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Inquiry in Early Childhood Teacher Education: Reflections on Practice

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Description

As teacher educators we work to make inquiry methodology explicit to help teacher candidates construct the link between theory and practice. Bringing inquiry learning into the early childhood curriculum method courses raises the potential for inquiry teaching practice for teacher candidates and models a constructivist practice in a higher education setting. Of the numerous curriculum studies available, few focus on methods of inquiry to guide adult learners' to construct inquiry- teaching practices that they can transfer to their work with children. To improve the quality of our teaching in an Early Childhood Teacher Education program we researched and developed several tools to facilitate the transfer from teacher candidates own learning experiences to their teaching practice. We relied on the literature regarding the Reggio Emilia approach of inquiry learning and teaching based on documentation, as well as Creativity theory to help us develop a method to relate concepts with materials in a cycle of inquiry. Through our Cycle of Inquiry and the introduction of Concept Materials we promote representation which is a critical aspect of constructing knowledge about what it means to teach. We find that this differs from merely modeling hands-on activities in that it promotes higher level reasoning and creativity throughout the early childhood curriculum, as teacher candidates learn to reflect on and question the big ideas—thinking and learning—they observe in play to develop practice that extends learning along a conceptual continuum of inquiry. This data accumulated over the course of two years at East Tennessee State University and the University of Michigan-Dearborn through our process of developing and implementing curriculum for teacher educators that models action research and teacher as researcher.

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Inquiry in Early Childhood Teacher Education: Reflections on Practice

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Abstract
As teacher educators we work to make inquiry methodology explicit to help teacher candidates construct the link between theory and practice. Bringing inquiry learning into the early childhood curriculum method courses raises the potential for inquiry teaching practice for teacher candidates and models a constructivist practice in a higher education setting. Of the numerous curriculum studies available, few focus on methods of inquiry to guide adult learners' to construct inquiry- teaching practices that they can transfer to their work with children. To improve the quality of our teaching in an Early Childhood Teacher Education program we researched and developed several tools to facilitate the transfer from teacher candidates own learning experiences to their teaching practice. We relied on the literature regarding the Reggio Emilia approach of inquiry learning and teaching based on documentation, as well as Creativity theory to help us develop a method to relate concepts with materials in a cycle of inquiry. Through our *Cycle of Inquiry* and the introduction of *Concept Materials* we promote representation which is a critical aspect of constructing knowledge about what it means to teach. We find that this differs from merely modeling hands-on activities in that it promotes higher level reasoning and creativity throughout the early childhood curriculum, as teacher candidates learn to reflect on and question the *big ideas*—thinking and learning—they observe in play to develop practice that extends learning along a conceptual continuum of inquiry. This data accumulated over the course of two years at East Tennessee State University and the University of Michigan-Dearborn

through our process of developing and implementing curriculum for teacher educators that models action research and teacher as researcher.

Introduction: Approaches to Teaching Inquiry

When we talk about inquiry we refer to observing thinking and learning, documenting our observations, and analyzing the observations to develop research questions that focus on what to study with and about children in order to extend their already developing knowledge. This way the planning of activities is tightly linked to teachers' observations of learning and their hypotheses about what children know and think. It is an action research process where the teacher candidate becomes a researcher. The inquiry curriculum planning seeks to extend play by developing ideas, hypotheses, about the concepts (big ideas) that teachers think are central to the play. Once these ideas are made visible teachers apply these to their plans for developing interventions to extend the play. The planning is meant to provoke inquiry among the players to motivate further play that involves problem solving and learning.

In constructivist early childhood teacher education programs, particularly influenced by the Reggio Emilia Approach, teacher candidates are required to learn to work with a variety of materials as a means of learning how to help children represent and re-represent concepts to deepen their learning potential (Forman et al., 1998; Gandini et al., 2005; Vecchi & Guidici, 2002). We experience teacher candidates entering our classroom having little or no experiences with materials since they were children. This reveals a lack of development with the properties of materials that might enable them to represent a variety of conceptual understandings with the appropriate media. They often seem uncomfortable using materials creatively. Our teacher candidates lack the ability to focus on process by applying imagination and extending ideas through application of hypotheses about their ideas in relation to the materials (NACCCE, 1999; Seltzer & Bentley; 1999; CAPE, 1998; Craft, 1996; Isbell & Raines, 2003). For example, a group of teacher candidates makes a space ship when provided with many types of white paper, wire, glue, a brush, markers and a card with a concept "Think Tall and Strong" on it to guide the play. Typically the group would experience this as a completed process once the spaceship is made. The inquiry teaching practice we follow seeks to extend play by developing ideas, hypotheses, about the concepts (big ideas) that teachers think are central to the play. Once these ideas are made visible teachers

apply these to their plans for developing interventions to extend the play. The planning is meant to provoke inquiry among the players to motivate further play that involves problem solving and learning. With the spaceship group there were small wire figures of aliens on the ship, there was talk of planets and stars. To extend this play on their next visit to class their instructor provided paper mache, pictures of planets, more wire, and questions as well as dialogue that invited them to tell the story of the aliens and reveal where the space ship was. This in turn would provide more information about what this group knows or thinks about this spaceship, aliens, and planets from which to develop new questions and extensions. To help teacher candidates plan for extensions of play based on the emerging ideas of children we need to make the process of inquiry visible to them. When we refer to creativity we are referring to being fluent, flexible, elaborate, original, complex, able to take risks, imaginative, and curious in pursuing goals rather than end products (Williams, 2005; Owen, 2004). This high-level creativity refers to familiarity with media to the point that one can use materials to express as easily as one uses words and language. Flexible teachers will be open minded enough to allow the course of an investigation to follow the children's understanding, which is very different than giving the right answers.

As a result of these gaps in teacher candidates' development and preparedness for implementing constructivist practice we reflected on our courses and what practices we can model in the adult classroom that we would expect to see in the teacher candidates' classrooms. We first recognized a need to provide enough time with materials to develop a better understanding of their properties and potential. Then we developed a strategy of exploring with these materials that took the teacher candidates beyond the traditional individual, pre-planned lesson format (Hunter, 1984) that separates lessons thematically or topically. Our strategy focuses on gradual conceptual development inspiring the teacher candidates' own cycle of inquiry as they explore. To engage them in this cycle we developed two new tools: Concept Materials (see figures 1-5) and Cycle of Inquiry Forms (see figure 6) that guide teacher candidates through a strategic planning process in an open-ended way.

This article presents our rationale and method for teaching as researchers that we developed to help teacher candidates transfer their university level learning experiences to their field work with children.

Research Questions and Hypothesis Regarding Transfer of Learning

We initially developed research questions based on our observations of teacher candidates use of materials to facilitate representation that guide our action research approach to teaching:

- How did the materials guide teacher candidates' thinking?
- How did peers influence teacher candidates' thinking and processes with materials?
- How can teacher candidates transfer this process to their teaching practice with children?

Additionally we formulated our ideas about the teacher's role in early childhood education to focus our facilitation of teacher candidates' learning experience on what we think critical for constructivist teachers are:

- Studying about children to understand what they know and think
- Studying with the children as a co-constructor of knowledge
- Finding media that make the children's thinking more explicit
- Provoking and facilitating cognitive conflict
- Offering tools to enhance reflective thinking
- Teacher as researcher

This inquiry practice we implement is meant to shift teacher candidates' practices from one end of a continuum (A) to the other end (B) (see table 1). Progression to B occurs as teacher candidates observe children and use the observations to carefully plan interventions—materials, questions, discussions—that guide the children to represent their ideas in many media.

Table 1. A Conceptual Continuum of Inquiry

Continuum	Examples of A	Examples of B
A) Teacher-centered instruction to B) Child-centered learning	Planning a unit on houses without noting an interest in houses or what children know about them	Inviting children to make and play with the characters represented in their block play to learn how the animals use the houses that the blocks represent
A) Reactive response to	Close-ended questions that focus on the	Questions posed to children were based on the

B) Proactive/ planned action	knowledge children already know. Questions posed to children are not provided to take in new meaning.	children's thoughts. Teacher tries to motivate and challenge children by creating disequlibrium in the questions
A) Single media representation to B) Multi media representation	Children are only using blocks in the play involving houses	Teachers introduce wood for them to glue solid house structures, asking children to draw the houses the animals play in, creating cutout animals to play in the block houses
A)Convergent/literal thinking to B) Divergent / critical thinking	Planning for a study on houses must lead to accurate representations of houses that are inhabited with people, i.e. realism	Planning for an investigation of houses to learn the many ways in which children think about houses in relation to people and the animals they refer to in their socio dramatic house play, allowing for opportunities to compare and contrast the many perspectives that children have
A) Isolated learning activity to B) Collaborative learning activity	Planning for each child to construct or draw a house	Planning for children to problem solve together through many media – blocks, wood scraps, drawing, cutout character play – the function of houses for people and animals
A) Thematic / topical to B) Conceptual Approach to Materials	A study of houses permeates all centers of the classroom for a week. People houses are in one center, dog houses in another, etc.	A study of houses emerges in the block area and develops over time to a point where the small group focusing on the study share their ideas with peers so that the ideas filter

		into extensions that emerge within other centers in the classroom. In this way the way that children pretend to be animals within the housekeeping center becomes an extension of the play centered on cutouts of animals in the block area. New materials representing animals needs to appear in the housekeeping area over time to support this play
A) Short term activity to B) Long term investigations	The ideas in the week long theme are not investigated deeply enough for children to develop relationships between the dog house and the human house, etc.	The progression of the ongoing concept of how animals inhabit and use a house leads to questions about cages and differences between humans and animals that eventually arise and help children construct mental relationships between these ideas that deepen their understanding of each
A) Learning by transmission to B) Individuals as agents in learning	Teaching a unit on houses where there is an end goal that children can state the right information about what a house is	Entering into a study on houses where children are invited to use their imagination to problem solve the purpose of houses in relation to the animals they refer to in their play. Teachers enter into guided discussions and play with children to provoke questioning and reasoning

All of these aspects of the constructivist practice inherently incorporate dimensions of creativity, which leads to our rationale for developing *Concept Materials* to support representation development in adult learners.

Method

The Courses

We will be discussing data from two different courses in two different university settings. One is a *Creative Development of Young Children* course at East Tennessee State University and the other is a course on *Strategies in Early Childhood Education* at the University of Michigan-Dearborn. Both are methods courses for Early Childhood Programs. The majority of students enrolled in both courses are at the end of their sophomore year just at the point of declaring their early childhood major or early in their junior year just after declaring their major. Their prior Early Childhood coursework has been in introductory classes. Most have not had any supervised field experiences teaching in an early childhood classroom. For the purposes of this article we will describe the Cycle of Inquiry process included in both courses without making distinctions because the differences between the two setting is not being analyzed in this article.

To prepare the teacher candidates for entering an inquiry teaching process they read, review and critique a number of books that include: Beautiful Stuff (Topal & Gandini, 1999), a book that presents an emergent investigation of materials; Children's Construction of Knowledge (Forman & Kuschner, 1983); Constructivist Play (Forman & Hill, 1984), and Developmentally Appropriate Practice (Bredekamp & Copple, 1997). Additionally they review and critique a number of documentation panels by students and Early Childhood educators. This critique process is based on Documentation Panel Guidelines provided by the instructor (Hong, 2000). All of these readings prepare them to understand the Constructivist theory and the materials exploration they will encounter.

On approximately the fourth week of the course, the teacher candidates begin a six to eight week Cycle of Inquiry with materials that are set up in their adult classroom on circular tables prepared for small group interactions. There are four to five of these tables (depending upon enrollment) that represent centers in an early childhood classroom. The instructor facilitates the Cycle of Inquiry for two to three weeks to model the process that groups of students will facilitate for the remaining four weeks.

Following the adult materials explorations teacher candidates enter into a field experience assignment, capturing learning episodes of one small group of children to plan and implement extensions that continue over a period of five to ten visits. They use videotape to observe and enter transcriptions into the Cycle of Inquiry Forms that they use to plan their extensions. In one class the planning and implementation occurs among a group of three teacher candidates, while in the other course teacher candidates implement alone based on the peers' feedback in class. In each class, at the close of the semester, the whole class analyzes the documentation of each teacher candidate or group.

In both courses teacher candidates transfer the knowledge they gain from their adult classroom explorations into the early childhood classrooms as they design and implement inquiry curriculum.

Preparing the Concept Materials

To introduce experiences with materials in our courses we developed a tool, *Concept Materials*, to present materials to students as a means of provoking higher-level representations, even among individuals who may be considered novice with their representation abilities. We have previously used the term concept in our constructivist work with children and teacher educators; building on the ideas of Piaget that individual's learning develops out of their own theories. In our interpretation of Piaget, developing theories reference the concepts contained within the mental schema that transform and become more elaborate as individuals interact with materials and others. Building on the idea that artists have fluency with materials to represent their concepts we choose to link the words *concept* and *materials* into a practice for early childhood educators, to help them focus on concept development when planning to incorporate creative experiences in their classrooms. The term is not mean to align the meaning of concept with the meaning of materials. We coin the term *Concept Material* to relate the idea of conceptual thinking to the planning and preparation of materials to promote higher level representations and incorporate inquiry experiences among teacher educators. In bringing this understanding to their classrooms they can then facilitate children's use of materials to reach higher levels of learning, and promote reasoning and problem solving (Broderick, 2004).

In developing our process of facilitating representation development in our teacher candidates we relied on constructivist theory as well as creativity theory. Many theories of creativity informed our teaching process. We used Wallace's Model (Isbell & Raines, 2003) to guide our understanding of the levels of development among our teacher candidates. Torrance's theory (1969), as adapted in two versions, by Williams (1980) and Wilson (2005) provided characteristics of creativity that helped us to understand the learning among individuals in our university classrooms. Creativity theorists have valued Csiksentmhlyi's (1990) research on flow because many agree that the state of flow is a critical aspect of the creative process. We organize our environment and curriculum around a set of characteristic dimensions Csiksentmhlyi (1990) developed that correlate to flow, which overall refers to the level of engagement in a process. When flow occurs among the teacher candidates in their explorations with *Concept Materials* we can be confident that they are creatively problem solving and learning.

We repeatedly used five sets of *Concept Materials* (see figures 1-5) to become familiar with the ways in which Teacher Candidates would represent in relation to these sets and unify among our two university populations. We carefully chose materials that Teacher Candidates might not expect to combine and related them to concepts that matched our hypotheses about the potential lines of thought these materials could elicit. As you read through the lists of 5 sets of ***Concept Materials*** consider why the facilitators chose these materials, how you think adult students will interact with these materials, and how these materials correspond to Early Childhood learning centers or content areas in primary classrooms?

The Sets of Materials

In designing these 5 materials sets we planned for scientific thinking, literacy development, musical development, mathematical thinking, sculpture, socio-dramatic interactions, and peer problem solving. These are things that we see occurring in the every day experience of children's play. At the same time we are covering a range of curriculum areas that would be seen in an early childhood setting yet we are presenting the materials in an open-ended inter-disciplinary way. This makes each center have a greater potential range for learning that is not limited to the discipline of the center that we often see in traditional early childhood centers. These materials sets will provoke individuals to raise questions, generate and test their hypotheses, and develop their representation skills in a non-threatening way

by incorporating provocations that welcome a playful attitude. Additionally, the group format will encourage solutions to open-ended processes that will be collaborative.

Figure 1: Think Tall & Strong

Set 1: Think Tall & Strong or Think White (see figure 1)

- At least five sheets of different shades of white paper
- White tissue paper
- 18 gauge wire
- White foam core boards
- Glue
- Brushes
- Scissors

Set 2: Think Sound of Movement (see figure 2)

- 1 or two different sized flat tubs or buckets
- A large collection of balls (golf, ping pong, etc.)
- A stack of paper
- Pencils
- Tubes or PVC pipe in about 3 ft lengths & cardboard tubes & gutters

Figure 2: Think Sound of Movement


Figure 3a & b: Think Metaphor

Set 3: Think Metaphor (see figure 3)

- *Walden;* children's illustrated book about Walden Pond
- Drawing Paper
- Paper with storyboard rectangles or with cut out rectangle in center
- Colored Drawing tool; either pastels or colored pencils
- Glass bowl with dirt
- Glass bowl with water
- Container with small branches
- Container with leaves, grasses, etc.

Set 4: Think Variation (see figure 4)

- Musical Instruments; limit to one or two (2 had boomwhackers; 1 had a rattle and small drum)
- White paper
- Pencils
- Colored squares of paper; 5 colors
- Colored Markers; 5 colors corresponding to markers

Figure 4: Think Variation

Set 5: Think Texture (see figure 5)

- Clay or Bowl of flour / Bowl of water
- Small pieces of wire
- Natural materials; sticks, grasses
- Bowl of water
- Boards or hard white paper to use as a work surface
- Pictures of a pond, a frog, a tree and clay sculpture

Figure 5: Think Texture

Exploring the *Concept Materials*

The room for exploring the materials is set up to model an early childhood classroom, with the *Concept Materials* set up on circular tables that represent different centers in our classroom. We aesthetically arranged each center to invite participants' curiosity and wonder. Our goal is for them to come in and want to play as if they were children. When the teacher candidates come into the room they put their packs to the side (in imaginary cubbies to maintain the aesthetic of the centers). They play for the entire session as we rotate through the centers documenting with videotape and scaffold their play. In the *Creative Development of Young Children* course the session lasts for a full hour. In the *Strategies in Early Childhood*

Education course the play lasts for one and a half hours. By providing a long time to explore we are orienting our teacher candidates to the time frame of children's development, which is essential for creative expression (Isbell & Raines; 2003; Edwards et al, 1998).

In modeling the aesthetic aspects of the set up and the careful selection of quality materials (see figures 1 – 5) we are orienting teacher candidates to the powerful way materials invite participation and initiate thinking. We are teaching them how to provoke, a skill that requires a respect for the materials and the environment. This respect mirrors a respect for the learners.

Early in the semester we see students enter the centers cautiously. The tone is generally quiet and reflective. Talking emerges as confidence with materials grows and as individual learners discuss their experiences with others.

Additionally, in the *Creative Development for Young Children* course the teacher candidates are required to display the ongoing projects throughout the semester along with documentation-in-progress. The documentation-in-progress differs from complete documentation panels in that it presents aspects of the thinking and learning as it develops, with initial and fresh analysis of teacher candidates that is eventually revisited more deeply for planning curriculum. The display of the materials is to be set up so that anyone entering the room, even those who may be unfamiliar with the explorations and their inherent conceptual development can "read" the display to interpret types of thinking that have been developing. This models a practice that we want teacher educators to transfer to their early childhood classrooms. We want to encourage them to prepare the environment daily, setting out the materials of ongoing investigations so that these serve as a form of documentation for parents and visitors, and, in our experience this invites children to return to their thinking on a daily basis. Then children can revisit prior learning and expand on it daily.

In the *Strategies in Early Childhood* course the teacher candidates don't have a room where they can display work between sessions. They keep their work in a curriculum lab. Each session the work and their documentation-in-progress is brought out and set up ahead of students' arrival so that they can revisit their previous experiences as a provocation for further investigation. Before they move on to play that day, they participate in a

whole-class discussion of the documentation-in-progress of each small group to support their next steps. These discussions among the whole-class model the importance of revisiting in the planning process and the role of collaboration in a Cycle of Inquiry. This continues throughout the six-week period.

In the *Creative Development of Young Children* course the work is also brought from the display area to the circular tables (centers) prior to students' arrival, as part of the planning process. Since these students only meet for an hour each session their whole-class discussions of documentation take place during their next session. The revisiting and collaborating process is really the same as that of the participants in both classes, only the time frame shifts.

In both classes teacher educators take on numerous roles to learn to explore and represent, as well as to plan for inquiry-based curriculum organized around *Concept Materials.* There are players who explore the *Concept Materials.* We tend to think of them as representative of children learning in an Early Childhood classroom. Documenters record the explorations using videotape, running records, audiotapes. They may sketch processes or products, and they may chart predictions or discussions. Facilitators rely on observations of previous play and their inquiry planning to support and scaffold the ongoing explorations (see figure 6). The Documenters and Facilitators represent the team teachers in an Early Childhood Setting. Our intention is for teacher candidates to practice roles that they will be required to fill in their field experiences with children, so that the skills and abilities they develop can transfer to their work with children. In the field experiences the teacher candidates repeat these same roles, rotating from week to week their practice with documentation and facilitation.

Developing Inquiry Skills

Our intention with these explorations is to develop curriculum from week to week where students' ideas extend gradually along a continuum of inquiry (see figure 6). This is different than planning discreet activities that have clear beginning and end points with specific objectives that are often focused on skill development rather than conceptual development. This conceptual development also differs from traditional early childhood skill building

activities in that they are generally embedded in weekly or monthly themes versus long term investigations.

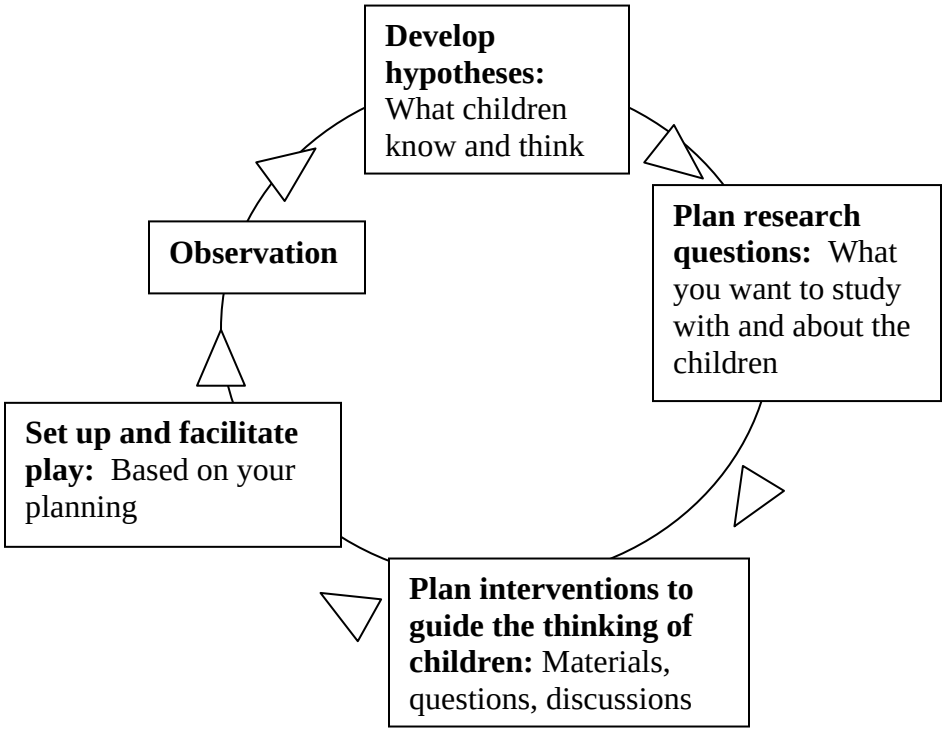

Figure 6. The Cycle of Inquiry

We recognize that traditional lesson planning forms didn't necessarily contain the elements of inquiry that we need to facilitate along conceptual lines. The traditional lesson plan forms usually contain a rationale, goals and objectives, lists of materials, steps to implement the teacher's objectives, and teacher's methods for evaluating the objectives that were or weren't learned in the process. Teacher candidates tend to manage this form of planning well enough but these planning methods don't guide them to think about how children learn. Instead they are planning from a top down, teacher- centered curriculum. Our inquiry process is child initiated and teacher framed, which requires skills of our teacher candidates that we needed new methods to develop. Our use of inquiry teaching is rooted in the Reggio Emilia Approach, which inspires our process (Edwards et al, 1998; Hong, 1998; Hong & Broderick, 2003).

With a teaching goal focused on trying to develop teacher researchers, teacher candidates need to learn to hypothesize what children know and think in order to plan curriculum to extend the ongoing learning that

naturally occurs in early childhood. The skills we wanted to facilitate are observing, listening, documenting, revisiting, analyzing, and reflecting. The end result is that the emergent inquiry curriculum is equal to an action research project, which is a non-linear process of developing and testing hypotheses based on experience that leads to new hypotheses and new forms of testing in order to achieve better understanding and construct knowledge.

Discussion

Lessons Learned

We're going to reflect in two ways in this section. First we will discuss the ways we use the Cycle of Inquiry to review our own practice in higher education. Then we will share the learning we observed in our teacher candidates after they moved through a series of the Cycles of Inquiry.

We've learned that we have become better observers. This involves our process of being with students in their explorations, videotaping and revisiting their work to understand and challenge them to progress to deeper levels of representation. We have learned patience as we've realized that a majority of these college students are really using materials at a developmental level that is similar to a young child. The difference is that we have most of our early experiences with observing and analyzing the actions and dialogue of individuals is with young children. Therefore, it has been challenging to observe adults interact with materials and discern their use of dialogue, which is more advanced in terms of vocabulary, yet not as explicitly linked to their processes as children's dialogue.

We realize that children vocalize their thinking as they play, organizing language in relation to actions, whereas adults will do this "thinking talk" internally. For example, with children you may see a group working with the *Think Sound of Movement* set of *Concept Materials* and you will hear them say, "listen to this," or "how fast will it go," which provides insight into their interests in variations of sound and speed of objects. Yet, with adult learners using the same materials you may hear, "try this," or "try that," which forces us to look more closely at exactly what they are trying—sound, speed of objects, etc.

Also, we found that children are more receptive to vocalizations of adults in that they often continue with their line of thinking until the conversation

totally distracts them. Therefore, with our previous experiences with children, where we are not entering into dialogue with them to distract our conversations are minimal and don't generally distract. If what we offer is of interest or helpful the children take the idea and go with it, and if they aren't interested they really stick with what they are already doing. This is very different with the adult learners. We find that they feel as if they "have" to "do" what we say. It takes time to find a way to encourage them to be in charge of their own actions, to recognize themselves as agents in their processes and view us as supporters instead of authoritarian transmitters of knowledge. When asking a teacher candidate to elaborate on the purpose of her structure on the first day of the exploration she said,

> *"Oh, I'm sorry. Maybe I didn't do it right? Is this what you wanted?"*

Our immediate response was that there is no right or wrong to this process and that we question to learn more about what she thinks. Two exploration days later she states in a written reflection at the end of the session:

> *"I like the way that you show an interest in our play. It really helps to give us new ideas and directions for our play and that way we have so many ideas among our whole group."*

What helps us to more quickly move teacher candidates to a place where they are empowered in their process is our strong faith we have in their abilities. We carry this belief with us from our work with children that all learners enter our classrooms with a wealth of knowledge, and we are merely here to help extend that knowledge. In verbalizing this to teacher candidates we initially inform them that we want to know what they know and think. Then through our continued verbalizations and actions we show respect for their ideas. We reflect back to them what they present to us, mirroring their words and actions by rephrasing and reflecting with them to encourage them to observe their own actions.

We find that the planning for adults takes time and extra effort. In part this is due to the nature of our visits with teacher candidates, which don't occur daily and due to the way that our classroom centers don't remain intact from visit to visit. At this point as we discuss our experiences with choosing materials we find it is important to distinguish our backgrounds here. One faculty comes from a fine arts background and the other comes from a science background. This is an important feature in relation to our planning

for *Concept Materials* that addresses what we also feel speaks to the benefits of an atelierista in the Reggio Emilia Approach, as well as the benefits of team teaching that Reggio Emilia schools promote. An atelierista is a studio teacher in the schools of Reggio Emilia, which is a bit different than an art teacher in that he or she is not teaching a set art curriculum with its own set of standards. Instead, the atelierista is a collaborator with all the classroom teachers, helping them to distinguish the big ideas and identify media to support and extend the theories children are developing around those big ideas (Vecchi, 1998; Gandini et al, 2005). The reason we distinguish these differences in our backgrounds is to share how one of us found the planning for materials more challenging regarding the materials themselves, while the other was more challenged along the lines of challenging teacher candidates towards scientific thinking. This is where our collaboration is so powerful, because it is easier to take risks in the areas where we feel less familiar when we can share our processes with each other. The end result is our co-construction of knowledge that guides us to develop better teacher practice.

Teacher Candidates learning

Students learn that a variety of materials open up the imagination of children. They recognized the power materials have to change the direction of the teacher candidates' thinking and process as seen in one of their comments:

> *I loved seeing how the students (teacher candidates) took our materials and evolved them into things that could meet their interests and goals for the day... I know that making the materials for astrology made me myself very interested in learning about it because I realized how much there was that I did not understand ...The illusion center took off in a direction that no one expected and that was very interesting to watch its evolution.*

Some learned that a lot of materials change the direction too much so that limiting materials to the relevance of the children's immediate interests will provide a center that is rich enough to capture the attention of children for a longer time, as can be seen below in the *Cycle of Inquiry* planning of one group (see table 2). They carefully choose to limit the many materials from previous group's facilitations to a few specific materials.

Table 2. An Example of the Cycle of Inquiry Planning

Hypothesis of what student's think & know: Students were most interested in making instruments
Evidence: Student's are making shakers and instruments with LOTS of materials
Research question: Can you build an instrument?
Materials: Wooden stands, duct tape, hammer, different materials to cover top, nails, rubber bands, shoe boxes, beans and other materials to make noises
Set up: Specific area for each instrument and only a few variations with materials
Questions:

- What materials make low or high noises?
- Do materials matter?
- Why learn to make instruments?
- Will certain instruments work better than others?
- Function and stability (think about it)

Note the use of the word "few" and "specific" in the plan for the set up of the materials in this center. One teacher candidate in this group reflects on the shift in thinking among the "players" (other teacher candidates) in the class on the day that she and her group facilitated:

> *We experienced a level of thinking that in most cases is hard to come by. Each student (teacher candidate) seemed so involved in each center and truly interested in what he/she was learning and creating. Some materials (centers) were more difficult than others and yet when faced with problems for once the students choose to remain at the center and problem solve.*

Teacher candidates continually said things about how they were amazed at how long children could focus on one activity, even those who worked with infants. They also commented on how the process of observing really taught them how much children know, which in our perspective reveals a growing respect for children.

Teacher candidates were amazed at how one material can be used multiple ways to sustain children's play. They also began to think outside of the box when choosing materials to facilitate children's thinking. They learned to

value every day materials like PVC pipe and springs from old toys for projectile activities. Common ordinary materials became the preferred choice over commercial products, which they also valued in terms of cost savings. They didn't have to spend a lot of money for their practice, they had fun discovering materials in their every day lives.

Teacher candidates entered the facilitation process with a fear of asking questions but the Cycle of Inquiry forms guided them through the steps from documentation of actual play to preparation in a developmental progression that worked. They entered their field experiences each day with a clear focus and multiple possibilities for questioning. This prepared the teacher candidate's mindset to be flexible enough to follow the children when the children may have an idea to follow that is different, while also maintaining a focus on the big idea that they are exploring.

> *I think the most significant part of this experience for me was the day the children began to relate the structure (a pipe structure) to the letters they had been learning in previous weeks. One student, Charlie, noticed that the shape of the structure they had just built looked like the letter "T." Another boy saw the letter "H" in the structure. This turned into drawing the structure on paper to see the different shapes and letters that could be found. Seeing the children jump so eagerly into this new aspect of the project really made me realize that children learn when it is best for them.*

This is an important feature that prepares teacher candidates to know that revisiting previous thinking is important for digging deeper into a concept, and helping them to see the relationships between their play from one day to the next, which prevents children from changing the direction of their play from hour to hour, day to day, and not developing deeper investigations. In this manner these teacher candidates also marvel at how much they are learning about children

Teacher candidates learned to value the importance of wording questions correctly so that they will challenge the children to see the activity from other perspectives. Their initial tendency is to enter play with children and constantly question, but they learned to allow the children to do most of the talking and to intervene only when necessary.

We recognized teacher candidates move from busywork activities to planning for ways to concretely manifest the children's ideas with materials. In addition, they recognized that more meaningful discussions occur as children focus on their ideas. The cycle of representations following a line of thinking shared among one group of teacher candidates in their field work with preschoolers shows the path of experience leading from continually building similar structures with blocks to a set of experiences more focused on the discussions that emerged among the children in the play. For example, the group of teacher educators heard from their cooperating teachers in the classroom that the children they were to work with had been building similar block structures for weeks. They also learned that what the children said these represented seemed to change almost daily. When the teacher candidates first observed the children referred to the blocks as houses. The teacher candidates brought in wood and other building materials to facilitate this play and the next day the structures were called cages. To elicit more information on what the children knew about houses and cages the teacher candidates shifted the focus by presenting new media. They created cutout figures of two people and invited the children to create the characters of their play. This led children to create and play with the cutout characters within the structures they created. The play in turn revealed more information about the ways the animals and people used the structures that further guided the teacher candidates to discuss the elements of the houses that children mentioned in their play, like rooms, windows, doors, toys, outside, inside, beds, and such. These discussions led to new representations as the children drew these things and then used their drawings as blueprints for building a house from cardboard.

These discussions along with the training in listening and observing brought our teacher candidates to a place where they shared their perspective of themselves as collaborators in the children's developing learning. Inquiry curriculum is often negotiated in the sense that both children and teachers have input in how the curriculum is designed.

These young teacher candidates learned something that we consider to be quite sophisticated. That the *Concept Materials* they choose and carefully tie to children's developing theories may not be acted on by children when first introduced. This often scares teacher candidates into believing their ideas and planning were wrong, but they learned that the provocations they set in place one day were usually acted on by children in succeeding visits, maybe two to three visits later:

> *I learned that when we present an idea to children with new materials they don't usually use it that day. They always used these new provocations but not for a day or two. This helped me have patience with their process and allow them to finish the thinking they were already involved with while using the materials that were already available. They would move to the new materials and ideas when they were ready.*

This reflects an aspect of the facilitation process that Malaguzzi (1998) spoke about so fluently. He referred to our facilitation of learning as a dialogue and that in natural dialogue one needs to take time to reflect on the input of another. Therefore, these children noticed the provocation on the day it was introduced and all they needed was time to assimilate the information and use it. This is a lesson for our teacher candidates about how children learn.

Also, we value this tremendously because this is not always the way we see lessons presented to children in early childhood settings. So we feel confident that our teacher candidates will have the skills they need to observe and really know about children when they are out in the field planning curriculum in an assessment dominated environment. Assessment regulations tend to enforce fast pace progression through lessons (U. S. Department of Education, 2001). Teacher candidates with strong knowledge of how children learn will have the ability to slow down the pace to meet the needs of the children while meeting the standards. The final lesson we would like to share is the powerful way that our teacher candidates experienced the collaboration among themselves:

> *"We bonded. No team did any planning without checking in with everyone."*

They recognized their classmates as a community of learners and as such, we are part of the circle.

We have shared an interpretation of our process and learning to provoke discussion among early childhood teacher educators. We are in the process of analyzing the details of this data to discern the levels of representation development among teacher candidates and the levels of development with inquiry in order to articulate and learn further. In sharing an overview of our

inquiry teaching practice we hope to make visible our idea of a "Cycle of Inquiry" as a tool for reflecting and reinventing our teaching practice, which is a continual journey. Our next step would be to design a longitudinal study on the effects of these courses when teacher candidates do student teaching and become teachers.

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