The Implementation of a Conceptually Coherent Curriculum within a Constructivist Preschool Environment

A Senior Project submitted in partial fulfillment of the requirements for the Bachelor of Science Degree in child
Development

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CHAPTER ONE

INTRODUCTION

Creating a learning environment that enchants children's curiosity and sparks exploration, discovery, and thought does not require a great amount of financial resources. Rather, one must concentrate on observation and focus on building on children's existing interests in the natural world. The research and theories of Swiss psychologist and philosopher, Jean Piaget, and Russian Psychologist, Lev Vygotsky provide a concrete look into a child's cognitive and social development and can be informative in creating such environments. Using the developmental knowledge presented in these theories, programs such as the Reggio Emilia program, the Preschool Pathways to Science program (PrePS), and the Big Ideas Constructivist approach were created. These perspectives share a view of the importance of an active inquiry-based learning environment focusing on the whole child. However, they also make unique contributions to understandings of young children's learning processes, such as placing particular emphasis on the role of others, the importance of coherency in the curriculum, and the value of quality materials. The strong theoretical groundwork in developmentally appropriate activities and social interactions that each of these programs has benefits and enhances the quality of the educational environment they provide for children.

For our project, we modified the patio environment of the Cal Poly Preschool Lab in light of best practices suggested by these theories and pedagogical approaches. The goal of our design was to provide the preschool students with a space where they could actively and freely explore a science-oriented curriculum with strategic guidance from their teachers. This was achieved by paying attention to Piaget's view of the child as an active constructor of his or her own

understandings. This view encouraged us to carefully consider the activities and environment presented to the children. Our goal was to make sure they were appropriate to the developmental level of the children and encouraged hands-on exploration of open-ended materials. Vygotsky's emphasis on social interaction and scaffolding drew our attention to the need for positive organization and flow within the whole environment and with the materials presented to the children. With a supportive environment it allows children to control their surroundings and encourages movement so that children can communicate freely with objects and people (Marion). Positive social interactions can be facilitated by not only the teachers but also providing a well organized environment. We were also influenced by the Reggio Emilio approach which highlights the importance of a child's hands-on experiences that are of personal interest to them. This perspective connects well with the recommendation that teachers chose a consistent theme throughout the environment, as suggested by the Big Ideas approach, in order to make those concepts more meaningful. This will enable students to observe and process core ideas through multiple outlets, in order to establish a holistic understanding. Finally, we resonated with the PrePS approach in which many effective ways to implement in-depth science-based learning are integrated into an environment.

In addition to being informed by theory and existing programs, our design was influenced by observations we made of children's engagement with the people and materials available in the existing environment. These observations led us to conclude that the children were not being presented with an engaging environment. The patio space went largely unused. Distinct, rigid learning areas were in place that did not include a cohesive or meaningful theme. Traffic flow and appearance of the patio was another area that disrupted the way the children were using the materials and environment. Along with the children, the teachers were unenthusiastic and

uninterested in the environment. This contributed to the negative atmosphere of the patio. Our survey of prior lab teachers validated these observational findings.

Our modification of the patio environment focused on addressing concerns with regard to conceptual coherence in activities, traffic flow, and teacher guidance. We chose to implement the theme of "Light" throughout our design due to our experiences with children's interest in this topic. Children are naturally interested in light. As little scientists, they spontaneously experiment on their own with light by conducting investigations such as, turning lights on and off, shining light through objects, and looking into mirrors. Our goal across the domains of art, science, and language, was for children to be able to manipulate and visualize the connection across a variety of experiences in regards to light as a big idea (Chaille et al., 2008). Through connections across various domains within the environment, different concepts of light can be illustrated, such as, symmetry, reflection, patterns, and contrasts (Chaille et al., 2008).

We also focused our modifications on improving the flow of traffic throughout the patio space. To address this area two different paths were created. We first created a pathway around the perimeter of the patio that included a design of numbers, tracks, shapes, facial emotions and colors. The goal of this pathway was to lead children into the patio as well as providing a preview of the activities available by following the path around. Second, we created an Astroturf pathway that led from the doorway out to the proposed gate down to the lower playground. This pathway contained small pieces of different materials and textures for children to use as stepping stones. The objective was to capture and direct children's interests as they came from the indoor classroom, help divide the space, and provide a sensory experience for the children.

Finally, to promote more positive teacher-child interactions, we conducted an informal orientation meeting regarding goals and modification of our design to the lab students assigned to the area, along with index cards located at each activity area detailing the specific learning goals. The informational meeting only included the five student teachers that had the patio space assigned to them and provided them with the goals of our design and how we were intending the space to be used. The index cards were placed throughout the patio but went largely unused by the possibility of lack of visibility and motivation to read them while interacting with the children.

Although our observations of children's experiences in the modified patio suggested that our efforts had a positive influence on play, several limitations of our project became apparent. First, we were also unable to implement some of our ideas due to time constraints and financial matters. For example, a proposed gate down to the lower level playground, installation of a new roof, provides softer and safer flooring and a permanent change to the organization of the patio. Second, a more professional development was needed to enhance positive teacher-child interaction. Teachers also needed more time with the design to observe children's interactions and work to scaffold and modify the activities to better suit the children.

Despite these limitations, we felt that our project was very successful. We hope that our efforts encourage future student teachers with inspiration and knowledge of creating a positive, cohesive preschool environment by conducting the role of a guide in providing children with repeated and related opportunities to work with.

CHAPTER TWO

REVIEW OF LITERATURE

Many researchers and theorists have argued that young children have an innate desire to learn and explore the world around them. For example, Conezio and French (2002) state that children are biologically equipped to learn about their natural environment, just as they are to learn to walk, talk and work with others. In general, children's natural inclinations to learn are promoted when they engage with people and materials in stimulating, knowledge provoking settings. Such rich and stimulating environments may provide children with increased opportunities to ask more questions of themselves and others, experiment with materials, and, consequently, develop new ideas. Creating an environment that captivates children's senses and sparks exploration, discovery, and the construction of new ideas does not require a great amount of financial resources (Curtis & Carter, 2003). For example, children may be fascinated by the everyday experiences they have within their current environments, such as when they observe seasonal changes, when they interact with assorted textures, and when they smell different natural aromas. One approach to guiding children's inquiry might be to focus on building on their existing interests in the natural world. Children can achieve in advanced ways when they are provided with opportunities that promote the development of building on knowledge they already know (Gelman, Brenneman, MacDonald, & Roman, 2010). A complementary approach is to make materials available for extended periods of time, rather than for brief daily or weekly "units." Children are stimulated to persist to ask questions and to practice and repeat an activity over and over again until they retrieved the information they are looking for (Gelman et al., 2010). Unfortunately, in school settings, specifically, research shows that many teachers fall

short of taking the opportunity to effectively support young children's natural inquiry processes (Gelman et al., 2010). An appreciation of children's inherent desire to learn might help motivate adults to provide children with a diversity of tools in order to help them as they explore their world.

Much of our understanding about children's learning processes comes from the research and theories by Swiss psychologist and philosopher, Jean Piaget, and Russian Psychologist, Lev Vygotsky. Using the developmental knowledge presented in these theories, programs such as the Reggio Emilia program, the Preschool Pathways to Science program (PrePS), and the Big Ideas Constructivist approach were created. Each of these theoretical perspectives and pedagogical models hold at least one view in common, namely that young children are investigatory scientists who have hands, mouths, eyes, numerous senses, and their whole being (Greenman & Stonehouse, 1996). These perspectives also make unique contributions to understandings of young children's learning processes, such as placing particular emphasis on the role of others, the importance of coherency in the curriculum, and the value of quality materials. In the following sections, we review these approaches with the goal of extracting information that will inform preschool teachers about how best to design physical spaces and implement a curriculum that will enhance children's inquiry processes.

The Constructivist Approach

The constructivist approach is based largely on the theories and practices of Swiss psychologist and philosopher, Jean Piaget, and Russian psychologist, Lev Vygotsky (Gregory, Kostelnik, Soderman, & Whiren, 2006). Piaget and Vygotsky agreed that children direct and create their own knowledge and understanding from their engagements within their everyday environments. Consequently, a constructivist approach to educational settings calls for a child-

centered approach in regards to education, which includes projects and activities that develops in unity with the students interests and values (Windschitl, 1999).

Although Piaget and Vygotsky both believed that children learn from their experiences within their environment, there are differences in their views. Piaget believed that children obtain their knowledge by independently exploring and self-constructing understandings (Gonzalez-Mena & Eyer, 2007). For example, a child may be curious to know what would happen if sand was poured into a sink and, consequently, brings sand from the sand table to the sink to satisfy his or her curiosity. Thus, the child is building his or her knowledge by experimenting with the physical materials available in the environment. Vygotsky, believed that young children acquire skills with the help of an experienced other (Bodrova & Leong, 2007). According to this view, young children can learn new abilities in a setting which promotes discovery and then practice and hone these novel skills when interacting with more knowledgeable peers or adults. Vygotsky emphasized that learning and problem solving are best fostered when children find themselves in a receptive environment that encourages social interactions (Gonzalez-Mena & Eyer, 2007). Adults in such environments use an approach called scaffolding, where they encourage children to learn on their own and only provide assistance when the children are about to abandon the problem at hand (Gonzalez-Mena et al., 2007). This type of adult interference at the appropriate time allows children to continue to work on the problem. These scaffolds are tasks on which adults build to develop the children's "zone of proximal development" (ZPD). The "zone of proximal development" is used to show how adults can properly assist children's learning. It is the distinction between what children can do independently and what they can do with additional assistance (Gonzalez-Mena et al., 2007). Consider a toddler, for instance, who tries to fit a piece of a puzzle that does not match the shape

of the empty space. The child seems to lose interest after many failed attempts, and an adult happens to see this happening nearby. The adult talks to the child by using verbal and physical cues to help the child fit the piece in the correct section of the puzzle by asking questions. .

Teachers who are informed by Piaget's and Vygotsky's constructivist theories may choose to provide sensory-rich materials for cognitive growth and encourage both assisted and independent discovery within a responsive environment. For example, a constructivist physical environment should support children's choices to travel from one area to next without asking for teacher approval, which would enable steady and fluid traffic flow. Allowing much adjustability in the use of physical space because the area must have the flexibility to be changed in any event presented, for instance, area dividers that are movable. Materials must be readily available to the children when, for instance, they are prepared ahead of time in an accessible location. Reciprocity between learning areas is also necessary because it can promote problem solving by integrating the materials throughout the areas, for instance, allowing children to use paint brushes in the water table. Finally, materials can be utilized in various ways to encourage children to think about the many opportunities; for instance, a box can be used as a table, a cave, a house (Chaille & Britain, 1997). The availability of the use of these materials aims to encourage the development of children's new ideas and experiences.

Piaget's View

As stated previously, Jean Piaget felt that children learn by independently exploring and constructing ideas from experiences within their environment (Gonzalez-Mena & Eyer, 2007). Piaget strongly believed in the idea that developmental change occurs as a series of stage like changes as children construct more intricate understandings (Cole et al., 2005). Thus, children of

different ages are impacted differently when interacting with their environment. He identified four broad stages of cognitive development, which range from infancy to nineteen years of age. The stage that focuses on children between the ages of two to six is titled the preoperational stage, where children represent reality to themselves through the use of mental images, words, and gestures (Cole et al., 2005). An example can be described when a child hears the word "jump rope", she understands what it looks like without having a physical representation of a jump rope present. He believed that children in the preoperational stage are unable to have logical mental operations, but rather they are viewed as thinking only from their perspective because of their egocentrism, confusion of appearance and reality, and precausal reasoning. Each of these limitations in thinking at the preoperational stage has implications for children's inquiry-based learning.

When children are in the preoperational stage, Piaget described them as viewing the world from their point of view as opposed from others. He labeled this perspective, egocentrism. Evidence supporting his claims comes from his experiments on spatial perspective taking and his observations of young children's conversations with peers. With regard to spatial perspective taking, the classic Piagetian task ("The Three Mountain Problem") asks children to reason about a large model of three mountains of various sizes, shapes, and attraction points. The children in this task were seated in front of one side of the model, while a doll was set on the opposite side and a different view of the site. When the children were presented with numerous pictures showing different viewpoints, the children were asked to point out the dolls perspective and the children almost always chose the picture that represented their own point of view (Cole et al., 2005). The second piece of evidence used by Piaget to support his claims about children's egocentrism is conversations among peers. When you see two children, between the ages of two

to six, for example, may seem to be having a dialogue with one another, when they are actually having simultaneous monologues (Cole et al., 2005). This stage displays how young children are not yet trying to communicate with one another because they still remain in an egocentric stage. During this egocentric stage, children seem to desire their independence and discovery of the world around them. Children may have the opportunity to focus on themselves by independently problem solving, asking questions about their environment, and seeking out their natural inquiry-based science learning through exploration.

In addition to failing to take others' spatial perspective and engaging in collective monologues due to their egocentrism, when children are in the preoperational stage they may be confused about differences between appearance and reality. For example, if a child has seen a twig that appears to be an insect, this may cause confusion between appearance and reality.

A final limitation of children in the preoperational stage is their inability to perform mental operations, which affects their way of thinking about cause-and-effect. Children love to ask questions about their world and where things come from such as, "Where does the sun go when it goes dark?" According to Piaget, children in the preoperational stage think from one idea to another when considering cause-and-effect, which is called precausal thinking (Cole et al., 2005). As an example, if a child misses her regular morning breakfast, she may think that it is not morning yet because she has not had breakfast. As children get older, they become able to think through their consequences when advancing to the next developmental stage.

Constructivist environments informed by Piagetian views should actively engage children in how their world works, without much need for instruction. Children can experiment with their world in a direct, observable, and logical ways which includes the movement of objects. These

movements include rolling, pushing, simply infinite opportunities that are engaging to children (Chaille & Britain, 1997). Children in such environments must be given the opportunity to engage in their own experimentation and problem solving.

Vygotsky's View

In contrast to Piaget's emphasis on object-centered learning, Lev Vygotsky believed that both physical and social interactions are vital for development (Bodrova, E. & Leong, D. J., 2007). Children gain knowledge by sharing their experiences through social interactions with adults and children. Vygotsky underlines that a child's physical manipulation with objects can only advance development if they are socially networking with one another. He argued that the potential for cognitive development depends upon the "zone of proximal development" (ZPD), a gap between what the child has already mastered independently and the level of development that can be attained when children engage in social behavior with a more knowledgeable other. A child reaching their complete potential and maximum development depends upon full social interaction within the ZPD. The range of skill that can be developed with adult guidance or peer collaboration exceeds what can be attained alone. When a child's mental functions are intertwined through means of social interactions and dialogue, it tends to sharpen their development. Therefore, children's social interactions and cognitive development work together simultaneously (Bodrova et al., 2007). As children begin to mature, their cognitive and social functions become more organized and in sync with each other, especially through the development of their language skills (Bodrova et al., 2007). When teachers are present, they must not only be physically there but also encourage the children to put their ideas into words.

When constructing an environment consistent with Vygotsy's perspectives on learning, one must consider how children's social interactions with each other, as well as teachers, will be impacted by the materials and design in the setting. Vygotsky's theoretical framework highlights how the people in the child's culture are influential in bringing them to a higher level of thinking. A preschool environment that is well set up can generate an optimistic and encouraging atmosphere (Leven, 2003). To challenge children in an environment, the appropriate materials need to be present that will push children to take risks and make connections. An environment that nurtures children's self-direction enables them to go about the space freely and interact with materials and individuals (Marion, 2003). When challenging materials are present, they capture children's motivation and they can build on previous successes in order to enhance the confidence of the learner and refine previous theories (Brownstein, 2001). Even simple materials that are developmentally appropriate for a child can be combined with other materials to create more complex play (super units), such as the simple block which is shown to increase cooperatively play (Kostelnik & Whiren, 2006). Overall, with the right materials, structure, and positive interactions between teachers and children, children can take their play to new heights using social interaction within a well-\designed environment.

Model Preschool Programs

Using the theoretical frameworks provided by Piaget and Vygotsky, programs have been created that implement some key concepts and expand off their theories. The programs discussed here touch on the importance of an active inquiry-based learning environment focusing on the whole child. Reggio Emilia, Big Ideas, and PrePs all provide, at some level, a consistent project based curriculum. A project-based curriculum is an intensive learning experience that engages

students in activities that are interesting to them throughout all areas of the environment. Most approaches that have grown from constructivism suggest that learning is accomplished best by using a hands-on, child-centered approach. Learners absorb information by experimentation through multiple mediums and not by being told what will happen. PrePS provides examples of a Big Idea approach, allowing children the time to actively explore one concept mainly through trial and error that initiates from their natural desires and curiosity. Giving children the chance to focus on one concept through multiple activities in order to truly grasp complex ideas is central to the Big Ideas approach. Similarly, Reggio Emilia also suggests a project-based environment, however the selection of what concepts to explore in the classroom is way in which these programs differ.

Reggio Emilia Approach

The Reggio Emilia approach to early childhood education offers a useful example of how constructivist theories can be applied to the creation of learning environments for children. The Reggio Emilia philosophy supports a child-centered learning style for education. In doing so, the Reggio Emilia philosophy follows many of the same principles of a constructivist practice, such as respecting and valuing children, focusing on the work at hand, and creating a social and physical environment that allows children to explore their individuality and objects. Grounded in Vygotsky's socio-cultural theory of learning, the Reggio Emilia approach contains the basic premise that knowledge is constructed as a system of relations between the simple interaction of two people, or between a stimulus and a response (Morrison, 1995). Vygotsky shares this belief that children gain knowledge through sharing their experiences by social interactions. Reggio Emilia also touches on Piaget's theory of assimilation and accommodation, which can be applied

through a process of re-reading, reflection and revisiting where children are able to organize what they have learned from a single experience within a broader system of relations (Morrison, 1995). Combining the theories, these processes are individually and socially constructed, where the child still is in the role of the active constructor of his or her own knowledge. This model allows children to express themselves through many different outlets such as clay, words, dramatic plays, and paints.

The Reggio Emilia approach has received much attention, being hailed by Newsweek magazine in 1997 as one of the best preschool models. Also, in the child development field, the NAEYC revised its recommended practices to include examples of the Reggio Emilia philosophy. This philosophy views children as competent, resourceful, curious, inventive and as having a desire to interact with others (Cittadini, 2007). Within Reggio Emilia schools, the environment within which children interact acts as an agent that teaches children. The environment is viewed as offering opportunities and spaces that provide the individual child and a group of children with the stimuli for play, discovery, and exploration (Municipal Infant-toddler Centers and Preschools of Reggio Emilia, 2010). For this reason, a great amount of attention is put into the environment to achieve an overall aesthetic beauty. The environment reflects a sense of respect towards the children and should be kept in good condition. The atmosphere in which children learn and grow needs organization and easily accessible materials, inviting the children in. When curriculum is organized, children can visually see what is available to them, as well as make connections with other materials that might be present in the room (Cittadini, 2007). This can then lead to higher level of play. Finally, documentation of the children's work displayed throughout the environment is another key component in the philosophy. This provides an opportunity for the children to look back and reflect on past

projects, thus making their learning visible. Also, having the work visible allows teachers to use previous work as aids to start conversation and allow children to construct or reconstruct their theories and ideas of the concepts learned (Loh, 2006). In sum, the focus of the Reggio Emilia approach is on the environment as an important learning aid, which children interact with. Therefore, the appearance, as well as materials implemented in the setting, is important.

Big Ideas Approach

The concept of "Big Ideas" centers on a project-based technique where students have a significant voice and impact in selecting the content and nature of the projects that they do. There is considerable focus on students' understanding of a particular topic and what it is they are doing. A Big Idea inspires and resonates with children by connecting numerous projects. The philosophy behind using Big Ideas is a quest of essence- structured learning around primary concepts (Chaille et al., 2008). Looking at the whole picture rather than parts makes the concepts more meaningful. When the children can observe ideas through multiple outlets they can see how they are connected. The construction of knowledge requires a holistic understanding. Complex big ideas such as light, sound, and cause and effect qualities require children to engage at many levels of interaction. This permits children with different interests to approach the topic using individual styles and ways of interaction (Chaille et al., 2008). In contrast, a "small idea" would be a curriculum that looks only at one aspect of the larger theme. For example, if the big idea was "growth", the small idea would only looking at plant growth. Often, preschools focus on small ideas without connecting them to an overarching concept. In the Big Idea approach, not only would you look at plant growth but also human growth, sound growing louder or contrasting what objects grow and others objects don't. During this active learning process,

preschoolers are encouraged to discover the world around them by exploring and playing. Having a child-directed curriculum allows the children to become intrinsically motivated, which creates personal drive and supports their natural yearning to learn. A school's curriculum is firmly centered on the students' interests in learning, which makes their education have more personal importance. When a task has personal significance, students are more intrinsically motivated to learn from the material and work towards their personal goals (Chaille et al., 2008).

Similar to the Reggio Emilia Philosophy, observations aid in discovering what an individual child or a certain group of children are interested in or prefer, which can help the teacher and children plan educational activities that take advantage of their preferences. Having developmental knowledge of each child will assist the teacher in planning an appropriate curriculum based on individual needs, which follows the concept of Big Ideas (Chaille et al., 2008). Children can absorb the most when learning through different mediums, with one or more particularly tailoring to their individual learning preference. For example, if children are immersed in learning about light, there should be different projects that let them explore different types of light. There could be coloring activities with different shades, followed by the exploration of a light table, continued by adding flashlights or a projector to the environment; all of which are instilling the concept of the color light. The Big Idea approach sets itself apart mainly based on the extent that an idea is explored and the selection of a theme. Other constructivist approaches such as Reggio Emilia build upon these ideas of a project oriented approach but may lean towards different concepts to explore or not having as large of a theme to explore.

PrePS Approach

Preschool Pathways to Science (PrePS) promotes science-based learning through many activities, which enable children to thoroughly investigate concepts that allow children to explore and learn the scientific procedures and vocabulary (Gelman, Brenneman, MacDonald & Roman, 2010). Advocates of this approach believe that preschool-aged children have the aptitude to understanding the technique and content of science. PrePS is a unique program because it does not have a set science curriculum planned out for teachers to present to preschool children, rather it is more of a philosophy for how to engage children with science. As with other constructivist programs, this approach recognizes children's natural desire to discover the world around them. In doing so, the PrePS approach relies on children's innate curiosity to learn about their world by using science to encourage children to ask questions, solve problems, focus on detail, document observations, make predictions, learn terms that explain their observations, and use these terms throughout the activity (Gelman et al., 2010). The goal of this approach is to connect existing to emerging knowledge, as well as to present possibilities for children to learn about math and science by instilling concepts throughout the academic year in many different ways (Gelman and Brenneman, 2004). Conceptually connected experiences seem to enable children to access these understandings over a long time. Children then start learning the concrete terms that link back to the concepts they investigated. Information about dogs, for example, is related to what we know about other animate living things. This enables children to make generalizations from familiar cases to new cases. For example, if we were told that the unfamiliar case, shanran is an animal, then we know that shanarans, like animals, eat, reproduce, and walk (Gelman & Brenneman, 2004). After time has gone by, children become familiar with and begin to use scientific vocabulary in appropriate situations.

The role of teachers in a PrePS environment is to guide children as they explore and make connections with concepts (Gelman et al., 2004). In this program, it is very important to focus on what the children are thinking about, rather than on what materials they are interacting with. Teachers in a PrePS school program worked with the same concepts for the remainder of the year, in order to assist children to comprehend the connection between concepts and activities. For example, the concept of "change" can explain human development, the weather climate, and so on. Teachers need to be enthusiastic and creative with their planned curriculum in order to respond to children's interests. (Gelman, Brenneman, MacDonald & Roman, 2010). The numerous variations that a teacher creates for a particular concept, the better a child will understand that idea.

Applying Theory and Existing Pedagogical Models to the Cal Poly Preschool Lab

The variety of programs and theoretical views mentioned above can inform and inspire the development of learning environments for children. The project design focuses on building from these programs to improve a physical space located within an existing early childhood program, the Cal Poly Preschool Lab.

Having a foundation in many of Piaget's and Vygotsky's understandings of the way a child develops, this was used to create our design for the lab and chose appropriate activities to implement. Piaget's view of the child as an active constructor of his or her own theories stimulated us to carefully consider the activities and environment we chose to present to the children. Activities were chosen that were appropriate to the developmental readiness of the children and encouraged hands-on exploration of open-ended materials. Comparable to Piaget, Vygotsky accented creating an environment that children will be actively exploring and social

interacting in. Vygotskys theory was implemented by looking at how the environment can support positive social interactions through successful organization along with scaffolding provided by the teachers. Effective dividers were placed to organize activity areas along with non-intrusively direct children in the area. Provided with an organized environment the children would be less likely to disrupt other activities and come into conflict with one another. For the student lab teachers a meeting was conducted to reinstate the importance of asking appropriate related questions that are within The Zone of Proximal Development and scaffold children's learning. The environment as a whole was also considered by presenting activities that provide an appropriate challenge to the children.

Our modification of the patio environment also focused on presenting a project-based, conceptual coherence across activities. Light was the chosen concept that children seemed interested in and the space was built off of the Big Idea approach by transforming not just one section of the classroom, but rather looking at the whole. Research showed with the appropriate amount of time this will hopefully make that concept more meaningful and will enable students to observe and process the idea through multiple outlets, in order to establish a holistic understanding. The Reggio Emilio approach emphasized the importance of a child's hands-on experience that has personal meaning to them, within the project-based approach. With observations made of the concepts that children are investigating, "light" became the conceptual theme and was implemented through the use of a variety of mediums such as a projector, light table, shades and tints, and other properties of light. Finally, a more refined aspect of the design was taken from the PrePS approach in which many effective ways to implement in-depth science-based learning are integrated into an environment. Magnifying glass, textures, and nature inspired objects were chosen and spread throughout the environment.

Since the nature of the Lab is to provide a learning opportunity for Child Development undergraduate as a time for them to learn and grow as professionals the space must maintain flexible and all changes easily modified. Therefore, our emphasis was on abstract, open-ended design pulled together in a conceptual integrated theme across all areas of the patio. This breaks the mold of conventional spaces that the current lab students were used to and produced a new experience for them as well.

We realize that with our limited time and resources, we were not cable of making all of the necessary changes and additions to provide the ideal learning and professional development to the children and student teachers. However, we hope these small alterations resonated with the current student teacher and will also affect future Cal Poly Child Development major students and children.

CHAPTER THREE

METHODOLOGY

The purpose of the project was to design a preschool environment to promote inquiry-based science learning for children between the ages of 3 and 4 years at the Cal Poly Preschool Lab in San Luis Obispo. Our design was informed by three strands of research: (1) an investigation of current research and theory on children's science-learning, (2) a survey of Cal Poly Child Development undergraduates who have served as teachers in the lab, and (3) an observation of children at play in the targeted environment prior to any modifications. After implementation of design, we conducted a second observation to evaluate the behaviors of children and teachers in the modified environment. Below we discuss our research process in the three areas that prepared us to create our design. We then describe the process we engaged in to prepare for the launch of our modified environment.

Literature Review

Before initial observations of the existing preschool laboratory environment, we conducted an intensive literature review using PsycInfo and other relevant databases. We focused on reviewing past research regarding active learning environments and learning processes of children. This literature review enabled us to develop a base knowledge of effective means to create a developmentally appropriate environment, as well as an understanding of what components to look for in a successful environment.

Survey of Prior Lab Teachers

Participants

Participants in this component of our project were Cal Poly undergraduate Child Development majors who have worked as teachers in the lab. Participants were administered the survey in higher division Child Development classes (CD413 & CD431), as well as selectively contacted via Facebook messages.

Materials

The survey included 5 questions asking participants to reflect on ways to amplify the appeal and functionality of the Cal Poly Preschool Lab Patio area for future Child Development undergraduate teachers and children. The questions were:

1. What quarter did you take Preschool Lab?
2. What area of the patio was the most used? Why?
3. What area of the patio was the least used? Why?
4. What three obstacles (in terms of patio design) might interfere with teachers' ability to effectively use the patio area?
5. What specific recommendations do you have for ways that we might improve the patio environment? You can think practically as you answer this question, and/or think BIG. Basically, what would a dream patio have that the current one does not?

Procedure

Twenty surveys were administered to students in advanced level Child Development classes (CD413 and CD430) consisting of prior Cal Poly undergraduate students who had taught at the Preschool Lab in previous quarters. We distributed these surveys during class time and

received 16 back from students who voluntarily completed them. An additional 20 surveys were sent to previous Preschool Lab teachers via Facebook message; six participants responded.

Patio Environment & Use

Environment

Pre-existing preschool lab setting. We documented the pre-existing patio environment by visiting the preschool lab on Monday, January 25, 2010 from 9:30-10:30am. The pre-existing patio environment was set-up by the current student lab teachers. We did not interfere with the design or to interact with the children throughout the time of observation. The student lab teachers were assigned to a specific area of the patio (science, crafts, or music) where they were responsible for the set-up of the curriculum activity and supervision of children's play throughout the lab period for that day. Specifically, five student teachers developed activities for three curriculum areas. One teacher was assigned to the music area, two were responsible for the art area, and two were in charge of the science area.

Modified preschool lab setting. The modified patio environment was documented through an observation of the preschool lab on Monday, February 22nd, 2010 from 9:30-12pm. During the observation, there was an interruption in documentation due to mandatory circle time for all children to attend, along with children's journal writing from 11:15-11:40am. We constructed the modified patio environment, which began on Sunday February 21st and then finished placing materials before the children arrived on the 22nd using the pre-planned design, albeit with minor adjustments. Throughout the documentation, we engaged with the children in the different curriculum areas, as did five other teachers who were assigned to the patio area.

Use

Pre-existing preschool lab use. We observed the behaviors of children and adults using the patio area at the Cal Poly Preschool Lab 9:30 a.m.-10:30 a.m. on Monday January 25th, 2010. The patio contained several different activity centers, such as: crafts, music, and science. Each activity area was assigned to specific teachers who created curriculum activities and supervised their area for the remainder of the day. The participants in this phase of the observational component were children attending the Cal Poly Preschool Lab. These children were between the ages of three to four years old and voluntarily attended the preschool three days a week, for three hours each day. The children mainly came from Caucasian middle-class socio-economic status families. Prior to their admittance into the program, the children's families signed a waiver allowing their preschoolers to be observed. In addition to observing children, we noted behaviors of any adults (teachers and parents) who were present on the patio during the time of the observation. Behaviors were documented through the use of a running record method, with each observer responsible for recording activities occurring in different sections of the patio. Observer A focused on the craft, woodworking and music areas, whereas Observer B focused on the science and water table areas. After the 60-minute observation, observers compared and discussed the documented notes.

Modified preschool lab use. We observed the behaviors of children and adults using the modified patio area at the Cal Poly Preschool Lab from 9:30am-12pm on February 22nd, 2010. The modified patio contained several different activity centers focused around the central theme of light. As in the first observation, five student lab teachers were assigned to the area to guide and monitor activity areas. In contrast to the first observation, these teachers were not responsible for curriculum development. Observers recorded the activities of individuals on the patio through the use of handwritten notes. Unlike our observation of participants' use of the

existing patio lab, each observer monitored the entire patio without focusing on a particular section of the space. Observers debriefed at the end of the session by reviewing notes and discussing observations.

Design Development and Implementation

The post observational environmental design was constructed using a variety of sources including research conducted in the literature review, a survey of past student teachers, results from a pre-observation of the lab, and input from the current head preschool teacher. Our review of current research on children's outside play environments and social interactions provided the initial foundation for the design. The input from past student teachers reinforced some of the findings presented in the literature review, as well as introduced new themes and ideas. The pre-existing patio observation of the lab area also provided us with a few new insights that were taken into consideration in the design process. After we obtained our initial ideas, a trip to Home Depot and Bed Bath and Beyond provided inspiration, information on the availability of materials, and the projected total financial cost. Finally, once the completed sketch and proposal of the patio design was developed, we obtained input and approval from the head preschool teacher. She helped us to finalize our design and curriculum materials, as well as helped us to schedule a meeting with the student lab teachers who were assigned to the patio for the day of implementation. During this meeting the overall design of the patio was discussed as well as the project goals for each of the separate activities. If students had any questions regarding the project they were also answered at this time.

On Saturday February 20th all materials needed for the project were purchased from Home Depot, Bed Bath and Beyond, The Dollar Tree, and Smart n' Final. Early the next day, materials were transported to the site and construction began. First, we removed unused tables

and swept the patio surface clean. Throughout the rest of the day and evening, we put created and installed various elements of our design. The next morning, before the children and lab students arrived, we set up final materials that could not have been placed outside in advance.

CHAPTER FOUR

RESULTS

Results are discussed in three sections. First we report results from the survey given to prior lab teachers to assess their evaluation of and recommendations for the patio area at the Cal Poly Preschool Lab. Second, we describe the pre-existing and modified patio environments. Finally, we discuss how teachers and children used the patio during both phases. Examples are provided from the observations of teachers' interaction with the environment, along with the children use of the materials.

Survey of Prior Lab Teachers

Of the 36 surveys distributed to previous preschool lab undergraduate student teachers, 22 were returned for our research consideration. In general, the common theme raised by participants was to implement amendments to the patio, along with reorganization of the current design. Question two asked which areas on the patio were the most used. Of the 22 participants, 11 indicated that the art area was the most popular, six specified dramatic play, three suggested all the areas were used comparably, one pointed to the water table, and one signified the music area was the most frequently used by children (see Table 1). Question three asked which areas were used the least by the children. As Table 1 indicates, over half of the 22 participants indicated that the music area was the most underutilized (N=13). In addition, five students pointed to art, two said woodworking, one specified dramatic play, and one signified that the water table was the least visited by the children. Question four asked participants to indicate what obstacles interfere with teachers' ability to effectively use the patio area. The most common obstacles stated were the limited pathway for child movement, lack of organization of materials,

dirty and inappropriate outdated materials, and the hard concrete flooring. Question five asked for specific recommendations on ways to improve the patio environment if unlimited resources were made available. Many of the previous preschool lab teachers suggested that the patio was not utilized to its fullest potential and needed modifications to make it more appealing to the children and teachers. The most recurrent proposals made were to increase the flow of the patio by eliminating activity barriers (e.g. wooden blocks), to introduce more engaging materials that stimulate creativity, to rearrange the environment occasionally, to incorporate distinct pathways to facilitate traffic flow, to repair the current outdoor roof, and to insert softer flooring.

	Most Used	Least Used
Art	11	5
Dramatic Play	6	1
Music	1	13
Science	0	0
Water	1	1
Woodworking	0	2
All	3	0

Table 1. Number of Prior Lab Students (of 22) Who Indicated Each Area of Patio

Patio Environment and Use

Environment

Pre-existing preschool lab setting. The activity areas set up on the outside patio were separated from one another. There were five teachers assigned to the three areas of the space, which included an art, music, and science area. The patio had a damaged roof, with holes and water leaks. The space looked dark and gloomy because of the lack of outdoor lighting and bright appealing colors. There were two old mats permanently placed in the music area, while the rest of the patio consisted of concrete flooring. Wooden cubbies for the children's belongings sat along the wall leading to the inside classroom, and one side of the patio fence contained storage units that held curriculum materials. The art area included two tables. One table was used for an art activity and the other was vacant. An easel stood in between the two art tables, with a string hung across two poles for art material to be placed to dry. The art activity of the day was the creation of picture frames using materials such as, tissue paper, colored popsicle sticks, glue, glitter, and markers. Next to the empty art table was a woodworking table that was not used that day. Next to the art area was the music area, which had blocks stacked approximately three feet high that acted as a barrier between the music and science areas. This area had a stereo playing music, which was propped up on the block barrier. Beside the stereo, stood the class rat that was out of reach and sight of the children. There was a xylophone set up on a small table, along with ribbons to dance with on the old mats. Hanging from the outside overhang in this area was a transparent green canapé with two pillows placed on the floor. On the other side of the block wall was the science area. An empty table was pushed up against the block divider, while another table held an activity. Right beside the empty table were two small child-size brooms. The materials for this area included a plastic liter container filled with vinegar and baking soda.

When combined they would inflate a balloon placed around the rim of the bottle. A few feet from the science activity was a small Lego table facing a chalkboard wall. In the corner of the patio space, next to the Lego table was a water table, which was not available for use because the lid was on. The overall curriculum did not appear to have a central activity theme because there was no connection or reciprocity between the activities in each area. For instance, the picture frames created in the art area did not relate to the xylophone placed in the music area. The results provide clear evidence that modifications could be implemented that would enhance integration of curriculum materials.

Modified preschool lab setting. Our primary goal in modifying the patio curriculum was to unify areas for the purpose of allowing children to explore the concept of light through multiple outlets. A main activity presented to explore the meaning of light was a projector placed under the roof, along with a white sheet that displayed the illuminated image. Surrounding the projector, a table was stationed as the materials hub that contained a variety of materials to test out on the projector or to explore with on any other part of the patio. Adjacent to the projector, a craft activity provided children with the opportunity to make cellophane windows that could easily be placed on the projector or used as a lens to explore the way the patio looked when filtered through different shades of color. The woodworking table offered an activity of hammering pegs into styrofoam pieces. These holes made in the styrofoam could be observed on the projector as well.

Spread throughout the environment, multiple other projects connected to the exploration of light. The water table contained dyed green water with shells, opaque and translucent rocks, and paintbrushes. Here the children viewed the rocks and shells through the water or holding them up to their eyes seeing the light shine through. We also provided paintbrushes as another

medium of investigating the rocks and painting on the sidewalk. Along the perimeter of the patio mats were placed down with a large cardboard box and flashlights. Children used the flashlights while crawling through the box, observing another source that light comes from. Next to the box a long tube contained glow sticks and a peek hole that the children looked through, resulting in a version of an enlarged homemade kaleidoscope. In this activity a glow-in-the-dark concept was introduced.

Art was another outlet through which the children could examine properties of light. Along the edge of the existing gate, we hung a plastic sheet with rainbow colored paints and rollers to provide a large painting surface. The different colors on the plastic provided translucent and opaque properties along with opportunities to blend colors or order them to make rainbows. Next to the plastic, we tied a small patch of chicken wire to the fence as a tactile craft area. We provided pipe cleaners and beads of different shapes, sizes, and properties for children to use in a lacing activity. Although not explicitly related to light we intended the differences in bead properties to be highlighted as they were strung on the pipe cleaners as well as being in a place were light could shine through them. Another available activity was an area in which children could paint using white and black paint and black and white paper. Here children were observed mixing the black and white paints together and then testing the shade out on black and white paper. For further exploration of light, included in the private area as described below, was a light table with view finder blocks. Children were seen in small groups sitting in this area playing with the blocks by placing them up to their faces or on the light table. Finally, a shelf that contained reading material about light, flashlights, kaleidoscopes, and texture pieces connected the areas together. Using different activities spread throughout the environment,

children were given the opportunity to examine different sources and properties of light. See Appendix A for a map of the modified preschool lab patio environment.

A secondary objective of the modification design was to incorporate and improve the organization and flow of the environment. To address traffic flow concerns that were noted in the pre-existing patio observations, two different paths were created. We first created a pathway around the perimeter of the patio that included a design of numbers, tracks, shapes, facial emotions and colors. These images were located at regular intervals along the looped path. Second, we created an Astroturf pathway that led from the doorway out to the location of the proposed gate down to the lower playground. Within the pathway we installed small pieces of different materials and textures for children to use as stepping stones, such as bubble wrap, cotton, footprint-shaped plastic bristles, carpet and pieces of rubber mats. Finally, for the purpose of organization and dividing spaces, we hung a clear curtain with pockets that held different types of plants in each pouch. To incorporate a place where children could easily remove themselves away from heavy traffic areas in the far right corner of the fenced in patio, a nature inspired private area was constructed using a bamboo umbrella and grass covered fence. Within this private area, pillows, a light table, and viewfinder blocks were placed.

Use

Pre-existing preschool lab use. Our observations revealed that the majority of the children in the preschool program neglected the patio space. Children were seen using the patio as a pathway from the inside of the classroom to the playground area. Only a small number (6 of 30) of children stayed to play on the patio area during our observations. In general, these children used the planned activities in traditional ways; they did not typically remove materials from the various activity areas for which they were designated. For instance, after a child completed her

craft activity, she left the activity at the table without incorporating it into the other aspects of her play on the patio. When one child did attempt to integrate materials across activity areas by bringing a wooden dog from the classroom to dance with her in the music area, a teacher told her to return the wooden dog into the classroom because it belonged inside. Teachers intruded on children's play in other ways as well. They often interrupted children who were interacting with activities in particular areas. For example, a child was dancing in the music area when a teacher disrupted the child's activity to encourage her to interact with a xylophone. Teachers also failed to support children's activities by extending their exploration and thinking through the use of verbal descriptions and questioning. The two teachers in the art area, for instance, failed to communicate with the one child who came to the art table. It was completely silent while the young girl was creating her activity. Similarly, one teacher in the music area danced with one of the two children in the space, yet did not communicate with or attempt to include the other child who was watching the two of them dance.

Modified Preschool Patio Use. In contrast to our observation of the pre-modified patio space, children were seen consistently engaged in positive interactions with the curriculum activities throughout the lab period. The perimeter path and texture trail that led to the activity areas served to provide children with an initial preview of all activities presented on the patio. These pathways also encouraged large motor activity; children were observed running around the entire path. We observed one child hop on one foot through the numbers, shapes and checkers, and then she walked on the rainbow. She stopped at the materials hub to look at the magnifying glasses and flashlights. She put on one of her shoes and headed over to the projector where she looked at the sheet where the illuminated images were displayed. Another child hopped from one

number to the next on the path and said the names of the numbers aloud. This eventually led her to a spot on the patio that might have not been investigated before.

Integration of materials throughout the environment was also observed. Rather than having a strict place for the materials to be used, a more open-ended use and purpose was seen in the objects placed in the environment. The magnifying glasses were observed in multiple areas, such as with the projector, cardboard box, and painting areas. The projector area was also noted to be a spot where multiple tools were integrated and explored. Creations from both the cellophane activity and woodworking areas were carried over to the projector for further investigation. Children were allowed and encouraged to bring materials across areas, and did so.

A major property of light infused in the curriculum provided throughout areas was the concept of opaque vs. translucent. Many of the materials provided in the environment contained opportunities to explore this contrast. The water table was one area that engaged children in this concept. With the assistance of a teacher, children were encouraged to explore the properties of the different rocks in the water by asking if they could see through them. The vocabulary terms “opaque” and “translucent” were also introduced at this table, with many children repeating the words. The lacing activity where the children strung beads through chicken wire also purposefully contained translucent and opaque qualities. During this activity the children didn’t seem to notice the difference in the beads but were more focus on the physics of getting the beads to stay on the pipe cleaner and attaching it to the fence. Finally, the projector was an apparent and clear tool to test the different materials. Children placed the materials on the projector then looked at the image to see if the color shined through or if it was just a black outline. An index card prompting teachers to use this vocabulary throughout the relating activities was supplied.

The preschool lab has a high adult:child ratio which provided children with constant assistance when exploring materials. Student lab teachers were almost always present at an activity with a child. One child looked at the woodworking table and headed over to put on his protective goggles and begin hammering pegs into Styrofoam pieces. With the assistance and encouragement of a teacher, the child took the styrofoam to the projector to observe the holes he made from the piercings. The child smiled when he pointed to the light holes on the sheet from the styrofoam. Across the activity areas, children had an adult present to work through an activity with or be available to support positive interaction with peers. This was not, however, always a benefit to children's discovery processes. Throughout the lab period, we observed interactions that suggested that teachers might have served to detract from effective facilitation of the children's activities. For example, one teacher was carrying around a coffee cup, which presented a safety concern as well as an obstacle when interacting with children. Also, teachers were seen often standing next to activities rather than being at the child's level. At one point during the observation, all of the 5 teachers were not present on the patio.

To provide guidance and support to the lab teachers prior to the implementation of the design a meeting was conducted where lab teachers were informed of changes that were going to happen to the patio as well as overall goals discussed. Throughout this meeting teachers were encouraged to ask questions about the design or purpose of the implemented materials however nobody responded or interacted. Explicit attempts to guide teachers' interactions with children were unsuccessful. Although small index cards were provided at each curriculum area detailing the projected learning goals associated with the activity, teachers were rarely observed reading cards and modifying their language to adhere to the learning objectives. For example, in the black and white painting table activity, teachers were encouraged to incorporate language

relating to tints and contrasts as the children explored the mixing of black and white. Such interaction and language was rarely seen in the modified patio observation.

Improving the environment did have a positive effect on children's behaviors. Some teachers also responded to the changes and efforts to encourage scientific inquiry but some teachers needed more guidance than a brief meeting/index card to change their ingrained behavior. There were few very good interactions between children and teachers. One teacher observed prompted experimentation at the projector site encouraging the children to try out multiple materials on the projector having them come up with a hypothesis of how it was going to turn out. Other teachers engaged with the children by walking around the perimeter path together jumping along the shapes. Overall results from the pre and modified environment observations led us to the conclusion that the environment prompted more scientific inquiry based learning surrounding the topic of light.

CHAPTER FIVE

DISCUSSION

We modified the Cal Poly Preschool Lab by implementing a curriculum with the goal of encouraging children's inquiry-based science learning by providing a diverse set of tools to facilitate the exploration of their world. This stimulating constructivist environment aimed at providing pre-school aged children with various opportunities to: (1) venture freely from one area to next without asking for permission, (2) easily access materials, integrate supplies, and use the materials and objects in a variety of ways, (3) explore materials that have conceptual coherence, and (4) interact with adults who provide appropriate levels of guidance. In the following section, we discuss the results of the pre-existing and modified patio by honing in on issues related to traffic flow, integration across activities, conceptual coherence, and scaffolding and guidance. We then consider possible\ future directions for continued work in this environment.

Traffic Flow

A key principle in creating a constructivist physical environment is providing consistent traffic paths to support children as they travel from one area to the next without asking for teacher approval (Chaille & Britain, 1996). The pre-existing patio did not provide adequate pathways and was primarily used by the children as a transitional area to get from the inside classroom to the downstairs playground. There was no incentive to actually enter the larger patio area. If a child did enter the patio, physical dividers (e.g., block barriers) separated the distinct activity areas and discouraged traffic flow from area to area. To address these concerns, the modified patio had a pathway that looped around the perimeter, as well as a texture trail that

intersected the patio. Each of these clearly demarcated pathways encouraged children to travel to all areas of the patio, enabling them to visit the numerous arranged activities nearby. The addition of these paths seemed to have positive impact on children's behaviors. For example, we observed one girl hopping on the various designs painted within the perimeter path and then stopping at the materials hub to look at the magnifying glasses on her way to the projector activity. The looped pathway on the patio encouraged the young girl to have the freedom to explore the various arranged activities. The modified patio pathway provided an area for children to run, jump, walk, and skip without disrupting ongoing activities. For example, a child was observed running along the perimeter path without intruding on any continuing activities. This was because the pathway was placed in a spacious location that would not disturb activities. The smooth and steady traffic flow also enabled children to self-direct themselves from activity to activity without teacher approval. The children seemed to own their environment by becoming familiar with the activity areas, identifying where the materials were located and how they were used, and self-directing their discovery through unsupervised movement. For instance, two boys entered the private area from the pathway independent of teacher direction. Children seemed to be more self-directed once the pathways were implemented, area dividers were removed and excess furniture was reduced. The teacher's contributed to the children's self-direction on the modified patio as well by monitoring the entire space, as opposed to following the format of the pre-existing patio in which teacher's were stationed at individual activity areas.

Integration across Activities

A second principle in the design of physical space is to have reciprocity between learning areas in order to promote children's problem solving by encouraging them to use the materials and objects across areas (Chaille & Britain, 1996). In the pre-existing patio set up, the children

used the curriculum activities in traditional ways; they did not integrate materials from the different activity areas, but rather kept them in their distinct areas. The pre-existing patio had designated areas, uninviting spaces, unorganized curriculum topics, and inaccessible materials and objects, all contributing to a lack of support for integration across areas. The modified patio design sought to remedy this by providing materials that were easily accessible to children, areas that encouraged fluid movement in and out, and a conceptually coherent curriculum to spark interest in the integration of materials into all areas. As an example, in some cases the pre-existing patio had interesting materials, however they were not used by the children because they were not easily accessible or linked to the children's interest. For instance, styrofoam pieces were packed away in bags and boxes placed underneath the woodworking table and could only be accessed by the children through assistance of a teacher. In contrast, the styrofoam in the modified patio area was set up on the woodworking table, available for use. Changes like this contributed to making the modified patio effective in promoting more stimulating ideas and incorporation of objects from one activity to the next. This was quite deliberate. We placed a materials hub in a central location in the modified patio arrangement. This hub contained items (blocks and magnifying glasses) that could be integrated throughout each activity by children.. By making materials easily accessible, children seemed to be more interested in integrating materials and objects from area to area. As evidence of this, one child hammered pegs into a piece of styrofoam and then took the styrofoam to the projector to observe the holes he made from hammering in the pegs. In another example, two children brought flashlights from one area of the patio to use as they explored the interior of a dark box.

Conceptual Coherence

A third principle for the development of environments to support children's learning is to introduce a holistic concept by encouraging the use of scientific vocabulary, conceptually themed activities, and materials that could be integrated across areas. We aimed at unifying the activity areas in the modification of the patio by providing children with opportunities to explore the concept of light through numerous mediums. Conceptual themes focus on the whole picture rather than the small parts, which allows the children to view ideas through a number of outlets and observe how they are connected. A child-directed curriculum allows the children to become intrinsically motivated, which supports their natural desire to learn and work towards personal goals. The pre-existing environment lacked a conceptual theme that was practiced throughout the patio. The undergraduate teachers independently planned their own curriculum areas without coordinating ideas with each other, which fails to instill a deep conceptual connection across the activities. In the modified patio area, however, the children were constantly engaged with the activities presented because there was a central theme that meaningfully connected activities throughout the curriculum. Magnifying glasses, flashlights, projectors, and black and white paints were some of the materials provided for the children that incorporated the conceptual theme of light. The water table activity encouraged consideration of the concepts of translucent vs. opaque while children explored the attributes of the various rocks in the water. With the assistance of a teacher asking the children if they could see through the rocks or not, and then using the words translucent and opaque, many children repeated the words. The modified patio was implemented for one day, which does not provide enough time for the children to meaningfully understand the connection between some of the concepts of light and scientific vocabulary. If the modified patio were to be integrated for an extended period of time, as

opposed to a single day, the children may have more opportunities to explore ideas through multiple outlets and instill a greater understanding.

Teacher Scaffolding and Guidance

A fourth principle that we attended to in the development of the patio is that "a careful observer of children can grasp the particular challenge or focus of the child's learning encounter, and ask an appropriate question at an appropriate time to stimulate the child further" (Chaille et al., 1996, p. 66). As seen in both the pre-existing and the modified patio, the undergraduate teachers were not particularly effective in supporting children's activities by expanding their exploration and thinking through the use of verbal explanations and asking questions. Although we provided the undergraduate teachers with index cards describing the objectives of each activity in the modified patio area, the teachers did not show valuable assistance to the children's activities. There was a lack of communication and questioning in both the pre-existing and modified patio arrangement. It is important to provide teachers with time and encouragement for their own professional and personal development. Vygotsky underlines that the amount of skill level that can be developed with adult guidance or peer assistance, surpasses what can be attained alone. Thus, children's social interactions and cognitive development work as one (Bodrova & Leong, 2007). Taken as a whole, with the proper materials, structure, and interactions between teachers and children, children can advance their play to new levels by continuously being socially active. The teachers in the modified patio were unresponsive and unenthusiastic during the orientation meeting of how the new materials were related to the conceptual theme of light. We believe the teachers were uninvolved with the children in the modified environment because of their lack of participation in the project design, not being

provided with adequate instruction and knowledge pertaining to theory in literature, and inexperience in a preschool setting that promotes reciprocity and holistic understanding.

Future Directions

One of the major challenges in the successful implementation of this modified constructivist patio environment was that the undergraduate teachers seemed uninterested in assisting children through verbal descriptions and questioning. We believe a future direction could be to include teachers in the development of the project design, which would aim to instill a sense of commitment and investment in the activities. They would be supplied with an orientation presentation at the beginning of the preschool lab course focused on the importance of providing skillful guidance when operating a constructivist curriculum classroom. Along with the orientation presentation, the undergraduate teachers would have a length of time set aside for training of on how to interact with children in a self-directed environment. This training period would prepare teachers far in advance and provide them with invaluable experience that could be used in the modified patio. Including teachers in the patio design, informing them about the literature on constructivist approaches, and providing meaningful training experience will enable them to facilitate interactions within the physical arrangement of the modified patio design.

Another challenge we faced was that we were unable to implement some of our project ideas due to time constraints and financial matters. This would have changed the dynamic of the patio almost completely. The first proposal that was unable to be installed was the gate leading down to the playground area. The gate would have been a driving force in directing children onto the modified patio because it would be placed in the center of the fence encircling the patio, thus changing the patio center into an active pathway rather than a transitional space. The second

initiative that was insufficient and unsuccessfully implemented was an amended roof. The patio roof covered about half of the entire space, which made the environment vulnerable to water damage. The changing weather took the curriculum focus away from the interests of the children in favor of more practical concerns, which made for limited activities. The third plan that was unable to be included in the design due to limited time and finances was lowering the encircling fence. The tall fence interferes with what the children can see on the other side, fails to be set to scale with relation to the height of the children, and presents an uncomfortable and uninviting ambiance for adults and children. The fourth idea that was not integrated was a permanent modification of the patio, rather than a temporary one. We anticipated developing permanent future plans for the modified patio, but limited time and financial difficulties made this idea unfeasible. For instance, we substituted permanent paint for a combination of cornstarch and water, which was used to create the encircling modified patio pathway. We expected that the installed materials would remain for an extended period of time, in order to nurture scaffolding for the children. However, when we integrated our plans into the patio, that same day the materials were taken down.

In sum, this project was driven by our enthusiasm for creating a modified constructivist patio that would support the idea that children are in charge of their learning. Every child has different style of learning, which highlights the plan that the curriculum is developed on the basis of the children's passions. The big picture of the patio is to have an environment that supports rich social interactions and cognitive development, which can motivate children to continually enhance their learning. Children advance their knowledge in this rich environment by asking the teachers for assistance and guidance. We wanted to design a space that allowed children the opportunity to utilize objects and materials in multiple ways, which creates new ideas and sets

the foundation for problem solving. Materials that can be used to spark creativity and assist in developing proper cognitive development are inexpensive and easily obtained. Items can be purchased for cheap and then be reused for a different purpose. We followed child-directed constructivist values by developing conceptual themes that hone in on the whole picture, which allowed the children to analyze their ideas through multiple outlets and then see how they are linked. We wanted to emphasize that a curriculum with a conceptual theme continues to build on children's previous knowledge, rather than being repetitive and providing passive means of gaining information. We encouraged children's intrinsic motivation through their innate desire to learn about their world. In addition, we wanted to let the children and teachers know that the furniture or curriculum areas are not permanently mounted to specific locations, but can be modified and adjusted. The implementation of the encircling paths and adjustment and relocation of the furniture demonstrated that guidance and engagement of children is not limited to teacher instruction. Through the implementation of a new physical layout, teachers can enhance children's exploration and discovery by allowing them to take activities and materials from one area to the next. The environment that we created capitalized on children's natural desire for learning by providing them with a flexible and intellectually stimulating context for play.

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APPENDICES

Pre-Existing Patio

Modified Patio