertain and unstable. *Source of knowledge* pertains to whether knowledge comes from an authority, personal experience and/or opinion/impression. For example, an individual with an absolutist-source of knowledge believes that knowledge comes from an external authority or direct experience, in contrast to a multiplist (subjective)-source of knowledge stance that holds that knowledge that is constructed internally by individuals.

Epistemological Beliefs are Multi-dimensional

In general, the authors found that the preschool children in our study do indeed have epistemological beliefs at different levels and can be categorized along the various dimensions. To illustrate this, the following are child-participant quotes taken from the focus group transcripts during the lesson on farm animals. It is important to note that these quotations are taken out of context and include different participants' statements.

Multiplist - Certain knowledge: "Cows are farm animals but dogs can be too but dogs can be pets and maybe cows can be pets too, the owners decide."

Absolutist - Structure of knowledge: "I like zebras but they are only at the zoo."

Multiplist - Structure of knowledge: "I think a farm animal um is a (pause) horse but it can be a race horse (pause) I know horses can be two things, some old horses go to farms."

Absolutist - Certain knowledge: "Big farm animals are on big farms."

Multiplist - Source of knowledge: "All the animals on the farm are best friends." "Because I just know or else they would eat each other."

Absolutist - Certain knowledge: "Farmers have cats to eat the mouses." "Miss Cathy read it in the story."

The majority of the child-participants portrayed their understanding of farm animals and plant growth as uncertain/unstable (i.e., Multiplist views). In addition, those who had higher levels of domain knowledge of farm animals, for example, were able to begin to contemplate the certainty of their knowledge. They also showed signs, however, of beliefs pertaining to more absolute views of knowledge. It is interesting to note that statements about the source of knowledge pertaining to the lesson happened the least even though the participants were asked "How do you know this?" as they discussed the lesson in the focus groups. It might be that knowing content without understanding process (how or why) can inhibit a child's certainty of knowledge development.

Multiplism Predominant: As we have stated, it appears that preschoolers do demonstrate personal epistemologies when they were discussing their knowledge of farm animals and plant growth. Epistemological statements had occurred the least in our findings, however, as compared to the affect and social categories. Interestingly, we found that multiplistic beliefs were more predominant among individual participants than absolutistic or evaluativistic thinking. This may contrast with some developmental theories that propose that young children's epistemological beliefs are absolutistic and simple (Mansfield & Clinchy, 1985;Schommer-Aikins, 2002;). In terms of more recent research geared toward younger children's beliefs,

however, these findings are consistent. For example, our results support Burr & Hofer's (2002) theory of a pre-dualistic subjectivity (i.e., experience) and Kuhn et al.'s (2000) subjectivity/objectivity claims (i.e., intergration of fact & experience) about the possible multiplistic nature of young children's beliefs and epistemological development.

Influences on Multiplist and Absolutist Beliefs

Child-participants with high numbers of multiplist statements demonstrated consistently high scores in the affect and social categories as well. That is, the individuals who tended to verbalize their knowledge of a topic as a set of facts or concepts that are complex in nature (i.e., structure of knowledge) and unstable (i.e., certainty of knowledge) also provided more animation or energy in their responses. They also seemed to have a better concept of the rules of the focus group and tended to take more of the lead in the discussions. In addition they demonstrated less egocentric perspectives which is in contrast to developmental theories about the social-cognitive capabilities of this age groups that say that egocentrism is quite prevalent in preschool-aged children (e.g., Flavell & Miller, 1999).

Conversely, child-participants with the highest absolutist ratings had the lowest number of overall contributions across all of the focus groups. Consistently, these participants were unable to give their views of knowledge unless the conversation was initiated by their peers. This finding suggests that children with more multiplists views acted as a scaffolds for other children who were not as comfortable and/or able to discuss their views on their own. These findings support the theory that students are receptive to peer-learning environments. It also suggests that affective and social factors are important influences in epistemological development and peer- learning.

Importance of Group Dynamics

In comparing Groups 1 and Group 2 within the category of social statements and behavior, the results were very similar. In generating knowledge claims, the child-participants had more statements and behaviors categorized as social than the other two categories

(epistemological and affective). Many of these statements that fell in the social category can be attributed to peers redirecting the less structured students.

The social group dynamics of the focus groups were interesting because without the teacher as the clear authority, the peer groups seemed to work more efficiently within the structure of the focus groups than what they demonstrated in their peer-play environments. One interpretation of this finding is that the children seemed to have grasped their different roles in certain social environments and/or were able to conform to the social conventions expected within different focus groups and peer-play environments. During the focus groups the children were less egocentric and less aggressive toward their peers. When those same child-participants were observed during unstructured play intervals they seemed to display behaviors that were more identified as "characteristic" of their age. That is, during play time they were not interacting as cohesively, they preferred to play individually, and while playing in pairs or larger groups they became aggressive and competitive. In addition, they demonstrated emotional outbursts and inappropriate problem-solving skills during the play intervals. The results indicate that the child-participants demonstrated a greater sense of social conventions within the more structured environment of the focus groups in that they utilized more appropriate behaviors, and implemented more appropriate problem-solving and critical thinking skills. This may have been due to the focused nature of the discussions or the influence of peers directly involved in the discussion as opposed to unstructured peer interaction present in free play activities. This supports the Vygotskian idea of social discourse as a necessary component of internalization of thinking.

This is particularly important because according to the National Association for the Education of Young Children (NAEYC, 2007) an essential feature of early childhood development is interactions with others; initially family and later peers. For example, interactions have a key role in social development by providing a context in which children learn important social conventions, such as cooperation, turn-taking, and sharing not only objects but

ideas. There is research that supports this claim; social conventions foster children's ability to understand other peoples thoughts, perceptions, and emotions (Black , 1989; Varga, 1992). Wach (1985) and Wohlwill (1983) investigated children's interactions during structured and unstructured peer play environments and both concluded that peer interactions have stronger developmental influences when mediated by social environmental parameters (i.e., teachers, parents). Preschools typically offer less structured time with peers in the classroom, in this study over ¾ of the day consists of unstructured peer interactions. However, they appear to desire the structure of learning with peer-groups and are more effective at adapting their understanding of social conventions within the peer-groups as compared to unstructured peer interactions.

Affect

Positive Affect: The affective category was the next level of evidence both Group 1 and Group 2 The dimensions within this category were defined as positive comments regarding the lesson content and processes of the group and the levels are represented as high, medium, and low. This was the most difficult construct to measure within the focus groups and this category received the lowest inter-rater agreement. This could be due to the fact that the main coder during the analyses (first author) was very familiar with the child-participants because of her role as facilitator in the focus groups, the classroom observations she logged, and her role as interviewer. The trained scorers did not have such in-depth access to the children. Nevertheless, the high levels of positive affect were very apparent in the children's enthusiastic responses, their eagerness to participate, and the cohesiveness displayed in the focus groups when discussing their views of knowledge. The affective nature of the child-participants is critical because it appears to be an important part of the foundation of how they interact with one another as they construct group knowledge.

Lack of Negative Affect: Another pattern that the authors believed to be important in the overall outcome of this study is the extremely low number of negative responses generated within the groups. Group 1 demonstrated only

two observable instances of negative affect. For example, the first occurrence happened when one child-participant got up from his seat during the focus group and placed his hand over another child-participant's mouth while she was talking. The second was a statement made by a child about another child who was trying to explain the difference between a plant and a flower and he said "No, he don't even know what a plant is." Group 2 had no instances of negative affect during any of the group interactions.

They think that the low negative affective component supports the generally positive outlook most young children have for learning; they are upbeat and excited about what they know (Weis & Lovejoy, 2002). They child participants seemed eager to share their knowledge in a safe environment with peers who were receptive of others knowledge. At the time the data was collected these students had spent several months interacting with each other in their classroom and on the playground and had formed social and affective bonds. Their ability to function harmoniously within the groups may have been influence by the expectations regarding positive behavior in their preschool learning environment and from their teachers and aids.

The Role of Peer Groups in Evaluativism

The results indicate that child-participants did display evaluativist thinking - thinking about knowledge and knowing but only in a group sense. In essence patterns emerged from the data that discussion during the focus groups allowed for evaluativistic-like thinking to occur. Building on what each of the group members had to say, instances of evaluativistic thinking in more of a collective sense was apparent. For example, there were several instances during the focus groups in which child-participants asked the researcher, "How do you know?" Often before the researcher could ask "How…" the children were asking each other "How do you know?" This, of course, was modeled in the interview and focus groups protocol but it was interesting to see them use this line of questioning effectively as well.(Figure 4)

Another instance of evaluativistic thinking occurred when a child-participant would reiterate their knowledge and
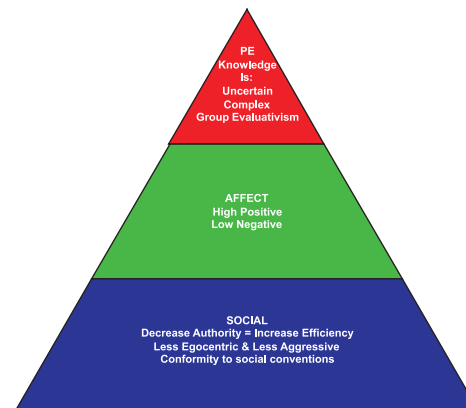

Figure 4. Result Hierarchy

add what someone else had contributed. For example, "plants need dirt and water both to live" or "how about, can it be, if a dog lives in my house it's not a farm animal but if it lives stays in a barn then it is." This if/then statement that the child-participant made represents the type of statements that the group constructed jointly. At this point, it cannot be determined if this same child would have formulated this idea independently but it does indicate some advanced views of thinking about knowledge. Participants also demonstrated cause and effect statements and contemplated the likelihood of certain conditions that are needed for plants to grow. For example, a child-participant explained to another, "That's why my dad has to mow the grass when it rains." Although they do not know the meaning of the word "conclusion" they readily provided several conclusions during the course of the focus groups.

These findings have many implications for theory and research associated with personal epistemology development. As a group, the participants together produced examples of evaluativistic beliefs. In terms of preschool education, exposure to group evaluativism may allow students to generate higher levels of thinking suggested and this reciprocal influence among group members is consistent with theory in the field of personal epistemology (e.g., Bendixen & Rule, 2004) and in the framework of Vygotsky's (1978) socio-cultural theory of child development.

Implications

Some theoretical and educational implications we

propose: 1) future research with very young children can be productive and informative for the direction of early onset of personal epistemology; 2) a beginning look into aspects of epistemological growth which may help us understand developmental issues such as recursion Chandler, Hallett & Sokol, 2002); 3) how the trajectory of epistemological development can contribute to the role of epistemic doubt in epistemological development (Bendixen, 2002); 4) knowing more about early onset of personal epistemology can assist in clarifying the role of epistemology in other cognitive constructs such as, learning, motivation, theory of mind, and self-efficacy; 5) significant impact on early educational curriculum, instruction, and metacognitive abilities; 6) cultivate cognitive sophistication beyond Piagetian theory; 7) promote higher quality education for pre-service teachers; 8) provide teachers with more balanced developmental foundations that can translate to efficiency and effectiveness in the classroom; 9) bridge the gap between theory and practice.

Focus groups investigations are a useful tool to identify cognitive, social, and emotional processes with preschool children. They provide rich perspectives about the children's thoughts and behaviors regarding their past, present, and future, as well as, how they incorporate experiences with family, teachers, and peers as they pertain to themselves.

The strong presence of social and affective responses supports Vygotsky's socio-cultural perspectives and identifies real-world examples of the integration of social and affective components with epistemological development (Bendixen & Rule, 2004). This may have implications for parenting and early childhood education programs as well (Walker, 1993).

Theoretical Significance

The findings from this study offer new and innovative theoretical significance in several ways: (1) it suggests that future research with very young children can be productive and informative for the direction of gaining knowledge about early onset of personal epistemology; (2) it serves as a beginning look into aspects of

epistemological growth and may help us understand developmental issues such as recursion Chandler, Hallett & Sokol, 2002); (3) knowing more about the trajectory of epistemological development can contribute to the role of epistemic doubt in epistemological development (Bendixen, 2002); (4) knowing more about early onset of personal epistemology can assist in clarifying the role of epistemology in other cognitive constructs such as, learning, motivation, theory of mind, and self-efficacy; (5) this study opens the door for more innovative methods of measuring personal epistemology and in doing so may lead the way for more clarity in the way we investigate beliefs about epistemology; and (6) the possibility of informative research with very young children allows for more longitudinal research in the field of personal epistemology.

Educational Significance

The results of the current study indicate that preschool children have the ability to move between subjective (more interpretive) and objective (more factual) epistemological frames of reference and it appears to be context specific. This could have a significant impact on early educational curriculum, instruction, and understanding of metacognitive abilities. In order to accommodate more cognitively sophisticated children than Piaget theorized we would need to make considerable adjustments to the education of pre-service teachers (Walker, 1993). Currently many states in the U.S. do not have educational standards for preschool children and in some cases families do not even send their children to kindergarten (it is still a choice in many locations). While we are adequately training pre-service teachers; parents also need to be educated about the affect of early childhood experiences on later cognitive and emotional abilities. Parents are interested in the intellectual ability of their children but we propose that not many parents or individuals know much about personal epistemologies, nonetheless their role in development. Also, the evaluativistic-like group epistemology that is proposed is an exciting cognitive phenomenon that many unknown educational implications because is rarely identified until much later in human cognitive

development and typically in highly educated individuals.

Conclusion

Children's personal epistemology is important because it provides valuable insights into what children know and how they learn. The more understanding we have about children's personal epistemology the better we will be able to prepare pre-service teachers to enter the classroom, no matter what level they are teaching. In addition, by better preparing teachers they will have more solid developmental and cognitive backgrounds and will be more effective and efficient in the classroom. How individuals develop personal epistemologies and the unique relationship they have to learning may assist teacher instruction follow more closely to theories of learning, hence bridging the gap between theory and practice. Understanding the importance of child epistemological development may help teacher bring more real-world instruction and assessment into alignment. As pointed out earlier evaluativism is a level of personal epistemology that is not recognizable until later adulthood but is thought to incorporate higher levels of cognition (metacognition) such as critical thinking, problem-solving, reasoning, and logic (Kuhn, et al, 2002). If we can identify how to cultivate this more sophisticated way of thinking and identify links in early childhood epistemological development the results could lead to better understanding the process involved in life-long learning. Understanding how very young children can produce evaluativistic thinking as seen in this study is one small step in this process

Knowing more broadly and deeply about the development process of child epistemology will inevitably contribute to the current literature in the field and perhaps provide new and innovative ways to measure personal epistemology. The more valid and reliable our research becomes the more likely administrators and government policy-makers of early childhood curriculums will be to consider and implement the value of personal epistemological development. Gaining more knowledge in children's personal epistemologies stands to impact early childhood

curriculums but also can guide the current effort to implement preschool standards across the U.S. It is not limited to early childhood curriculums, all state standards and local curriculums could benefit from incorporating what is known about an individual's personal epistemologies.

Children's personal epistemologies research can foster parent's interpretation of early child developmental milestones and transition perceptions away from traditional developmental limitations. Providing parents with a clearer vision of children's cognitive abilities may help parents better prepare their children to enter structured classroom environments. Perhaps if there was less focus on behavior factors in early childhood teaching and learning we would be more evenly weighted social, affective, and epistemological factors, as opposed to our finding of predominantly social and affective levels. It appears that very young children have the propensity to develop epistemologically however; we may not set them up for successfully reaching their potential until decades later. Perhaps focus groups that are directly linked to classroom instruction and individual interviews provide very young children with a scaffold to be able to pin-point early characteristic of evaluativism and early onset of personal epistemological development. It may also indicate more evidence for trajectories that occur through epistemological development.

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