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EDUCATIONAL CONTEXT AND EARLY CHILDHOOD ART-RELATED PROBLEM SOLVING

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

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*****

The Ohio State University
2002

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ABSTRACT

Ideally, art activities motivate students to think and be engaged in purposeful action and interaction. This study was an attempt to get a closer look at a preschool which is influenced by the Reggio Emilia, Italy, educational approach, where symbolic expression is valued as a means for cognitive development. The purpose of this study was to examine the physical and philosophical context of the preschool classroom at the A. Sophie Rogers Laboratory School and its effect on children's problem solving. In a context of playing, expressing ideas and communicating, problem solving was part of the classroom's everyday life. Classroom activities grounded in children's interests and concerns and in attempts of negotiating understanding, led to situated problem solving and developed spontaneous, autonomous, responsible, flexible problem solvers. Socioconstructivist classroom problem solving was facilitated by teachers who developed a learning community and encouraged purposeful communication and interaction.

Through classroom observations, informal conversations with the teachers and content analysis of the fieldnotes, the types of problems that arise for young children during art-related activities were described and the main cognitive qualities during problem solving were identified. The data was interpreted through two levels of
content analysis and provided evidence that, in their daily activities, children deal with interpersonal, conceptual and practical conceptual problems. Interpersonal problems can be caused by children’s attempts to share objects, plan play themes for group play, communicate, draw peers’ attention, and develop and maintain involvement in peer culture. Thinking strategies and qualities that were observed to be successful during children’s interpersonal problem solving were reasoning, imagination, flexibility and communication. Conceptual problems were related to children’s decision making and developing ideas, representational or expressive challenges, and differences between personal goals and ideas among individual group members. Problem finding, investigation and communication were important cognitive qualities during conceptual problem solving. Practical problems occurred with children’s initial difficulty in using materials due to undeveloped sensorimotor skills, lack of experience and practice, and inability to organize them. Teachers’ most commonly observed behavior during children’s problem solving included providing resources, reminding children about classroom rules, emphasizing planning, and encouraging children to communicate and negotiate meaning.
Dedicated to my family and friends
who accept and support me for who I am
ACKNOWLEDGMENTS

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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>ii</td>
</tr>
<tr>
<td>Dedication</td>
<td>iv</td>
</tr>
<tr>
<td>Acknowledgments</td>
<td>v</td>
</tr>
<tr>
<td>Vita</td>
<td>vi</td>
</tr>
<tr>
<td>List of Tables</td>
<td>xi</td>
</tr>
<tr>
<td>Chapters:</td>
<td></td>
</tr>
<tr>
<td>1. Introduction</td>
<td>1</td>
</tr>
<tr>
<td>1.1 Educational contexts and young children's thinking skills</td>
<td>3</td>
</tr>
<tr>
<td>1.1.1 The role of the teacher</td>
<td>4</td>
</tr>
<tr>
<td>1.1.2 Children's cognitive development</td>
<td>7</td>
</tr>
<tr>
<td>1.1.3 Early childhood art-related problem solving</td>
<td>10</td>
</tr>
<tr>
<td>1.2 Purpose of the study and research questions</td>
<td>15</td>
</tr>
<tr>
<td>1.3 Significance of the study</td>
<td>16</td>
</tr>
<tr>
<td>1.4 Summary</td>
<td>18</td>
</tr>
<tr>
<td>2. Problem solving in early childhood</td>
<td>19</td>
</tr>
<tr>
<td>2.1 Types of problems that young children solve</td>
<td>20</td>
</tr>
<tr>
<td>2.2 Qualities of thinking related to problem solving</td>
<td>29</td>
</tr>
<tr>
<td>2.3 Qualities of thinking during young children's problem solving</td>
<td>33</td>
</tr>
<tr>
<td>2.4 Summary</td>
<td>41</td>
</tr>
<tr>
<td>3. The Reggio Emilia philosophy and practice</td>
<td>44</td>
</tr>
<tr>
<td>3.1 The notion of the Hundred Languages</td>
<td>46</td>
</tr>
<tr>
<td>3.2 Emergent curriculum and the project approach</td>
<td>51</td>
</tr>
</tbody>
</table>

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
3.3 Summary ............................................................................................65

4. Pilot study at the A. Sophie Rogers Laboratory School ...........................67

4.1 The Lab School's physical settings, routines and philosophy, and the effect on thinking and problem solving ...........................................70

4.1.1 Daily schedule and classroom organization ..................................70

4.1.2 School philosophy on children and children's learning ...............74

4.1.3 Planning and organizing the resource room ...................................77

4.1.4 The nature and purpose of art-related activities ............................79

4.1.5 Documenting children's work .....................................................81

4.2 Observations, conclusions and implications .......................................84

5. Research methodology ...........................................................................92

5.1 Pilot study ........................................................................................93

5.2 Primary study .................................................................................96

5.2.1 Purpose of analysis ......................................................................96

5.2.2 Paradigms and perspectives .......................................................97

5.2.3 Boundaries for data collection ..................................................102

5.2.3.1 Children's behaviors ...........................................................103

5.2.3.2 School settings and teacher's behaviors .................................104

5.2.4 Procedures for data collection ....................................................106

5.2.5 Initial level of analysis .................................................................108

5.2.5.1 Coding system ...................................................................109

5.2.5.2 Data interpretation ...............................................................123

5.2.6 Second level of analysis ..............................................................125

5.2.6.1 Coding system ...................................................................126

5.2.6.2 Data interpretation ...............................................................128

5.3 Summary ........................................................................................131

6. Data analysis and interpretation ............................................................133

6.1 Interpersonal problems .....................................................................134

6.1.1 What are interpersonal problems related to? ..............................134

6.1.2 Thinking strategies during interpersonal problem solving .........139

6.1.3 School context and teachers' behaviors affecting interpersonal problem solving .................................................................144

6.1.4 Summary ..................................................................................149

6.2 Conceptual problems .................................................................151

6.2.1 What are conceptual problems related to? ..................................152

6.2.2 Thinking strategies during conceptual problem solving ..........155
6.2.3 School context and teachers' behaviors affecting conceptual problem solving ................................................162
6.2.4 Summary ...............................................................................169

6.3 Practical or technical problems .......................................................170
6.3.1 What are practical problems related to? ...............................171
6.3.2 Thinking strategies during practical problem solving ......................176
6.3.3 School context and teachers' behaviors affecting practical problem solving .....................................................181
6.3.4 Summary ..............................................................................186

7. Findings and conclusions ................................................................................190

7.1 Situated learning and the Reggio Emilia philosophy .......................191
7.1.1 Everyday problem solving ...................................................194
7.1.1.1 Summary .................................................................197
7.1.2 Curriculum planning for meaningful problem solving .........198
7.1.2.1 Summary .................................................................207
7.1.3 Problem solving in contexts of negotiating understanding ...207
7.1.3.1 Summary .................................................................211
7.1.4 Conclusions .........................................................................211

7.2 Educational playfulness and the Reggio Emilia philosophy ............214
7.2.1 Children responsible for their own learning and problem solving ...................................................216
7.2.1.1 Summary .................................................................219
7.2.2 Constructive play and problem solving ......................................219
7.2.2.1 Summary .................................................................225
7.2.3 Sociodramatic play and problem solving ...................................225
7.2.3.1 Summary .................................................................229
7.2.4 Teacher's role .........................................................................229
7.2.4.1 Summary .................................................................232
7.2.5 Promoting dispositions for problem solving .........................233
7.2.5.1 Summary .................................................................241
7.2.6 Conclusions ..........................................................................242

7.3 Socioconstructivist learning community ..........................................244
7.3.1 Communication and interaction affecting problem solving ...........245
7.3.1.1 Summary .................................................................249
7.3.2 Social behaviors and relations affecting problem solving .........249
7.3.2.1 Summary .................................................................256
7.3.3 Conclusions ..........................................................................257

7.4 Implications for art education ..........................................................258
7.4.1 Goals of art education ..........................................................260

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<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.4.2 Context of art education</td>
<td>262</td>
</tr>
<tr>
<td>References</td>
<td>267</td>
</tr>
<tr>
<td>Appendices</td>
<td>280</td>
</tr>
<tr>
<td>A. Observed cases from pilot study</td>
<td>280</td>
</tr>
<tr>
<td>B. Observed cases after the pilot study</td>
<td>287</td>
</tr>
<tr>
<td>C. Analyzed cases</td>
<td>305</td>
</tr>
<tr>
<td>D. Second level of analysis</td>
<td>331</td>
</tr>
</tbody>
</table>
LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The cognitive complexity of educational play</td>
<td>9</td>
</tr>
<tr>
<td>2. Example of data recording sheet</td>
<td>107</td>
</tr>
<tr>
<td>3. Example of practical problem solving case</td>
<td>111</td>
</tr>
<tr>
<td>4. Example of conceptual problem solving case</td>
<td>112</td>
</tr>
<tr>
<td>5. Example of interpersonal problem solving case</td>
<td>114</td>
</tr>
<tr>
<td>6. Coding system for initial analysis of observed cases</td>
<td>122</td>
</tr>
<tr>
<td>7. Example of analyzed case</td>
<td>124</td>
</tr>
<tr>
<td>8. Example from second level of analysis</td>
<td>130</td>
</tr>
</tbody>
</table>
CHAPTER I

INTRODUCTION

Art teachers, as well as early childhood teachers, often encounter situations where they need to justify the use of artistic and playful experiences in programs for young children. As Eisner (1990) states, art and play, like imagination and fantasy, are not regarded as a part of the "serious" business of schooling. I view any playful activity as an essential learning medium. According to Sponseller (1974), this perspective is an affirmation of the positive contribution which play offers to all stages of life and all areas of development. It is also a response to the emphasis on early academic learning, which causes the exclusion of play from the curriculum. By the time children reach four years of age, they develop rapidly, without participating in any formalized learning programs. By that age and through play, they learn to walk, run, jump, hide, tease, talk, build, etc. Yet, about that time, when children show evidence of the vast amount of learning they have acquired, adults look at them and say, "You have played around long enough; now it's time to learn something", and the process of learning is denaturalized in the name of education.
Art making can be playful. The purpose of contemporary art education, however, is not just entertainment or basic experimentation with material. Ideally, art activities motivate students to think and be engaged in purposeful action and interaction. Arnheim (1969) suggested that there is a natural relationship between art and thought, pointing out that thinking calls for visual images, and images contain thought. Therefore, he concluded, the arts can be a source for developing thinking. Getzels and Csikszentmihalyi (1976) observed that, artistic expression has not been widely studied as a cognitive process. In the tentative conceptual framework they adopted, they envisioned the creative process as a response to a problematic situation. This perspective, accords with Athey's (1988) assertion that even young children are able to solve problems when they are presented in a concrete, flexible, and playful context. Long term research that took place in the Reggio Emilia preschools verifies that early childhood art-based programs contribute to children's cognitive development (Edwards, Gandini, and Forman, 1998). The Reggio Emilia educators emphasize that artistic expression allows children to explore, hypothesize, investigate, interact, and learn playfully and at the same time provides adults with evidence of children's learning and chances to give feedback.

This study was an attempt to get a closer look at a preschool which is influenced by the Reggio Emilia approach, and where symbolic expression is valued as a means for cognitive development. My interest in studying young children's development of thinking skills during art activities begun when I started studying the cognitive importance of children's play in educational contexts. Studying the context
of educational play revealed the important role of the teacher in facilitating contexts for developing children's thinking skills. The following section is a description of the areas of education that served as initial lenses for focusing my general interests on more specific educational contexts, affected by the teacher for potential early childhood cognitive development.

**Educational contexts and young children's thinking skills**

A common perspective suggests that play is any activity that serves a recreational function. According to educators such as Bruner, Jolly and Sylva (1976), and Garvey (1990), pleasure and recreation are necessary but not defining characteristics of play. Firstly, play is spontaneous and voluntary. It is not obligatory but is freely chosen by the player. It has no extrinsic goals; its motivations are intrinsic. Fun itself is intrinsic and the yield is confined to the player. Anyone or anything that intervenes between the player and the play interrupts the fun and distorts his/her performance. Children supply their own meanings to activities and control the situations themselves.

Spodek and Saracho (1987) make the distinction between educational and noneducational play. The difference is not in the activity but in the purposes ascribed to the activity: Educational play is designed to further children's learning. It may be used to help children explore and gain information from their world as well as process that information to create meaning. It can further physical, social, and cognitive goals and help children better understand and cope with their feelings. In school settings,
can teachers design educational contexts that would be based on pleasant activities and encourage self-motivated learning?

The role of the teacher

Play becomes educational when the teacher modifies the spontaneous play so that it has educational value. The role of the adult in children's play is not that of an instructor or entertainer, but rather of a supporter and facilitator, whose presence insures the quality and appropriateness of the experience. The teacher provides initial direction and motivates children to engage in a specific activity. Children would have the choice to either internalize the goal and become intrinsically motivated players, or modify the initial goal but continue to play in the same context, or simply choose not to participate in that activity. If the teacher manipulates the context of children's play without limiting their freedom of choice or controlling their spontaneity, then play can become educational. The teacher can set up the "possibility" for play without actually enforcing it. If, for example, a preschool teacher carefully selects the objects that will be placed in the water table, the children that will choose to play there would freely manipulate the objects and may experiment with concepts such as sinking and floating.

The teacher's behavior is very important in the process of moving from unstructured play to purposeful educational play. Wolfgang (1986) developed the Teacher Behavior Continuum, an explicit model for teachers to use in effectively directing the play of young children. The process suggests a progression across a
power continuum using the minimum level of control, to structure and facilitate learning while maintaining an open and dynamic play environment. Generally, in educational play the teacher maintains what appears to be, according to Wolfgang (1986), an active "looking-on position" (p.56). When play is not progressing, for example when it becomes repetitive and stereotypical, the teacher claims power but always returns to active looking-on position when new problems are being solved or new themes are being developed. Wolfgang (1986) observed that teacher behavior during educational play can include non-directive \ supportive actions, directive statements, modeling, and physical intervention. Non-directive \ supportive statements refer to encouraging play behavior by visually looking-on or even verbally encoding the child's activity, i.e., "You are working hard at painting. You have painted the ocean and started a battleship!" Directive statements generally take the power away from the child. The best forms of directive statements, according to Wolfgang (1986), suggest to the child an action which presents a new interesting problem or action that might lead to new play activities. On some occasions it may be necessary for the teacher to take over in the use of materials and tools, for example, and demonstrate solutions, especially when a child is having sensory-motor difficulty in using objects and uses them in an unsafe way. The final behavior of Wolfgang's TBC is the process when teachers physically intervene into children's play by adding new props or materials to make the environment new and interesting, thus again facilitate play.

Researchers such as Tizard, Philips, and Plewis (1977) have found play in preschools to be more "occupational" than educational. The following questions were
raised: Is this because teachers can't tell the difference between "occupying" and educational play or because they don't know how to encourage more complex play? Sylva, Roy, and Painter (1980) point out that teachers could be trained to look more closely at children's behavior, noting examples of stretching worthwhile play. What characterizes worthwhile or educational play is its complex nature. The researchers suggest that an attempt to classify children's play according to its complexity can rely on notions of "differentiated sequence" or "transformation". During their observation of preschool children, Sylva, Roy, and Painter (1980) drew the conclusion that when several actions are strung together such that each one builds upon the one that precedes it, they form a contingent progression and this is in sharp contrast to a sequence of unrelated or repetitive acts. Sylva, Roy, and Painter (1980) adopted a strict behavioral definition of cognitive complexity as extremely task-related and relying on empirical evidence of contingent sequences of behavior. They recorded, for example, how carefully a child wielded the paint brush, whether he/she was resistant to distraction and could concentrate or was quick to fly off to something else.

What makes artistic play distinct from other forms of educational play, is the classroom context in which children function. The development of artistic play requires specific physical settings, materials and teacher's actions, which are related to aesthetic expression and inquiry. As Van Hoorn, Scales, Moninghan-Nourot and Alward (1999) note, "the spontaneity with which children turn art into play does not mean that specific planning for art need not take place" (p. 109). Planning for artistic play requires flexibility, and consideration of when the activities should be
spontaneous, when they should be guided and what are the benefits from each type.
Inventing time management skills for balancing spontaneous and directed play is also
required. For facilitating artistic play, the whole school environment should be
organized and structured towards freedom of choice, making a big variety of materials
and tools available to the students.

**Children's cognitive development**

Educational play becomes, as Sponseller (1974) calls it, a "medium" for
learning. Sponseller's (1974) analysis of the meaning of the word "medium", provides
further understanding of what educational play is:

1. *A medium is a condition in which something may function or flourish.* Play is a
   condition in which the cognitive functions of the mind can be allowed to function
   optimally.

2. *A medium is a means of conveying something, a channel of communication.* Play is
   often the means by which children express their thoughts and feelings and facilitates
   understanding of these thoughts and feelings.

3. *A medium is a surrounding or enveloping substance.* Children become completely
   enveloped in play. Almost every activity in which young children engage has elements
   of play behavior, such as spontaneity of physical and emotional expression.

4. *A medium is a material or technical means of active expression.* For young children
   active expression is vitally important and sensorimotor activity is a major mode of
   behavior. Play is used by children as a technical means of actively expressing
themselves. It is their tool for releasing energy when they feel active or relax when they feel tired. Playing with blocks in a preschool classroom for example, can serve both of these purposes concerning sensorimotor expression. Children can use blocks to build castles, spaceships, fire engines and get engaged in very active imaginary battles and missions with their peers or they can build houses and hiding places so that they can just sit there, talk and relax.

A way of conceiving cognitive complexity as a characteristic of children's educational play concerns "transformation" of materials or people. It is seen most often in children's make-believe. One object or act is made to represent another. Transformation is not merely representational, it achieves some functional equivalence as well. This kind of "double-knowledge" (Sylva, Roy, and Painter, 1980) requires complex thinking that treats two substances as though they were alike while at the same time really knowing the difference. Sylva, Roy, and Painter (1980) collected and analyzed instances of both rich educational, and simple play and assigned twelve samples of behavior to the complex-educational and ordinary play. They also looked closely at each kind of preschool activity and found out that in some activities, such as art making, most of the observed time was "worthwhile" or intellectually demanding.
Table 1: The cognitive complexity of educational play

Sutton-Smith (1972) describes the different types of play as imitation, exploration, testing, and world construction. There is a direct connection between Sutton-Smith's play categories and the process of art production. The process of artmaking for individuals of all ages, is an inquiry activity of exploring and expressing ideas that reflect experiences. Divergent thinking, spontaneity, risk-taking, and experimental manipulation of media, are significant artmaking behaviors. These
behaviors can be facilitated by play. Monigham-Nourot, Scales, Van Hoorn and Almy (1987), for example, stated that in constructive play children "manipulate objects to construct or create something" (p.26) by modeling their constructions on the known and at the same time creating something uniquely their own.

**Early childhood art-related problem solving**

When art instruction is planned around play, children can draw ideas from their own experiences instead of following the teacher's lead. They learn how to discover and plan for themselves. In artistic play the process of art production is constructed as a part of children's culture and offers opportunities of absorbing, examining, altering, restating or even rejecting ideas. Artistic play in educational contexts can be expanded into problem solving possibilities when children are provided with open-ended materials and are encouraged to plan, predict possible outcomes, make decisions and observe the results of their actions (Goffin and Tull, 1985).

I had taught in a preschool where the children used to collect found objects, such as empty boxes, plastic bottles and old newspapers and they would bring them to school to use them in their three-dimensional art works. They organized the objects themselves according to shape, size or color. Once, during the morning group activities, I introduced a princess-puppet to the children and told them a story about her, walking in a forest when suddenly it started to rain. The children were given the task of creating something that would protect the princess from the rain. Those who wanted to participate in the activity, had the choice of working individually or in
groups, and using any of the available art tools and materials. It did not take them more than ten seconds to have their first ideas. Each idea was immediately either rejected or considered as a possible solution to the problem and small groups were formed.

A young girl, who decided to work alone, worked with the three-dimensional shapes that we used the previous day for a different activity, and created a castle for the princess. A group of three other children worked with empty boxes, paper, glue, and paint and built a jeep so that she could quickly drive away from the forest. They were even considerate enough to provide her with a spare tire! When the same activity took place in a different classroom, a group of four children disassembled an old round chair, covered the parts with newspaper and painted it to look like a giant mushroom that would provide shelter for the princess. All children chose to conclude the process with related dramatic play, which helped them evaluate their work. The "Princess in the Rainy Forest" project is an example of motivating the children and proving them with resources to engage in artistic play. The teacher manipulated only the context of learning (tools, materials, settings), and the students freely chose to participate in a playful process that involved reasoning and problem solving.

Bretherton's (1984) research on the symbolic play of children gives evidence of great strides in reasoning ability. I am not suggesting that art teachers should guide students towards strict logico-mathematical reasoning, which proceeds step by step according to priori rules. Reasoning in the art classroom can be "interpersonal," for example, through verbal interaction. As Noddings (1991) adds, this type of reasoning
is open, flexible, responsive, and is marked by attachment and connection rather than separation and abstraction. The children who participated in the "Princes in the Rainy Forest" activity, were engaged in symbolic play. They had to decode the visual symbol of the puppet to perceive it as a princess and also respond to the language symbol of the rainy forest. Within certain limits, children's reasoning involved in the following ways:

(a) Prediction of events, e.g. thinking about what can be found in a forest or what would happen if the princes had a car.
(b) Estimation of probabilities, e.g. drawing the conclusion that a princess would likely live in a castle rather than any other type of building.
(c) Reasoning about cause and effect, e.g. making assumptions about what would happen if the princess stayed in the rain and why she need protection.
(d) Drawing conclusions about the nature of things, e.g. the round form of the chair can be associated with the shape of other round things, such as a mushroom.

After children are encounter with a problem, they form and test hypotheses. Hypothesis testing, an ability often tied to scientific thinking, in reality occurs in all forms of thought. Isaacs (1966) relates the ability to construct fruitful hypotheses directly to the ability to reconstruct past events in play and continues that sometimes, lack of experience or misinterpreted experiences may lead to invalid hypotheses. A group of children that participated in the "Princess in the Rainy Forest" project, for example, had previous experiences with mushrooms and were familiar with their stylized shape. Therefore, they were able to hypothesize that a round chair could be
transformed into a mushroom. On the other hand, a different group misinterpreted their experiences concerning convertible vehicles in natural environments and hypothesized that such a vehicle could protect the princess from the rain. Athey (1988) emphasizes the importance of social context in formulating and testing hypotheses. Play is a vital ingredient of this context because the child is playing with ideas that are roughly at the level at which they can be assimilated. New evidence provided through play, leads children to proceed with problem solving by either rejecting and rethinking their hypotheses or accepting them.

Problem solving is enhanced through play because, as Garvey (1990) points out, play facilitates cognitive flexibility, serves symbolic function, and leads to problem finding. Play allows for diverse interpretations of situations and multiple uses of materials and therefore encourages cognitive flexibility in the solution of problems. Playful art activities offer children the opportunity to manipulate actual objects, act out the problem and develop diverse solutions. For children, play can serve the same symbolic function in solving a problem as thinking or talking through a problem does for adults. For example, for children, who repetitiously work through a problem, play is an attempt to assimilate information which is imperfectly understood. At the same time, if children choose to work in groups, they can talk their problems over with others, construct relationships and develop a plan as a group. Play also leads to the discovery and even the generation of new problems. The problem solving attitude leads to sensitivity of problems and problem finding, which can be more important than the actual problem solving process. Play stimulates intrinsic motivation forces of
exploration and curiosity. These forces, as Athey (1988) notes, drive children to seek novel stimulation and increase the chances of recognizing new problems.

Csikszentmihalyi (1996) adds that sensitivity to problems is one of the important components of creative thinking.

According to Edwards and Springate (1995), when educators fully understand how exploration, representation, and communication feed one another, they can best help children achieve this potential. After two quarters of observing the classroom and playground activities of the Sophie A. Rogers Laboratory School at The Ohio State University and conducting a pilot case study of children's problem solving, I found out that their educational approach was worth studying further because their philosophy promotes intellectual goals for the children rather than academic tasks. Academic tasks, as described by Katz (1999), are typically carefully structured by the teacher, sequenced, and decontextualized small bits of information that often require some small group or individual instruction by a knowledgeable adult. Intellectual goals, on the other hand, address dispositions, that is, habits of the mind that include a variety of tendencies to interpret experience (Katz, 1993a). The intellectual dispositions include the dispositions to make sense of experiences, to theorize about causes and effects, to hypothesize explanations, to account for observations, and to analyze and synthesize whatever information is available. Katz (1999) points out that these dispositions can be seen when children are engaged in the investigations of things around them in the course of which they persist seeking answers to their questions and solutions to the problems they encounter.
Purpose of the study and research questions

Through a descriptive qualitative case study of the Lab School preschool classroom, I examined the ordinary, everyday, taken-for-granted children's behaviors and questioned basic assumptions about children's learning and symbolic expression. Interrelated sets of beliefs and practices about problem solving, such as what types of problems do children deal with during their school activities and how do they solve them, were developed. When I conducted a pilot study at the OSU Lab School, I found out that the children had an important role in defining the learning process, since the teachers were consciously and continuously encouraging them to plan their own learning and make choices about what to do and how to do it. This empowerment of the child, however, does not mean that the role of the teacher is not important during the learning process. Another goal of the study was to provide evidence of the importance of the learning context in children's problem solving, which is mainly framed by the teacher.

I focused on the different activities that took place at the school and tried to find out who made decisions about the different activities that take place, what types of problems did children encounter and what strategies did they use to solve them, and what did the teachers consider when they made decisions about planning and implementing the curriculum, as well as creating an educational and resourceful environment. The main questions for investigation were:
• In what way does a socioconstructivist preschool classroom context - physical and philosophical - facilitate children's problem solving?
• What kinds of problems arise for young children during preschool activities and what are the main cognitive qualities that they use when they are trying to solve them?
• What is the role of the teachers in planning and implementing activities and in facilitating children's problem solving?

Significance of the study

Descriptive educational research, in general, allows both art teachers and art educators to develop images about what actually takes place in the classrooms and also allows for a common language about classrooms to emerge. It is vitally important for teachers to gain knowledge of the different teaching methods and strategies in order to reflect on their own thought processes, gain a strong knowledge of self, and facilitate student achievement. Educational research can not provide "recipes" or prescribed strategies for confronting the challenges of teaching, but it can offer examples from teachers' practice and analysis that could serve as guidelines for turning theories, such as the Reggio Emilia approach, into practice. As Mills (2000) points out, one of the outcomes of educational research is that it satisfies the desire of teachers to increase the predictability of what happens in their classrooms - in particular, to increase the likelihood that a given curriculum or instructional strategy will positively affect student outcomes. The findings of my study contributed to the
predictability of specific teaching environments with outcomes that emerged from the implementation of playful problem solving art activities.

The main focus of research in art education has been elementary and secondary education. This study was designed to add to the body of knowledge about preschool environments. It was an attempt to illuminate the value of children's early exposure to art activities. It also provides early childhood teachers with evidence that the playful nature of educational programs can benefit cognitive development in young children, particularly if the teacher is aware of how the process works. My study was intended to support art teachers in coping with the challenges of practice, by providing guidelines for helping students solve problems and become self-motivated learners.

The globalism anticipated in the future stresses the significance of educating young children towards problem solving. Britz and Richard (1992) claim that to survive in the new American society, children must be able to hold onto their values and yet be flexible to adapt to the new traditions and cultures of which they are becoming a part. Studying and facilitating problem solving would encourage the learner to become aware of a variety of viewpoints, look for diversity in solutions, and negotiate to reach a common solution. Individual should become competent not by acquiring knowledge by rote, but rather by learning to solve problems creatively. My study provides evidence that the skills and techniques needed to meet this challenge can be introduced early, practiced often, and expanded throughout the curriculum.
Summary

My interest in studying young children's development of thinking skills during art-related activities begun when I started studying the cognitive importance of children's play in educational contexts. Studying the context of educational play revealed the important role of the teacher in facilitating contexts for developing children's thinking skills. The role of the adult in educational play is not that of an instructor or entertainer, but rather of a supporter and facilitator, whose presence insures the quality and appropriateness of the experience. Teachers provide initial direction and motivate children to engage in purposeful activity. The whole school environment is organized and structured towards freedom of choice, making a big variety of materials and tools available to the children. Art-related play in educational contexts can be expanded into problem solving possibilities when children are provided with open-ended materials and are encouraged to plan, predict possible outcomes, make decisions and observe the results of their actions.

Empowering the children does not mean that the role of the teacher is not important during the learning process. A goal of this study is to provide evidence of the importance of the learning context in children's problem solving, which is mainly framed by the teacher. An attempt was made to study the physical and philosophical context of a preschool classroom to find out what kinds of problems arise for young children during art-related activities and what are the main cognitive qualities that they use when they are trying to solve them.
CHAPTER 2

PROBLEM SOLVING IN EARLY CHILDHOOD

Ideally, art motivates students to think and to be engaged in purposeful activity. Arnheim (1969) suggested that there is a natural relationship between art and thought, pointing out that thinking calls for visual images, and images contain thought. Therefore, he concluded, the visual arts are a home ground for thinking. Getzels and Csikszentmihayli (1976) observed that artistic expression has not been widely studied as a cognitive process. In the tentative conceptual framework they adopted, they envisioned the creative process as a response to a problematic situation. This perspective, accords with Athey's (1988) assertion that even young children are able to solve problems when they are presented in a concrete, flexible, and playful context. Long term research that took place in the Reggio Emilia, Italy, preschools also verifies that early childhood art-related programs contribute to children's cognitive development (Edwards, Gandini, and Forman, 1998).

Schoenfeld (1985), and Reys, Sudan and Lindquist (1989) define a problem as a situations where a person wants to achieve something but does not know how. According to Britz and Richard (1992), problem solving is decision making through
spontaneous investigation, exploration and experimentation. "It means pursuing understanding, looking for answers, trying out some possibilities, and finding out whether or not they work" (Britz and Richard, 1992, p. 12). Both play and problem solving help children become aware of alternatives, cope with difficulty, and feel empowered, rather than vulnerable. Britz and Richard (1992) continue that whether the source of the problem to be investigated is the teacher or the child's spontaneous interest, the problem solving experience must occur in a context that is meaningful to the child, such as children play. In this chapter, an attempt is made to describe the types of problems that young children solve during playful art-related activities, through related literature. Problem solving is also discussed in relation to critical thinking, creativity, problem finding, investigation, planning, commitment, imagination, and flexibility.

Types of problems that young children solve

Adult artists deal with technical, aesthetic, stylistic, expressive, and conceptual problems (Walker, 2001). Similarly, young children's play involves technical practical, conceptual representational, and interpersonal problems. All types of problems are interrelated. A single situation may require parallel solution of multiple problems or consecutive solution of sequences of problems.

*Technical or practical problems* are related to materials and their physical properties. They are rooted in children's initial difficulty in using the materials due to undeveloped sensorimotor skills or unfamiliarity with new objects and situations. A
child who tries to disassemble a chair, for example, may not have the physical strength to do that and has to develop a strategy for achieving his/her goal. Practical problems can be as simple as choosing materials, deciding how to spread paint on a printing tool, how to cut paper, how to clean up a paint spill or how to make a stable base for a paper structure. Kantor and Whaley (1998) describe how a group of children from the OSU Lab School that participated in a long-term project faced practical problems due to their decision to use concrete and cement as their building materials. Not only they had to think where they could find these materials, but also discover how to use them. At the end, they became more realistic and decided to create their art works using the recycled materials at their disposal.

Golomb's (1997) research on children's clay construction provides evidence to support that the "primitive" representations of young children do not result from cognitive immaturity or distorted conception of reality, but rather are related to the problems inherent in the nature of the medium and the lack of experience and practice that modeling technique requires in order to be mastered. Golomb (1997) presented eight modeling tasks for the children (a cup, table, man, woman, person-bending-down, dog, cat, and turtle) and hypothesized that the factors of complexity, symmetry, and balance are closely related to children's modeling. On the two tasks that were relatively simple in structure, symmetrical and balanced, almost all children, including the preschoolers, created three-dimensional representations and demonstrated effective use of spatial concepts, such as "in", "under", "top", "side." During the animal task there was a tendency to create an upright standing animal with its head and body
orientation clearly differentiated. In general, stick figures were few in number, modeled by older children, from eight years on, and were a function of both practice with the medium and the ambition to create a more complex and differentiated figure. Golomb (1997) found evidence that the young artist struggles with problems older children must also confront: "how to create a satisfying representation in a medium that puts a premium on balance, uprightness, and the modeling of multiple sides, all of which require great skill and practice" (p. 140).

Sylva, Bruner, and Genova (1976) examined the contribution of play to children's subsequent approaches to a practical problem. The researchers asked preschool children to sit at a table individually. Directly in front of them, but out of reach, was a transparent plastic box which opened on the side facing the child, although its door was held closed by a "J" shaped hook. A piece of colored chalk was placed inside the box and the children's task was to retrieve it. In front of the child were three bright blue sticks and two "C" clamps. The initial instructions presented the problem in a game-like manner and the children were allowed to freely engage in the task. All children were given the following instructions:

See the colored chalk? That's the prize in a game you are going to play. Your job is to figure out the way to get the chalk. If you do, you can take it home and keep it. You can take as much time as you wish to play the game and can use any object you think will help you. There is only one rule to the game. You can't get out of your chair.

Prior to the presentation of the problem, the children were put in three groups. Children in the first group were given sticks and clamps and were allowed to free play...
with them. The second group observed an adult demonstrating the construction of an
elongated tool by rigidly joining two long sticks with clamps and the third group had
no treatment. The results showed that children in the play group required fewer hints
to solve the problem than those in the group that observed the principle. The play
group approached the task in a different way than other children. When confronted
with the chalk in the distant box, they demonstrated play behavior: They were eager to
begin, continuous in their efforts to solve the problem, flexible in their hypotheses,
significantly more goal-oriented, and using means of increasing step-by-step
complexity. Additionally, the researchers concluded that tool invention, like other
forms of practical problem-solving, requires serial ordering of the constituent act
involved and players were the only ones who had an opportunity to explore alternative
serial orders and proceed with less frustration and fear of failure.

Children also impose representational or conceptual problems when they are
trying to decide how to create \ express representations and symbols of concepts, how
to materialize their ideas. The Lab School teachers constantly remind the children to
think of their ideas "inside their heads" and make choices. In order to achieve these,
children have to solve conceptual or representational problems. A child, for example,
who liked his friend's idea of making animal planets and wanted to try it herself, had
to solve the problem of how an animal planet would look like. Would it look like an
animal or would it look like a typical planet with only animals as its habitants?
Golomb (1992) points out that earlier accounts of children's drawings attributed to
children the unsuccessful intention to copy nature. In the past, children, as well as
adult artists, were seen as aspiring toward realism in art. Therefore, it was the task of
the investigator to identify the factors that led to the typical false imitations exhibited.
Instead, Golomb (1992) continues, we have come to view artistic activity in the child
as a process in which lines and forms merely "stand" for objects that differ vastly from
the materials with which the artist works. Representation does not aim for one-to-one
 correspondence between the elements that constitute an object and the depicted image,
nor is it meant to produce copies of the original.

Rudolf Arnheim's orientation to child art focused on the invention of two-
dimensional solutions to an essentially intractable problem, that of representing three
dimensions. Representational problems are "translation" problems, since the
perception of something should be represented using a different language. According
to Arnheim (1969), the human mind can be forced to produce replicas of things, but it
is not naturally geared to it. Since perception is concerned with the grasping of
significant form, the mind finds it hard to produce images devoid of that formal virtue.
The terms picture, symbol, and sign describe three functions fulfilled by images. "An
image serves merely as a sign to the extent to which it stands for a particular content
without reflecting its characteristics visually" (Arnheim, 1969, p. 136). Images are
pictures to the extent to which they portray things located at a lower level of
abstraction than they are themselves. As Arnheim (1969) explains, pictures do their
work by grasping and rendering some relevant qualities, such as shape, color, and
movement, of the objects or activities they depict. Pictures are not mere replicas and a
child can capture the character of a human figure or a tree by a few highly abstract
circles, ovals or straight lines. Finally, an image acts as a symbol to the extent to which it portrays things which are at a higher level of abstraction than is the symbol itself. A symbol gives particular shape to types of things or constellations of forces.

Apart from deciding if a concept, an idea or an object will be presented as a sign, picture or symbol during art making, the artist has to consider the context of the representation. Krampen (1965) pointed to the example of a snail used in an old pictographic traffic sign to call for a reduction of speed. A snail is not only slow but also slimy, easily frightened, etc., but the highway setting helps in picking out the relevant aspect even if the image itself offers no guidance for the selection. Children's purposeful play during projects is based on themes and these themes offer guidance for solving representational problems.

Representational art problems can involve more than one symbolic languages or means of expression. Forman (1995) documented a case study from the pedagogy of the preschools in Reggio Emilia, the Long Jump project. Forman (1995) mapped the mental course of how children learn to verbally review and debate their facts, act out or draw their present understanding, make graphic representations of their discoveries and inventions, and develop notations and scripts to communicate this knowledge to others. He concluded that cycles of symbolization is an apt descriptor of the learning process. A single cycle is defined by a common problem, such as the relation between running space and landing space. Within a single cycle the children confront and discuss a problem using media in various ways some invented, some conventional (Forman, 1995), but representational problems would also lead to other
types of problems. During the Long Jump project the children wanted to create a model of the track and had to decide what where the main visual characteristics of the different parts of the track that should be represented. They focused on the differences of texture between the run way and the sand landing area. Their decision turned into a practical problem within their working cycle: What materials should be used to represent this difference? They finally decided to use highly-textured paper for the sand landing area and less-textured paper for the run way.

According to Forman and Fyfe (1998), the "Hundred Languages" of children emphasized by the Reggio Emilia educators, means that there are various means of creative expression that qualify as languages that children could use if the classroom culture would allow it. Forman and Fyfe (1998) emphasize that we need to move beyond the level of making symbols into a level of inventing different "languages". It is the nature of the relation among the symbols that converts the medium into a message; and it is the presence of an intended message or the need to present a solution to a problem that motivates children to negotiate shared meanings and to co-construct knowledge.

Finally, interpersonal problems are related to everyday relationships, whether the children are trying to draw the teacher's attention or participate in peer culture. Through an analysis of articles in the area of play from 1880-1980, Sutton-Smith (1985) found that there was a bias in sources towards psychology and did not do justice to anthropology and sociology. Various approaches that have been developed recently for viewing the social aspects of play (Kantor, Elgas, and Fernie, 1993)
emphasize the importance of children's communication strategies for introducing, expanding and solving problems of play themes, coordinating their ideas with others, and for producing situationally appropriate verbal and nonverbal behavior.

Sociocultural researchers of early childhood view classrooms as cultures where life is patterned, constructed over time by its members' interaction with and reaction to each other (Elgas, Klein, Kantor, and Fernie, 1988). Play is a part of the power politics of the groups in which it occurs. Turner (1974) gives the example of play forms that are used by tribal members as an active technique for resolving or assuaging social conflicts when other, more direct forms are not available.

As Corsaro (1988) points out, after children enter preschool, they discover common interests and a central theme of peer culture begins to emerge. Corsaro (1992) defines children's peer culture as a stable set of activities, routines, or rituals, attitudes, artifacts, values, and concerns that children produce and share in interaction with peers. Interpersonal problems that children have to solve are caused by their attempts to modify their behavior around the daily program of the preschool to serve the purpose of developing and maintaining involvement and success in peer culture. Kantor, Elgas, and Fernie (1993) explored individual children's relative success in relation to a core group in a preschool classroom. They found out that cultural knowledge, which includes shared object possession and language, has to be applied to fit the moment and dynamics of any particular play episode or situation.

Corsaro (1988) adds that at the same time that children are exploring the preschool environment, developing the desire to create, participate and maintain a peer
culture, and constructing the social identity of peer or friend, they are also running up against boundaries or barriers represented in the reactions and rules of teachers. Adult ideas, materials, rules, and restrictions can be seen as frames or boundaries within which features of peer culture emerge and are played out. During their daily activities, children have to solve problems of how to maintain their peer culture without breaking the teachers' boundaries.

During projects, when children work in groups, they deal with problems of how to blend their ideas. Kantor and Whaley (1998) describe how, during a project at the OSU Lab School, two children solved an interpersonal problem. When they encountered the problem of having different opinions about what they wanted to create, the children decided to blend their respective interests to create a "Jurassic Park / Princess Castle", with dinosaurs living on the first floor and the princess on the third floor.

The Lab School teachers view problem solving as the foundation of a young child's learning, which must be valued, promoted, provided for, and sustained in their classroom. It is their belief that when the children explore social relationships, manipulate objects, interact with others and make choices, they are able to formulate ideas, try these ideas out, and accept, reject or revisit what they learn. By observing the children closely, the Lab School teachers document the classroom activities and use the children's experiences to facilitate problem solving and related cognitive behaviors.
Qualities of thinking related to problem solving

Many educators have long advocated the teaching of critical thinking skills (Beyer, 1983; Chambers, 1988). There are many definitions of critical thinking. Paul (1988) calls it the ability to reach sound conclusions based on observation and information. According to Walsh and Paul (1988), it is not the same and should not be confused with intelligence; it is a skill that may be improved in everyone. Critical thinking skills identified as important for various disciplines may differ (Howe and Warren, 1989), but skills common to most lists are identified by Winocut (Costa, 1985) and by the California State Department of Education and are included in three categories: 1. enabling skills, 2. processes, and 3. operations. Enabling skills include observing, comparing / contrasting, grouping / labeling, categorizing / classifying, ordering, patterning, and prioritizing. Processes include skills related to analyzing questions, facts / opinion, relevancy of information, and reliability of information. Processes also include skills necessary for inferring, understanding meanings, cause / effect, making predictions, analyzing assumptions, and identifying points of view. Operations include logical reasoning, creative thinking, and problem solving skills. Problem solving and creativity are both operations that require critical thinking but they are distinct.

According to Getzels and Csikszentmihalyi (1976), creative thinking is a response to a problematic situation. Creativity is not a requirement for solving problems but creative production is one of the situations that require problem solving. Creativity is essentially a special form of problem solving (Moran, 1988). When trying
to understand this, it is helpful to consider Guilford's (1956) differentiation between convergent and divergent thinking. Problems associated with convergent thought often have one correct solution. But problems associated with divergent thought require the problem solver to generate many solutions, a few of which will be novel, of high quality, and workable - hence creative. As Lacy (1979) concludes, creative problem solving is a process for approaching a problem in an imaginative way resulting in effective action. In creative problem solving the emphasis is on building up alternatives by searching for a variety of choices at each step of the problem solving process which resembles the creative process; Dewey claimed it was the same thing. The Lab School teachers constantly encourage children to share their ideas. All ideas and problems that are defined at the Lab School are open ended and allow students to revisit their working processes and express multiple solutions. It is the Lab School teachers' goal for all problem solving that takes place, to be creative.

Rostan (1997) reviewed research which suggests that the context plays a significant part in creative productivity and that domain-specific problem situations play an important role in predicting success in creativity up to a certain stage in the adult artist's development but not the child's. Creative problem solvers are those individuals whose solutions to problems are innovative. Gardner (1993) adds that creativity should not be thought of as inhering principally in the brain, the mind, or the personality of a single individual. It emerges from the interactions of the individual with his/her own needs and values, the domains available for study and mastery within a culture, and the judgments rendered by a specific field within a culture. Thus, "the
creative individual is one who regularly solves problems or fashions products in a
domain, and whose work is considered both novel and acceptable by knowledgeable
members of a field” (Gardner, 1993, p.xvii).

Eisner (1964) distinguished four types of creativity: creativity as investigation
of facts, invention, excess of limits and aesthetic organizing. Creativity as
investigation is the ability of using a certain possibility of a fact, which has never been
used by others. When people present something new, which was not known before,
they demonstrate creativity as invention. Through creativity as excess of limits, a
person uses his/her imagination and envision, and rejects or reverses something that
used to be accepted as a fact. Creativity as aesthetic organizing ability does not
necessarily lead to the creation of a new object, or idea, like the other three types of
creativity. It has to do with the ability of applying order and unity.

The connection of creative thinking and the product of the process in early
childhood creates confusion. While the result of the child's work is not something new
in the eyes of adults, it could be so for the child. According to Csikszentmihalyi
(1996), Creativity, with a capital C, is "a process by which a symbolic domain in a
culture is changed" (p.8). The Creative person has strong knowledge of a domain, and
has connections with the field. It is impossible for children to learn a domain and
know the field to the point that he/she could produce something that will change the
culture. According to Csikszentmihalyi (1996), it is impossible to tell whether a child
will be Creative or not by basing one's judgment on his or her early talents. The author
assumes that each person has, potentially all the psychic energy he/she needs to lead a
creative life. In education creativity should be examined in relation with the individual experiences of the creator and not just by insulating the product. A five year old who paints a picture of a doctor's office, may have been creative, even if for adults the result is a repetition of a well known subject. A child who solves problems, discovers and creates is not necessarily an inventor.

Amabile and Tighe (1993) point out that undoubtedly, creativity is a quality of persons, processes, and products. The focus of the Reggio schools and the Lab School is on the process of children's problem solving. The focus of my study will be any type of problem solving that will be observed at the Lab School, whether the children use divergent or convergent thinking, whether the solution is creative or not. Through my Lab School observations, however, I found evidence of children's traits and skills during problem solving that are described by Torrance (1969) as abilities of creative individuals.

Isaacs (1966) relates problem solving to children's development of open, flexible, responsive reasoning that is marked by attachment and connection rather than separation and abstraction. Within certain limits, children's reasoning during problem solving evolves through prediction of events, estimation of probabilities, reasoning about cause and effect, and drawing conclusions (Noddings, 1991). Reasoning is a general term that includes a lot of the skills that are involved in problem solving, such as planning and decision making, which, for the purposes of my study, I consider part of processes of investigation. Prediction will not be examined in great detail because, according to Forman and Kuschner (1986), predicting is more difficult for young
children than explaining an effect after it has occurred. Teachers' questions at the Lab School are usually directly related to children's activities and probe their practical knowledge. Through my observations I found out that prediction can be a result of children's imagination rather than reasoning.

Qualities of thinking during young children's problem solving

Olson (1980) described the characteristics of the problem solver, based on a study of individuals such as Frank Lloyd Wright, Robert Frost and Albert Einstein. Even if Olson (1980) focused on adults that were identified as creative problem solvers, the problem solving characteristics that he described offer some guidelines for what kind of behavior can be observed when children try to solve problems. Olson's (1980) conclusion was that problem solvers are capable of recognizing problems, and engaging their conscious and unconscious mind to solve it. They are receptive to their own ideas and those of other people. They combine judgment and intuition to select the best solution and they have the energy and commitment necessary to transform their ideas into usable results. Similarly, children who solve problems are focused on the task and continuously define new problems, ask questions out loud or appear puzzled. Committed problem solvers are children who choose a possible solution and try to stay focused on it. The problem solving skills that I will investigate will be: problem finding, investigation, planning, commitment, imagination, and flexibility. Not all of the above skills are strictly thinking skills. Commitment and risk taking can
involves personality and emotional attributes, whereas, flexibility during interpersonal problem solving can be attributed to social skills.

**Problem Finding.** Getzels and Csikszentmihalyi (1976) believe that the main elements of problem situations, are the formulations of the problem or problem finding, the adoption of a method of solution, and the reaching of a solution. Problem finding is related to being receptive to ideas, even to those of other people. Children with developed sensitivity to problems usually respond to changes in their environment. Problem finding has its natural source in children's play.

**Case 1:** As soon as they entered the playground, Maria and Walden run towards an area where a lot of leaves have fallen. They run and fall on the leaves and then start throwing them up and at each other. Walden covers himself completely with them. Maria pretends that she did not see him and asks, "Hey, where is Walden?". He jumps up and says, "Wake-up time!".

Through this incident, I studied how children react to changes, for example changes in the environment or availability of new materials. Some children responded negatively to the changes, asking other children not to throw leafs at them, felt threatened and worried. Other children just ignored the leafs on the ground, having a neutral reaction to changes. Walden and Maria, while they were not asked to play with the leaves, they defined that task for themselves and responded creatively to the changes of the environment. Problem finding was achieved by being receptive to new material and to each other's ideas. Maria observed Walden's actions and made an assumption about his goal and the necessary tools and strategies for that task. The problem of how to
participate in Walden’s play was defined by her and at a next level she had to formulate a solution, which she did.

Investigation. Britz and Richard (1992) define problem solving as decision making through spontaneous investigation, exploration and experimentation. They further explain that this means "pursuing understanding, looking at answers, trying out some possibilities, and finding whether or not they work" (p. 12). Investigation, which is related to exploration and curiosity, not only leads to problem finding but also facilitates generating solutions and additional problems. Young children’s investigations are usually related to experimenting and testing the possibilities of tools and materials.

Case 2: Walden takes a plastic castle-shaped mold and a shovel from the sand area and starts walking around the playground. He stops at a spot where no grass is growing. He picks dirt with his shovel and fills the mold, turns it upside down and lifts it up. Seeing that this process did not result to creating a castle with dirt, he flattens the dirt with his shovel and walks back to the sand box.

Walden found his own problem because he tried to explore the possibilities of a tool that he was already familiar with, by investigating how would new materials work with it. During his experiment, the tool was his control variable and the material was his dependent variable. He hypothesized that using dirt instead of sand would have the same results and proceeded in testing his hypothesis.

Planning. Very early plans tend to be made close in time to the actions they are guiding, to incorporate only one or few actions and to be aimed directly at meeting the goal. Only later in development do children begin to form plans that are further
removed in time from the actions they will guide, that include more diverse actions,
and that incorporate hierarchically organized subgoals, especially ones that involve
actions whose immediate impact is to take the problem solver further from the overall
goal (Ellis and Siegler, 1994). Gauvain and Rogoff (1989) studied collaborative
problem solving and children's planning skills. They found out that when children's
collaborative planning efforts include sharing task responsibilities, their problem
solving has important cognitive gains, whether the collaboration is between peers or
children and teacher.

Case 3: Carly is filling a bucket with sand using a shovel, after carefully removing
grass or leaves from the sand in the shovel. She then turns the bucket upside down and
pulls it up creating sandcastles. She moves a little and repeats the process. After
finishing each castle, she counts them all out loud. Sara approaches Carly and asks her
how did she make the castles.
Carly: I just fill the bucket and tip it over. I want to make twelve.
Nebyat runs and kicks one of the castles. Carly asks him to stop and he leaves. She
looks at the destroyed castle and tries to fix it by placing the bucket over the sand and
pushing it down. The first attempt doesn't work so she tries two more times again with
no result.
She then starts the process from the beginning.

Young children are capable of making plans about the near future and trying to
maintain them. Carly was really immersed into the task of creating sand castles and
she seemed to ignore all other activities that were taking place around her but were not
directly affecting her. She was paying a lot of attention to details and she was very
specific about the materials she wanted to use. Her focused attention was also
demonstrated by the fact that she was only using a shovel and a bucket, the necessary
tools for the task, and was not "tempted" to use the new fire tracks that were also in
the sand area. She had a plan and she clearly expressed it by explaining to Sara that
she was intending to make twelve castles. All the steps of creating a sand castle were
clear to her and she was able to describe them to Sara in a clear and simple way. The
problem that she found for herself was how to put a changed situation back to its
previous status. The solution to the problem that she came up with was repeated more
than once.

**Commitment.** Many people think that young children can not concentrate and
that they have "butterfly minds". According to Beetlestone (1998), this is a myth that
should be instantly challenged. Torrance (1969) believes that commitment can be
considered an indicator of curiosity. It is expressed through persistence in examining
and exploring stimuli in order to know more about them, and unwillingness to give up.

**Case 4:** Maria and Aitana were playing with the sand but moved to a different area of
the playground with their shovels. After digging the grass, they found worms. They
were really excited and started running around the playground, shouting: Worms,
worms! That
drew the attention of other children, including Hugh, who joined the digging process.
Hugh spent the whole playground time digging, at first to find worms and then to find
anything that was buried in the ground, such as rocks. Ike, Peter and Brian were also
involved in looking for buried object but they soon became more interested in the act
of digging itself and not its results. They brought fire trucks into their play and moved
into racing them. Hugh was the only child who was more focused in the use of tools
since he was only using a shovel and a bucket and continued digging the next day. At
the end of the first day he asked Carly to "save" his bucket for him and he was also
looking for a "safe" place to leave it before going home because he was planning to
continue his play the next day.
Imagination. Historically, educators who have addressed imagination have construed it in limited and specific ways. In its most influential forms, the imagination has been seen as a projection of the unconscious, as creative behavior, as a distracting flight of fancy, or as the imagistic side of cognition (Egan and Nadaner, 1988). According to Mitchell and Stueckle (1983), imagination refers to the capacity of pretending or engaging in fantasy-related thought processes. It may take the form of narrative, pure visual imagery, or abstract relations. Duffy (1998) concluded that to imagine is to: 1. Detach oneself from the tangible world and move beyond concrete situations. 2. Not to be restricted to the immediate perceived world. 3. Internalize perceptions. 4. Separate action and objects from their meaning in the real world and give them new meanings. 5. Bring together and integrate experiences and perceptions. 6. Contemplate what is not but might be. Imaginative children use strategies, such as storytelling and pretend play as common problem solving techniques.

Case 5: Ellie is walking around the classroom and she sees a clear plastic vase with some marbles in it. She goes and gets a basket, returns to the vase and empties it in the basket. She holds the basket and skips around the classroom. She finds a small empty box, picks it up, puts the basket on a table and starts putting the marbles in the box, slowly, one at a time. Carly and Nebyat approach her.

Carly: Marbles! Can we play too?
Ellie: These are not marbles, they are rats. We need to put them in their house.
Carly smiles and puts the marbles in the box. One of them falls on the floor.
Ellie: Get that rat! Put that rat back in the house.
Carly: I'll get it, I'll get it.

Ellie was engaged in pretend play by herself. She was able, however, to develop divergent thinking by combining her personal goals with the goals of her friend who wanted to play with her.
Flexibility. According to Torrance (1980), flexibility refers to the capacity to produce a variety of ideas that may cause a shift from one thought pattern or category to another. It allows children to readily adapt and adjust to new situations, consider other people's ideas and compromise, when necessary, for solving problems. It also allows for diverse interpretations of situations and multiple uses of materials.

Case 6: A group of children are playing at the block area. Hugh starts shouting to Ike, saying "No, stop". The teacher asks what is wrong. Ike and Walden say that Hugh won't let them play with the structure that they had all built. The teacher says that Ike and Walden can play there too.

Hugh: But this is my computer, they can't put animals on the computer.
Teacher: You are going to have to make a plan.
They all stay quite, staring at each other for a few seconds.
Hugh: I have an idea: this can be my computer (pointing to the upper part of the structure) and this can be for the animals (pointing to the lower part of the structure). The other children accept Hugh's solution and continue to play.

Hugh was able to point out an interpersonal-technical problem. The problem was: Can you share materials and space when you have different goals and how? Even if he was the one who spotted the problem and in a way it was his problem, he was flexible enough to overcome being upset and try to find a solution. His leadership skills, which he demonstrates in various situations during his play, sometimes make him an independent learner who can control his emotions and solve problems.

The Lab School teachers' role in the development of children's problem solving skills, is that of a mentor stimulating initiative and research. They do not hesitate to serve as models when they solve problems with children, when they verbalize reflective and probing questions while involved in problem solving situations, and when they ask children similar questions to encourage understanding of the
relationships between their actions and outcomes. They do not think that they can give
the children the "gift" of thinking and neither do they believe that purposeful thinking
comes from tossing children unaided into a situation. The Lab School teachers believe
that problem solving takes place when the teacher provides not only facts, but also
practice, feedback, and motivation.

They believe that everyday activities can be expanded into problem solving
possibilities by providing the children with open-ended materials and encouraging
testing of ideas. They also encourage interactions as sources of interpersonal and other
types of problems. Interpersonal problem solving encourages children to consider
others' points of view, to develop social understanding, and to assume responsibility in
their relationships with peers. Children often resolve problems without understanding
how the outcome was achieved (Forman and Fosnot, 1982). The Lab school teachers,
however, believe that by asking questions, they can challenge the children to reflect on
the thinking process they used, to encourage the reorganization of their ideas into
more adequate frameworks. They constantly ask the children to justify an answer or a
decision, make plans, "think in their head", predict outcomes and explain actions. The
Lab School teachers' conceptions about children's thinking, which are mainly derived
from the Reggio Emilia philosophy, are directly related to the types of thinking that I
will be looking for. Through my study I will observe projects that will be taking place
at the Lab School and try to find evidence of teachers' attempts to provide children
with information, feedback, and motivation for problem solving. I will try to find out
what choices do the teachers make for planning projects and how do their beliefs about children's thinking affect their choices.

Summary

Young children's activities involve technical, practical, representational, conceptual, and interpersonal problems. All types of problems are interrelated. A single situation may require parallel solution of multiple problems or consecutive solution of sequences of problems. Technical or practical problems are related to materials and their physical properties. They are rooted in children's initial difficulty in using the materials due to undeveloped sensorimotor skills or unfamiliarity with new objects and situations. Practical problems can be as simple as choosing materials, deciding how to spread paint on a printing tool, how to cut paper, how to clean up a paint spill or how to make a stable base for a paper structure. Sylva, Bruner, and Genova (1976) examined the contribution of play to children's subsequent approaches to a practical problem and found out that the children in the play group required fewer hints to solve the problem than those in the group that observed the problem solving principle.

According to Golomb (1992), we have come to view artistic activity in the child as a process in which lines and forms merely "stand" for objects that differ vastly from the materials with which the artist works. Representation does not aim for one-to-one correspondence between the elements that constitute an object and the depicted image, nor is it meant to produce copies of the original. Representational problems are
"translation" problems, since the perception of something should be represented using a different language. Arnheim (1969) points out that the human mind can be forced to produce replicas of things, but it is not naturally geared to it. Children impose representational or conceptual problems when they are trying to decide how to create express representations and symbols of concepts, how to materialize their ideas. The Lab School teachers constantly remind the children to think of their ideas "inside their heads" and make choices. In order to achieve these, children have to solve conceptual or representational problems.

Interpersonal problems are related to everyday relationships, whether the children are trying to draw the teacher's attention or participate in peer culture. Various approaches that have been developed recently for viewing the social aspects of play (Kantor, Elgas, and Fernie, 1993) emphasize the importance of children's communication strategies for introducing, expanding and solving problems of play themes, coordinating their ideas with others, and for producing situationally appropriate verbal and nonverbal behavior.

Problem solving and creativity are both operations that require critical thinking but they are distinct. According to Getzels and Csikszentmihalyi (1976), creative thinking is a response to a problematic situation. Creativity is not a requirement for solving problems but creative production is one of the situations that require problem solving. Creativity is essentially a special form of problem solving (Moran, 1988). Qualities of thinking during children's problem solving are problem finding, investigation, planning, commitment, imagination, and flexibility. Problem finding is
related to being receptive to ideas, even to those of other people. Investigation is related to exploration and curiosity, leads to problem finding and facilitates generating solutions and additional problems. Young children's investigations are usually related to experimenting and testing the possibilities of tools and materials. Early planning tends to be made close in time to the actions it is guiding, to incorporate only one or few actions and to be aimed directly at meeting a goal. Later in development children begin to form plans that are further removed in time from the actions they will guide, that include more diverse actions, and that incorporate hierarchically organized subgoals, especially ones that involve actions whose immediate impact is to take the problem solver further from the overall goal. Commitment can be considered an indicator of curiosity. It is expressed through persistence in examining and exploring stimuli in order to know more about them, and unwillingness to give up during problem solving attempts. Imagination refers to the capacity of pretending or engaging in fantasy-related thought processes. It may take the form of narrative, pure visual imagery, or abstract relations. Imaginative children use strategies, such as storytelling and pretend play as common problem solving techniques. Flexibility refers to the capacity to produce a variety of ideas that may cause a shift from one thought pattern or category to another. It allows children to readily adapt and adjust to new situations, consider other people's ideas and compromise, when necessary, for solving problems.
CHAPTER 3

THE REGGIO EMILIA PHILOSOPHY AND PRACTICE

Reggio Emilia is a small, wealthy region of northern Italy, well known for its agricultural and industrial productivity, as well as its art and architecture. Directly after World War II Loris Malaguzzi, an intellectually oriented young Italian teacher, became interested in the attempt of the parents in Reggio Emilia to build a school for young children. Malaguzzi offered his services as a teacher, and quickly became involved in dialogue with current educators and philosophers of the day to conceptualize what would become the Reggio schools today. His philosophy drew from the constructivist theories of Piaget and Vygotsky, and Dewey's basic principles about learning. The educational community of Reggio Emilia constitutes a remarkable group of teachers of various specialties, who have worked together for years with parents, community members, and children to set up a child-centered and arts-centered system that "works".

44
The key principles of the Reggio Emilia philosophy were summarized by Hamza (1998) as follows:

1. The child is competent, full of potential and active in constructing his/her own knowledge through interactions with others.

2. Children can achieve symbolic representation of their lives through the use of the "Hundred Languages".

3. Time is very important when building new knowledge and revisiting/refining children's work and ideas.

4. The teacher is a co-explorer and facilitator.

5. The parents should be active contributors to the life of the school.

6. The environment is the third teacher, conveying to children, parents, and teachers how their presence is valued and respected.

7. Interaction and collaboration between the children, staff, parents, and environment is essential.

Malaguzzi (1998), the founder of the Reggio Emilia schools, pointed out that when it is time to turn theory into practice, teachers face the fear to lose the capacity or the ability to connect the theories with the objective problems of daily work, which in turn are generally complicated by administrative, legal, or cultural realities. Teachers in Reggio Emilia do research, either on their own or with colleagues, to produce strategies that favor children's work or can be utilized by them (Malaguzzi, 1998). According to Forman (1998), the main educational practices of the Reggio schools are: Planning without preconceived objectives, and the project approach.
Every year each school delineates a series of related projects and these themes serve as the main structural supports. Then it is up to the children, the course of events and the teachers to determine the daily activities. The goal is to allow for the children to make choices, communicate their choices, and receive feedback from others. For example, a study of crowds originated when a child told the class about a summer vacation experience. While teachers had expected the children to tell about their discoveries on the beach or in the countryside, a child commented that "crowd" was all that she remembered. The projects are in-depth studies of specific topics undertaken by small groups of children. They are a sort of adventure and research that can start through a suggestion from an adult, a child's idea, or an event.

The Reggio Emilia preschools have been receiving world attention since the early 1980's, when the exhibition "The Hundred Languages of Children" began touring Europe and the United States.

The notion of The Hundred Languages

In Reggio Emilia children grow up surrounded by centuries-old masterpieces of architecture, painting and sculpture. According to Edwards and Springate (1995), the citizens are very proud of their artistic heritage and art becomes a natural vehicle for helping children explore and solve problems. As New (1990) points out, Reggio Emilia teachers believe that art is inseparable from the rest of the curriculum and in fact is central to the educational process, not only as a form of exploration but also as a form of expression. A teacher who is trained in the visual arts, the atelierista, works
closely with the teachers and the children in every preschool. According to Edwards, Gandini and Forman (1998), the "atelier" is a central feature to each school. It functions as a resource room, as the place where expression through media becomes inseparable from the learning process. It could be compared to an art studio, but Reggio educators explain that the purpose of the atelier is much more complex than simply a place for art production. It is a place where children work at learning to acquire skills and techniques with a variety of media and art materials to add to the "vocabulary" of expressive languages, adults can come for reflection to broaden their understanding of the children's learning and thinking process, and present and past work can be revisited and savored again and again.

To understand the notion of the Hundred Languages, it is important to know how children and children's learning are viewed in the Reggio Emilia schools. According to Gandini (1993), children are viewed as strong, rich, and capable. They are valued as active and participatory, as apprentices, rather than targets for learning. Each child is valued as a child and not just for what adults want the child to become (Gandini and Edwards, 2001). It is believed that they all have preparedness, potential, curiosity, and interest in constructing their learning, negotiating with everything their environment brings them. The child is especially valued as sensitive and responsive to others. Children easily learn procedures for interactive learning in which they are eager to ask questions and solve problems with others. They are communicators. They have a natural desire and they are given the right to use many materials in order to
discover and communicate what they know, understand, wonder about, question, feel, and imagine.

Rinaldi (2001) points out that one of the fundamental points of the Reggio philosophy is an image of the child who experiences the world, feels a part of the world right from birth, is full of desire and ability to communicate from the start of his/her life, and is fully able to create maps of his/her personal, social, cognitive, affective, and symbolic orientation. The variety of young children's symbolic representations is reinforced at the Reggio preschools by the wealth of materials that are available to them. As Cadwell (1997) points out, the wealth is in the variety of materials available to the children and in the ideas for their use, as well as in the time given by the teachers to prepare and present the materials, and thoughtfully reflect on how and what the children make.

Children's thinking becomes visible through various means of expression. As Cadwell (1997) explains, the Reggio educators' fundamental principles about childhood and learning, foster children's intellectual development through a systemic focus on symbolic representation, including words, movement, drawing, painting, building, sculpture, shadow play, collage, dramatic play, and music. Children have many opportunities to experiment with, play with, and develop knowledge and competence in the languages of all the materials available to them. The use of the different media or modes of expression is what the Reggio educators have called the hundred languages of children. Children's symbolic representations through the hundred languages lead to surprising levels of communication, symbolic skills, and
creativity. Abramson, Robinson and Ankenman (1995) believe that the theory of multiple languages echoes Howard Gardner's theory of multiple intelligences. They are both theories that recognize multiple paths of expression and intellectual performance.

According to Forman and Fyfe (1998), a language is more than a set of symbols. A language contains rules of combining these symbols to convey meaning. For example, a clay figure of a runner is a symbol, but it is not itself a language. However, when a group of children have to make group-decisions to solve the problem of telling others how to play "Drop the Handkerchief" and create different clay figures to achieve this, the figures become the elements in a language. Forman and Fyfe (1998) emphasize that it is the nature of the relation among the symbols that converts a medium into a message or a language and it is the presence of an intended message that motivates children to negotiate shared meanings and to co-construct knowledge.

Nimmo (1998) asks us to consider an event that he observed at the Scuola Diana for further understanding of the role of the symbolic languages. A young child was working at an easel observing a flower in a vase nearby and painting it. Another child who was watching intently for sometime, reached forward, took another brush and carefully added to the painting. The first child was clearly unhappy about the intervention but the painting was neither hurriedly destroyed nor did a teacher come to the rescue. Nimmo (1998) is not suggesting that teachers should invite children to impose themselves on other's work. He is making the point that in Reggio schools.
individual ownership is lower in the priority of values than the goal for representation to be a means of communication, a symbolic language for exchange of ideas between and among children and adults. Representation is more than the expressive act of an individual; it is instead an invitation to interact.

Young children's hundred languages are rich in because they are both playful and inventive. By playful, it is implied that not everything is in the service of representation. As Winner (1989) points out, preschool children are not concerned with realism and appear to play with forms and colors or objects simply for their effects yielded; they are not governed by the goal of visual realism. Children also invent visual equivalents for objects rather than simply attempting to mimic adult schemas.

In the view of Reggio educators, children's expression through many media is not a separate part of the curriculum but is inseparable from the whole cognitive / symbolic expression in the learning process (Gandini, 1993). After studying the Reggio Emilia approach, Edwards and Springate (1995) pointed out several aspects of young children's learning which are important to consider when implementing teaching through their hundred languages. First, young children are developmentally capable of classroom experiences which call for, and practice, higher level thinking skills, such as analysis, synthesis and evaluation. Analysis refers to the ability of breaking down material into component parts to understand the structure, and to see similarities and differences. Synthesis is the ability of putting parts together to form a new whole and evaluation is judgment of material based on definite criteria. A second
aspect of learning is that young children form mental images, represent their ideas and communicate with the world in a combination of ways, but need increasing competence and integration across formats or languages. Through sharing and understanding others' perspectives, and then revisiting and revising their work, children move to new levels of awareness. Third, young children learn through meaningful activities in which different subject areas are integrated. Activities that are meaningful and relevant to children's life experiences assist them in seeing the interrelationships of things they are learning. And fourth, young children benefit from in-depth exploration and long-term, open-ended projects.

Emergent curriculum and the project approach

According to Forman and Fyfe (1998), reflective practice of teaching must stand on a well defined theory of knowledge. The Reggio epistemology holds that knowledge is gradually constructed by individuals becoming each other's students, by taking a reflective stance toward each other's constructs, and by honoring the power of each other's initial perspective for negotiating a better understanding of subject matter. This theory of knowledge leads to practices described by Gardner (1999) as education that is based on helping the children study their ways of making meaning and their negotiations with each other in a context of symbolization and communication.

Malaguzzi (1998), the founder of the Reggio preschools, described pre-planned curriculum as teaching without learning. Rinaldi (1998), a pedagogista, stated that "...the potential of children is stunted when the endpoint of their learning is
The Reggio educators share a social constructivist theoretical foundation for curriculum development, which is manifested through the idea that children learn through engagement with the environment and should be given the opportunity to explain what they have experienced. This is accomplished through emergent curriculum planning.

The process of emergent curriculum planning begins as teachers observe and interact with children. Reggio teachers define planning as a method of work in which they lay out general educational objectives, but do not formulate the specific goals for each activity in advance (Rinaldi, 1998). Instead, they express general goals and make hypotheses about what direction the activities might take, consequently, they make appropriate preparations. These hypotheses are flexible and adapted to the needs and interests of the children. The goal of planning without preconceived objectives is to allow the children to make choices and receive feedback from others to construct knowledge. Gandini and Golhaber (2001) emphasize that having respect for the children does not mean that the teachers should blindly follow all their ideas but they should think about them to determine which ones should be pursued and how they might be supported.

The Reggio curriculum is played out in emerging projects. Projects are defined by Firlik (1994) as interactive activities that develop a deeper understanding by offering multiple perspectives of a phenomenon(a) over an undetermined period of time. As Forman (1998) points out, the project approach may seem similar to the 1930's progressive education. There are, however, some contemporary additions to
those past approaches. The first addition is the sophisticated use of symbolic representations to help the students reflect on their own thinking and formalize their practical knowledge and the second is the facilitation of constructive conflicts between the students to help them heighten the logic of their final solutions to problems. This approach encourages students to ask questions and seek answers, and to collaborate with peers. New (1990) has observed that the project approach is a strategy that provides maximized opportunities for shared problem solving.

Forman and Fyfe (1998) define the system behind the Reggio project approach as "negotiated learning", a dynamic system of causes, effects, and countereffect. They specify three components that define negotiated learning: design, documentation and discourse. Design refers to any activity in which children make records of their plans or intended solutions to problems. Discourse connotes a deep desire to study and understand each other, confront constructively, experience conflict and seek footing in a constant shift of perspectives. Documentation refers to any activity that renders recording of the performance with detail, to help others understand the behavior and the reasons behind it.

Forman and Fyfe (1998) point out that the Reggio curriculum is not child centered or teacher directed; it is child originated and teacher framed. According to Trepanier-Street (1993), in the past, teachers developed themes or units based on what they thought interested children and what the school district or state considered important. They gathered all the materials and preplanned each lesson. In contrast, the Reggio projects provide a solution to the problem of learner autonomy, of making the
learners responsible for their own learning (Fried-Booth, 1986). According to Katz and Chard (2000), the opportunity to make choices is an important general feature of project work because many teachers have found that increasing opportunities for children to make genuine choices are accompanied by increase in the children's interest and commitment to the work undertaken. Katz and Chard (2000) have observed that projects offer children the opportunity to make choices at several levels. Some choices can be procedural, some aesthetic, and some functionally intrinsic to the activity but they all have implications for learning in cognitive, aesthetic, social, emotional, and moral areas. More specifically, children can make choices about what work to do, when to work, where to work, and with whom they are going to work, but they should always be able to consult the teacher for advice or to negotiate decisions.

The children's involvement and problem finding is what defines the projects' direction and the children assume responsibilities both as individuals and as members of a cooperative group. For example, a Reggio teacher asked the children to collect in a box items that interested them during their summer vacation. One might anticipate that a study of the seashore could develop from the shells that a child collected, however, the child responded with "The crowd" when asked about what she remembered. The teacher recognized the children's interest in the crowd and encouraged investigation of a crowd. Their initial drawings of crowds disappointed the children because they did not capture the movement, feeling or visual perspectives of a crowd. They were not able to solve their representational problems with their initial drawings. After discussing their ideas, solving interpersonal problems, going out into
the city to experience a crowd, acting out "crowd" in the classroom, discussing the concept again and repeatedly drawing pictures of the crowd, their understanding, as seen in their artistic representations of people’s movement and facial profiles, was enhanced (Trepanier-Sreet, 1993). The children defined the course of events, solved their own problems, and clarified and expressed their understandings in various ways and the teachers provided reframing and reinforcement of initial concepts and interests seeking to uncover the children's beliefs about the investigated topics.

According to Katz (1994), themes and units are related to project work. A theme is usually a broad concept or topic, such as "seasons" or "animals" but in theme work children are rarely involved in posing questions to be answered or plan investigations. Units usually consist of preplanned lessons and activities on specific themes that the teacher considers important for the children to know more about. Katz (1994) considers both themes and units as important in early childhood education but she emphasizes that they are not substitutes for projects.

Talking about projects in American education, Moss (1998) points out that teachers can begin determining project topics at the start of an instructional cycle by conducting a class needs assessment to identify areas and skills to be developed. As the teacher and learners get to know each other better, new topics and issues may come to light that are appropriate for project learning. Whatever the project, Moss (1998) continues, learners need to be in on the decision making from the beginning. Similarly, Reggio projects can result from the children's natural encounters with the environment and their interest in themselves, or reflect mutual interests of the children.
and adults. They can also be based on the teacher’s ideas about cognitive or social concepts the children are developmentally and receptively ready for. When a teacher observed children’s play on a sunny day and captured the event through a photograph, their play turned into an extensive exploration of the properties and magic of shadows. When parents and teachers were concerned about the major role of war toys and action figures from cartons in children’s dramatic play, they decided to redirect the children’s interest and suggest that they create the space scene in which the typical battles took place. Even within a project, children can select their activities from a variety of activities that may range in difficulty. Sometimes they may choose a familiar task that is comfortable, easy and less stressful, while at other times they may choose a task that is challenging, difficult and risky (Katz and Chard, 2000).

Katz and Chard (1998) stated a list of criteria for deciding if a topic or idea is appropriate for projects. I believe that these criteria can be considered an overview of the Reggio Emilia educators’ concerns for facilitating the development of projects. A topic or idea is appropriate if:

1. It is directly observable in the children's own environments.
2. It is within the children's experiences.
3. First-hand direct investigation is feasible and not potentially dangerous.
4. Local resources (field sites and experts) are favorable and readily accessible.
5. It has good potential for representation in a variety of media.
6. Parental participation and contributions are likely, and parents can become involved.
7. It is sensitive to the local culture and culturally appropriate in general.

8. It is potentially interesting to many of the children, or represents an interest that adults consider worthy of developing in children.

9. It is related to curriculum goals and standards of the school or district.

10. It provides ample opportunity to apply basic skills.

11. It is optimally specific—not too narrow and not too broad.

The environment is considered the third teacher of Reggio Emilia children and the physical environment of the preschools is set up to initiate problems that would lead to the development of projects. The school is organized as a resource space for children, who are always encouraged to select their own materials and find new uses for objects. A great variety of materials is beautifully organized and maintained by adults and children together. As Cadwell (1997) observed, objects and materials at the Reggio schools are offered in many different ways, sometimes with specific proposals and suggestions and sometimes without. Often, simply the way the materials are presented suggests a starting point without any words spoken. Objects and materials can initiate projects that can extend for a week, several weeks, or several months.

Projects should be based on relevant, meaningful problems in children's lives. Topics should stem from real problems. According to the theory of Piaget, meaningful, relevant projects can lead to construction of knowledge. Trepanier-Street (1993) adds that a real problem for a child causes disequilibrium in the child. The child then actively works to solve the problem and, consequently, construct knowledge. They are intrinsically motivated to solve problems and need less teacher-
directed motivation to learn. Problem solving that could lead to project work could be
initiated from children's play because play is natural for children. As Athey (1988)
points out, play facilitates cognitive flexibility, serves symbolic functions and leads to
problem finding because it allows for diverse interpretations of situations and multiple
uses of objects.

Playfulness is an important characteristic of projects because, apart from the
fact that children engage in play naturally, play can be a medium for learning.
Sponseller's (1974) analysis of the meaning of the word "medium" provides further
understanding of the role of play during project work:

1. A medium is a condition in which something may function or flourish. Play is a
condition in which the cognitive functions of the mind can be allowed to function
optimally.

2. A medium functions as a channel of communication. Play provides the context and
creates appropriate conditions for expression of thoughts and feelings and also
facilitates understanding of other individuals' thoughts and feelings.

3. A medium is a surrounding or enveloping substance. Children become completely
enveloped in play. Almost every activity in which young children engage has elements
of play behavior, such as spontaneity of physical and emotional expression.

4. A medium is a tool for active expression. For young children active expression is
vitally important and sensorimotor activity is a major mode of behavior. Play is used
by children as a technical means of actively expressing themselves. It is their tool for
releasing energy when they feel active or relax when they feel tired.

58
In Reggio schools, generally, projects begin with an experience and children are then encouraged to start with a graphic exploration of their ideas. The teachers probe with open-ended questions to develop children's interest in investigations. Katz (1994) adds that once a topic for investigation is selected, teachers usually begin by making a web, a concept map, on the basis of brainstorming with the children. During preliminary discussions, the teacher and children propose questions that they will seek to answer and the children also recall past experiences related to the topic. Project planning is ongoing.

According to Katz and Chard (2000), projects, like good stories, have a beginning, a middle and an end. This temporal structure helps the teacher organize the progression of activities according to the development of children's interests and personal involvement with the topic of study. Field work during projects consists of the direct investigation, which often includes field trips to investigate sites, objects or events. As Chard (1992) describes, in the heart of projects children are solving problems, investigating, drawing from observation, constructing models, observing closely and recording findings, exploring, predicting, and discussing and dramatizing their new understandings.

Reggio educators stress the importance of debates, negotiations and cooperative problem solving during projects. According to Katz and Chard (2000), preschoolers are more likely to work on projects in small groups rather than individually or in large groups. Cooperative learning involves children in the active exchange of ideas rather than passive learning (Tudge and Caruso, 1988). When
children share a goal and have differing perspectives on the best way of attaining it, which is often the case during Reggio projects, then cooperative-problem solving is likely to be effective. To facilitate cooperative problem solving, Tudge and Caruso (1988) suggest that the teachers encourage children to interact with each other, help them clarify or adapt their shared goals, and help involve children who are less likely to initiate.

In projects at Reggio, LeeKeenan and Nimmo (1998) saw a strong connection between process and product. Because young children tend to be immersed in the immediate moment and in the process rather than the product of their activity, often teachers, when developing curriculum, tend to put little emphasis on long-term planning and on developing extensive connections between different activities (LeeKeenan and Nimo, 1998). This gap is bridged through the Reggio approach. The product and the process seem to merge together. According to Malaguzzi (1998), ideas are explored, discussed and revised, therefore, any piece of children’s work shifts through multiple transitions. When new children join a group to enter the adventure of projects, they offer new elaboration and through group analysis the product becomes the starting point for a new process.

Rinaldi (1998) points out that children’s own sense of time and personal rhythm is one of Reggio educators’ main considerations when they plan and implement activities for projects. The time requirements of projects is what American educators have considered a subtle but significant disadvantage of project based learning, at least for American middle and high schools. The Buck Institute of

60

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Education is a non-profit research and evaluation organization in California dedicated to improving schools by advancing knowledge about the practice of teaching and the process of learning. Their goal is to develop innovative educational practices in collaboration with teachers and refine these practices in classrooms. Their Problem Based Learning Handbook is intended to provide middle and high school teachers with materials to help them implement project-based units in their classrooms. BIE supports the use of project-based learning as a central strategy by which specific curricular goals and standards can be attained. One of their objections to project-based learning, however, is that projects can expend large amounts of instructional time, not allowing opportunities for other learning. BIE (1999) specifically states that, when proficiency requirements and direct instruction in basic skills are the main focus of schools, projects are only viewed as large time blocks in the curriculum. The full-day schedule of the Reggio preschools however, rather than overwhelming the children, seems instead to provide sufficient time to complete projects with satisfaction. A project may engage and involve children for extended periods of time, that is, until children's interest and curiosity are satisfied (Katz and Chard, 2000).

Gandini (1993) emphasizes that Reggio teachers get to know the children's personal timeclocks because children stay with the same teachers and the same peer group for three years. Children and teachers enter into the projects together as co-learners with no particular destination in mind (Jaruszewicz, 1994). The Reggio Emilia teachers are present without being intrusive and are active facilitators of the learning process. To know how to plan and proceed with their work, they observe and...
listen to the children carefully and then use their understandings to act as a resource for them. Reggio teachers consider themselves to be partners in the learning process, which might proceed with pauses and setbacks but is an experience constructed and enjoyed together with the children (Hendrick, 1997). The adults act as brainstorming facilitators, resource persons, problem-posers, guides, and partners to the children in the process of discovery and investigation. They take their cues from children through careful listening and observation, and know when to encourage risk-taking and when to refrain from interfering (Edwards and Sringate, 1995). The term "scaffolding" (Wood, Bruner, and Ross, 1976) can be used to describe the teacher's role during projects. Scaffolding involves use of specific strategies aimed at allowing children to freely participate, maintaining their interest, and increase their competence simultaneously. As the students demonstrate increasing planning and problem solving skills, the teacher can gradually relinquish control until the children can play, create and learn independently.

Another important role of the teachers is that they serve as the "memory" of the groups that are engaged in projects, through documentation of the learning process (New, 1990). According to Gandini and Goldhaber (2001), documentation is not considered as the collecting of data in a detached, objective, distant way. It is seen as an interpretation of close, keen observation and attentive listening, gathered with a variety of tools. As Gandini (1993) points out, transcriptions of the children's remarks and discussions, photographs of their activity, and representations of their thinking and
learning using many media are carefully arranged by the atelierista and other teachers, to document the work done in the schools. The purpose of documentation is:

1. To make parents aware of their children's experience and maintain parental involvement.

2. To allow teachers to understand children better by constructing a shared understanding of children's ways of interacting with the environment, peers and adults, and of constructing their knowledge.

3. To evaluate teachers' own work, thus promoting their professional growth.

4. To facilitate communication and exchange of ideas among educators.

5. To make children aware that their effort is valued.

6. To create an archive that traces the history of the school and of the pleasure and process of learning by many children and their teachers.

The role of the teachers during projects is summarized in the following points:

- Get the children started by dispensing occasions that challenge children intellectually and emotionally.

- Create situations which permit children to make unusual connection, for example, taking the indoors outside and the outdoors inside.

- Offer experiences from the natural world and help children connect them with the art materials.

- Turn a dispute into a hypothesis to test.

- Encourage children to solve their own disputes.

- Make a large quantity of high quality materials available to the children.
- Provide instruction in tool-use and technique directly as the children work with the materials.
- Engage children in conversations, in small groups (up to 5 children), away from distractions.
- Comment on the work itself rather than on the children's skill level.
- Work around children's lack of technical skills and go directly to their thinking (use of photocopies).
- Allow children slow, unhurried time.
- Encourage children to work and rework on a representation.
- Have regularly scheduled meetings with colleagues.
- Document children's work and share the documentation with parents, children, colleagues, and public.
- Review transcripts and photos with children.

According to Katz and Chard (2000) an appropriate curriculum for the early years, such as curriculum based on the project approach, first strengthens and extents children's behavioral knowledge and then helps them to employ a variety of abstract representations directly related to it (representational knowledge). Behavioral knowledge is primarily practical or procedural in nature; it consists of how to enact various procedures and roles and to perform skills. Knowing how to use scissors is an example of behavioral knowledge in young children. Representational knowledge consists of mental representations of the concepts, ideas, facts, propositions, and schemata that are abstracted from direct and indirect experience. Projects at the

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Reggio schools, can be rich stores of experiences for building behavioral knowledge, providing a firm basis for subsequent development of abstract representational knowledge expressed through the Hundred Languages.

Summary

Reggio Emilia is a small, wealthy region of northern Italy, whose educational community started receiving world attention since the early 1980's, when their exhibition "The Hundred Language of Children" began touring Europe and the US. Reggio Emilia teachers believe that art is inseparable from the rest of the curriculum and is central to the educational process, not only as a form of exploration but also as a form of expression. The "atelier" is a central feature to each Reggio school. It functions as a resource room, where children work at learning to acquire skills and techniques with a variety of media and art materials to add to the "vocabulary" of expressive languages, adults can come for reflection to broaden their understanding of the children's learning and thinking process, and present and past work can be revisited and savored again and again. The variety of young children's symbolic representations is reinforced at the Reggio preschools by the wealth of materials that are available to them.

Reggio education is based on helping the children study their ways of making meaning and their negotiations with each other in a context of symbolization and communication. This is accomplished through emergent curriculum planning. The process of emergent curriculum planning begins as teachers observe and interact with
children and lay out general educational objectives, but not specific goals for every activity. Children are allowed to make choices and receive feedback from others to construct knowledge. Having respect for the children does not mean that the teachers blindly follow all their ideas but they think about them to determine which ones should be pursued and how they might be supported. Projects are an important part of the Reggio curriculum and are defined as interactive activities that develop a deeper understanding by offering multiple perspectives of a phenomenon(a) over an undetermined period of time. This approach encourages students to ask questions, seek answers, collaborate with peers, engage in shared problem solving and negotiate learning. The Reggio curriculum is not child centered or teacher directed; it is child originated and teacher framed. The children define the course of events, solve their own problems, and clarify and express their understandings in various ways and the teachers provide reframing and reinforcement of initial concepts and interests seeking to uncover the children's beliefs about the investigated topics.

The role of adults in the Reggio classrooms is to act as brainstorming facilitators, resource persons, problem-posers, guides, and partners to the children in the process of discovery and investigation. They take their cues from children through careful listening and observation, and know when to encourage risk-taking and when to refrain from interfering. As the students demonstrate increasing planning and problem solving skills, the teacher can gradually relinquish control until the children can play, create and learn independently. Teachers also serve as the "memory" of the groups that are engaged in projects, through documentation of the learning process.
CHAPTER 4

PILOT STUDY

My interest in art-related activities came from the study of the Reggio Emilia philosophy and my goal became to learn more about their practice. I believe that the Reggio project work involves continuous problem solving by the children, who are free to discover and solve problems. Schools that adopt the Reggio approach, such as the Sophie A. Rogers Lab School, encourage and facilitate the development of what I consider important problem solving skills and behavior.

My research preparation and data collection followed a pilot study which was conducted at the Lab School with the purpose of planning and practicing the appropriate data collection techniques. An additional purpose of the pilot study was to find evidence and provide practical examples for the categories of problems that young children solve as well as the thinking qualities related to problem solving described by related literature. The analyzed data from the pilot study helped me construct a coding system in relation to the primary research questions. The coding categories related to the types of problems were derived externally, outside of the data, from the existing literature. Research and literature on cognition also includes
descriptions of different thinking skills or qualities of thinking and my hypothesis was that some of them are related to problem solving. Since the related literature on these skills was very broad and not discussed in relation to problem solving, the coding categories for my study, related to the thinking qualities during problem solving, were mainly derived internally, from within the data.

During my pilot study, I observed the preschool children of the Lab School three days a week, for about two months, during their afternoon playground activities and the next two months, they were observed during their morning classroom activities. My initial observations were focused on obtaining a general idea about the school's physical settings, routines and atmosphere that could have an effect on problem solving. It was my hypothesis that a problem solving theory can be informed by first discovering the cultural rules for problem solving in a particular context. Describing the Lab School settings and atmosphere was important in finding out the group's attitude towards problem solving. Additionally, while describing what I observed, I tried to find connections between my data and the literature on the Reggio Emilia schools.

After describing the school, I tried to learn more about the individual children by observing different group activities. My attempt to find out what the important characteristics of children's personalities were, had different stages. I first studied the children's biographies and asked the teacher to informally talk to me about each child. Then, my initial observations were centered around characteristics of peer culture in the classroom. Corsaro (1992) defines children's peer culture as a stable set of
activities, routines, attitudes, artifacts, values and concerns that children produce and share when interacting with peers. I viewed children's school life as a social situation which can be identified by a place (a preschool classroom), actors (children or teachers) and activities (play, projects, problem solving). For my observations I selected specific classroom areas (e.g. dramatic play area, block area, sensory play area, etc.) based on the amount of activity that was going on at the time. In my fieldnotes I described the space, objects, actors and action. The actions included children's dialogues whenever any verbal interaction was taking place. Each "incident" was described on a different data collection sheet.

The acts were then analyzed in terms of goals, events and feelings expressed and this analysis resulted in finding out if the children were facing or solving a problem and what was the type of that problem. Further analysis of the acts provided patterns of behavior and evidence of the use of different thinking qualities related to problem solving, such as problem finding, investigation, planning, commitment and imagination.

When I got to know each child better and learned more about their personalities and problem solving skills, my observation plans changed. Instead of observing specific areas, I chose to observe one specific child at a time by following his/her activities around the classroom. I focused on the children who, based on my previous observations, were identified as children who could define problems and would not avoid problem solving situations.
The Lab School's physical settings, routines and philosophy, and the effect on thinking and problem solving

The first thing that drew my attention during my observation at the Sophie A. Rogers Lab School was the peacefulness, serenity and smooth function of the daily activities. I recalled previous experiences that I had from preschools where the children would spend their time in chaotic situations, and loud noises would compete with children's and teachers' shouting in creating the school atmosphere. These are experiences that I would definitely not associate with the Lab School experience. There, the school atmosphere, which has direct effect on problem solving, is based on healthy communication and discourse adopted from the Reggio Emilia approach to learning. Through my observations at the Lab School I found evidence that the teachers there, not only have knowledge of the Reggio key principles, but they try to implement them in their daily practices. As a result, the classroom becomes a place for the children to solve multidimensional problems by using complex cognitive skills and behaviors.

Daily schedule and classroom organization

Every morning the children start arriving with their parents between 8:30 and 9:00 and they are greeted by the staff. The parents help the children put their coats, lunch boxes and anything else that they brought from home, in their cubbies. The parents stay in the classroom until the children are settled in an activity and are ready to say goodbye, but this does not usually take a lot of time. The children are
encouraged to engage in different activities that are organized and set up by the staff until 9:30, when all children arrive and the first "oval time" is called by the sound of a xylophone played by the child who is in charge of giving the messages that day. The children also take turns in feeding the class animals, watering the plants and choosing or modifying the songs for the group's morning singing.

During "oval time" the children sit on the blue carpet at the center of the classroom, next to each other, following the oval shape formed by a white line on the carpet. The teachers are also part of the oval. The children discuss different topics that interest them for about twenty minutes and then with the teachers' guidance they choose one of the activities available, continue to work on a project in progress or start a new project. The necessary supplies and tools are set up on tables, light tables, easels, sensory tables, placed in convenient spaces. Everything else that the children may need, recycled and nonrecycled materials, is on organized shelves in the cabinets of the art area or in the resource room.

The Lab School's preschool classroom is physically divided and organized in specific areas which define the nature of the activities but not the tools and materials used. On the right side of the entrance, there is the observation deck. The deck is separated from the rest of the classroom by a two-meter wall and its floor is raised about one meter above the classroom floor. At the opposite side of the room there is a small kitchen, the children's bathrooms next to it, the art area with the resource room, and the "quiet area". The kitchen, bathrooms and "quiet room" are separated from the rest of the classroom but the art area is not.
The "quiet room" is a space where the children can go when they feel that they would like to get away from noise and distraction during their afternoon nap or any other time of the day. The school's computer is also in the "quiet room" but I haven't observed frequent use of it by the children. The art area includes the resource room, shelves and cabinets, two sinks, easels and a big table. The three big windows at the back wall allow plenty of light in that area. Because of the good lighting of the art area, most of the classroom's plants are close to it. Additionally, because the children study animals and create artworks, the classroom's pets are also placed close to the art area. The class has fish, frogs, turtles, rats, and birds. There is also a screen and an overhead projector in that space. The children have learned how to use them for tracing enlarged images on paper and they also incorporate projected images in their pretend play.

Right by the entrance steps that lead to the main part of the classroom, there is the science area with two sensory tables. At different times the sensory tables became water, sand, leaves, seeds, snow, or styrofoam tables. At the science area there is also a table with mirrors, color wheels, prisms, and light sources where the children experiment with color. In front of the kitchen there is a light-table and transparencies of different themes, related to children's interests. The children often select specific transparencies after viewing them on the light table, and take them to the overhead projector by the art area for further study.

As you move from the science area towards the center of the room, you find tables for games and puzzles on the left, a table that is only used for breakfast and
snack eating, and the dress-up area on the right. The dress-up area consists of shelves with dresses, shoes, crowns, hats, helmets, purses, and capes that the children put on to enrich their pretend play. The dress-up area is an extension of the larger dramatic play area next to it. The dramatic play area is a small-scale kitchen and dining room where the children take different family roles. Next to the dramatic play area, towards the center of the room, there are two desks and a round table which were initially placed there to be used as a writing area or for drawing with pencils and markers, but the children transformed one of the desks into a doctor's office and at a different time into a vet's office and a library desk.

At the far left corner of the room there is the block area. The children use the wooden blocks of various sizes and shapes to construct cars, buses, fire trucks, space ships, houses and anything else that is related to their current interests and explorations. It is a classroom rule that before they leave school, the children have to stack all the blocks by the wall. If a child or a group of children are planning to use their constructions the next day, they know that they should put a note on them, otherwise other children could take the blocks during clean-up time. This is a rule that has been conceived by the children themselves when the problem of destroying other people's work arose in the classroom.

Right by the back door of the classroom that leads to the playground, there is a small separate area, the music area. The music room is used for sound exploration. Apart from a big variety of musical instruments, other miscellaneous objects that could be used to produce interesting sounds are also added to the music room. For
example, as a follow-up to drum music that the children were choosing to listen and
dance to, the teachers added some metallic objects to the music room for further
exploration. The classroom's tape recorder, however, is always next to the block area
and not the music room because the children frequently incorporate singing and
dancing in their everyday play.

School philosophy on children and children's learning

Knowledge at the Lab School is considered as a socially constructed
achievement, with the children being active and interactive throughout the learning
process. Each child is viewed as a unique individual, capable of contributing to and
enriching classroom life. Children's biographies are constantly updated by the teachers
and teachers' assistants and include descriptions of each child's background, skills and
interests. Each teacher observes and takes notes of the children's behavior and
expression of interests in the classroom and on the playground and then they discuss
their observations with the other teachers and parents and decide what would be the
most meaningful resources that they should offer to the children, based on what they
had observed. After the leaves started to fall, for example, and the children showed
high interest in collecting and playing with them on the playground, the teachers
encouraged them to explore other possibilities of leaves in the classroom, such as
printing and drawing. The curiosity and interest of all children to negotiate with
everything that the environment brings to them was recognized and it was up to the
children to develop ideas and plans and negotiate with the teachers the course of events and daily activities.

The children's cultural individuality is also respected at the Lab School. The teachers encourage the children to talk about ethnic customs and other cultural experiences of their families and they try to bring additional materials to school to assist with the presentations. One of the girls, for example, has Native American heritage and she is always very excited and eager to share her pow-wow experiences with her friends. When the teachers saw that the other children could not share Aitana's enthusiasm, they brought a film about pow-wow to school and that, not only drew the children's attention and enriched their knowledge spectrum, but it also promoted Aitana's pride in her heritage.

Birthdays and holidays are other occasions when the teachers collaborate with the parents to present the various cultural groups in the classroom. During a Hispanic-American child's birthday, the parents brought a pinata and paper decoration to the classroom and on Chinese New Year the parents of a Chinese-American boy brought Chinese food to school for lunch and cards in red envelopes for every child. Additionally, in February, which is Black History Month, the class visited the Hale Cultural Center on the OSU campus to listen to some African storytellers. The teachers also try to learn a few words, such as "hello" and "good morning", in different languages and use them to greet the bilingual children. All these create a positive environment at the Lab School, one of acceptance and communication. According to Cummins (1991), a program that accepts and respects the language and culture of the
students, empowers them to feel confident enough to risk getting involved in the learning process. Risk-taking is a necessary skill for problem solving.

Apart from cultural heterogeneity, the Lab School classrooms are also mixed-age. The preschool group consists of three- to five-year old children. Age does not seem to be a factor affecting the friendships that are formed among the children. The older children regularly form play groups with younger children and they learn to be patient and understanding with younger children's lack of some motor skills. I have observed a case when four and a half-year-old Ellie was riding a tricycle and her three-year old friend, Jose, suggested that he drive the tricycle with Ellie sitting at the back seat. Ellie agreed but a problem arose when Jose could not ride the tricycle uphill with Ellie's additional weight at the back. Ellie was trying to convince him that she should be the driver because she was older but that did not seem to convince Jose to give up his driver role. Both children wanted to play with each other so the teacher pointed out that they needed a plan. The teacher's request for a plan clarified the fact that the children were facing a problem and helped them realize that they needed to find a solution. Ellie decided to let Jose be the driver but every time they would reach an up-hill point, she was getting off of the tricycle to push it because, like she said, she was stronger than Jose.

Mixed-age groups provide nurturing opportunities. When a five-year-old is asked to be tolerant of a four-year-old's efforts to put on his/her jacket, we have the beginnings of parent education. The Lab School classroom is a real context in which children's dispositions to be nurturing can be manifested and strengthened. Children
are given opportunities not only to observe and imitate a wide range of competencies, but also to find companions among their peers who match, complement, or supplement their interests in different ways. Katz, Evangelou, and Hartman's (1990) studies provide evidence that the interaction of children with different levels of understanding has important intellectual benefits.

Planning and organizing the resource room

Planning and organizing the school activities is guided by the teachers in collaboration with the children and their parents. Every week a curriculum guide is sent through electronic mail to parents, student teachers and anyone who is interested in what takes place in the classroom in terms of community happenings, symbolic languages, literacy, physical knowledge, dramatic play and future plans. The children are aware of these guidelines because everyday during their "oval time" they talk about their ideas and make plans for activities. Every child's ideas, personal objects of interest, and individuality are respected by the teachers who constantly set up an example and encourage children to "make choices" while listening to their peers and "make plans" with each other by using "nice words" and "regular voices". On a daily basis, the physical space of the classroom is divided into "areas". The permanent areas include the science area, the sensory table, the writing desk, the dramatic play area (kitchen, dress-up clothes, doctor's office), the library, the block area and the art area. Occasionally, play-dough, puzzles and other stored games/objects occupy the empty tables if the children ask for them or if the teacher finds their use relevant to the
children's present play themes. The children are constantly reminded that if they need materials for their ideas and they can't find them on the tables, they should talk to the teachers about it.

Right by the art area, there is a storage room for the different recyclable objects, found objects, natural objects, art supplies, tools and materials. The children always have access to the resource room, with some adult supervision for safety purposes. New materials are constantly added to the room after the children are informed about them. The teachers, parents and children add objects to the resource room. Labels are attached to the containers to help children organize new objects or find what they might be looking for. I have observed three-year-olds at the Lab School using the resource room to find materials for exploratory play. When four- and five-year-olds were accessing the room, they often had an idea of what they were looking for and sometimes items in the room sparked their imagination. A group of four and a half-year-old children, for example, expressed high interest in space play and decided to turn the block area into a spaceship station in outer space. After building their spaceships with blocks, they decided to turn some lights off and create planets that would be hung from the ceiling to create their outer space scenery. They acquired access to the resource room with the initial intention of finding something round to create their planets but while looking they came across some styrofoam balls and some gold and silver pipe-cleaners. The pipe cleaners inspired them to create the rings around the planets that they could see in the space photographs that their teacher brought to the classroom. As Duckworth (1987) points out, children's learning is
facilitated when they are able to use a wide variety of materials in a wide range of activities and in cooperation with adults who help them ask questions.

The adults at the Lab School allow the children to use the resource room to learn for themselves and correct their own errors. One day a group of children became very interested in the properties of the masking tape that they found in the resource room and they started using pieces of it first during their pretend play (as Band-Aids) and then on their drawings. Later they decided to use watercolors to paint their creations and as the paper got wet, they watched the masking tape pieces fall off. The teacher asked them what happened and one of them responded, "I guess water makes masking tape fall the paper". For their second masking tape drawings, they used markers to add color. The children were not discouraged when their initial idea did not work because they were not treated as failures by the teacher. The availability of multiple materials from the resource room stimulated children's use of thinking and problem solving skills.

The nature and purpose of art-related activities

According to the Lab School educators, what is done with materials in the preschool classroom is not regarded as art per se because young children's use of many media is not a separate part of the curriculum but an inseparable, integral part of the whole cognitive \ symbolic expression involved in the process of learning. The Lab School teachers usually consider anything involving materials and creativity as art and would also see artistic elements in dramatic play, music, playing with blocks etc. As
one of the teachers stated, they don't assume that knowledge is constructed in separate
domains, but rather that it more naturally and genuinely occurs in an integrated way,
with all domains open to overlap with others.

For the Lab School teachers there is a distinction between art and crafts. Crafts
are also based on the use of materials but they have prescribed results. The products of
art activities evolve as the individuals go along. Young children's art activities may not
even lead to a finished product. An activity can start as a craft and evolve into art, if
the child chooses to move away from the prescribed product. Art-related activities
combine children's development of technical skills by using tools and materials, with
self expression. Children who are engaged in art-related activities use the materials
with an initial purpose or goal of creating, but not a prescribed product, even if their
efforts are not always completed.

When asked what the goals of an art activity are at the Lab School, one of the
teachers said:

There are many goals - one of the first being to establish a relationship with
the materials so that thoughtful work can be supported. Children's creativity
is without limits. It could be free self expression, could be fine motor
development, could be emotional growth, and of course could be
representational. It wouldn't be possible for me to list all of the possible goals
because we don't believe that goals have to be predetermined and / or clearly
identified. That's not to say that we don't have goals for the children's work -
of course we do! The goals we have are broad and address the whole child,
so wouldn't be necessarily tied to just one aspect of the curriculum.

Art products are not necessarily representational but they could be. It is the Lab School
teachers' assumption that early introduction to observational and realistic
representation does not inhibit children's abilities or desires to use the media for
abstract, creative, and imaginative expression as well. Children are free to use many materials in order to discover and communicate what they know, understand, wonder, question, feel, and imagine. Art making is one of the children's natural forms of expression that makes their thinking visible.

Creativity is not considered sacred and extraordinary but rather as likely to emerge from daily experience. It is believed that when children are exposed to multiple experiences involving a variety of resources and they are encouraged to make choices and think beyond the obvious, then creativity becomes a characteristic of their way of thinking and not a separate mental faculty. Creative is expressed through cognitive, interpersonal-social, affective and imaginative processes.

**Documenting children's work**

Another standard part of the Lab School practice, derived from Reggio Emilia is the use of the documentation of children’s experiences. Documentation has the form of children observation and extensive record keeping. The teachers take photographs of the classroom activities, collect and study children’s drawings and other creations and record the children’s conversations and comments on a specific topic. The photographs, artworks, and teacher and children comments are then displayed on panels, which are placed in areas where both the children and their parents would have easy access to them. I have observed children carefully and consistently studying the "How to make paper-flake angels" and the "Helping wildlife in the Winter" projects and taking notes, as well as talking to other children about them. When Valentine's
Day was approaching one of the girls studied the "Helping wildlife" panel and from other children's documented observations, she found out what squirrels' favorable treats are and how long it takes them to find the treats that the children leave for them outside. Then she and other children decided to make a "valentine" for the squirrels by providing some preferred foods in a specially decorated container.

After new projects are documented and the children start to lose interest in the old documentation panels, the old panels are placed at the observation deck so that visitors could have access to them. One of the panels at the observation deck at the time of my observations resulted from the children's explorations and interest in tigers. The panel included a colored copy of the photograph of a tiger that a child brought to school and initiated their interest in tigers, copies of children's initial drawings and paintings of tigers using different media, their conversations about the habits and living conditions of tigers, photographs of children's dramatic play related to tigers, and more revised visual representations. Documentation typically includes samples of children's work at several stages of completion; photographs showing work in progress; comments written by the teacher or other adults working with them; transcriptions of children's discussions, comments, and explanations of intentions about an activity; and sometimes comments made by the parents.

The children seemed very excited and proud of their work when it was documented and displayed and were eager to show new panels to their parents, their friends and visitors. According to Katz and Chard (1996), careful and attractive documentary displays can convey to children that their efforts, intentions, and ideas...
are taken seriously. The Lab School displays, according to the teachers, are not intended primarily to serve decorative or show-off purposes. According to the teachers, the purpose of the displays is to encourage other children and parents to become involved in a new topic and to adopt new representational techniques. It also encourages children to approach their work responsibly, with energy and commitment. Documentation helps teachers examine what goes on in the classroom on a regular basis and discuss with the children their ideas and the possibilities of new options for the following days.

In the calm environment of the Lab School the children have opportunities to build their own knowledge by revisiting and refining their previous work and ideas. The teachers are coexplorers and facilitators of learning through social construction. The social environment of the classroom conveys that each individual's presence is valued and respected. Voting, for example, is one strategy that was used to choose one idea among many that the children had. Teachers encourage the children to think ("think about your choices inside your heads"), experiment, try things that they have not tried before and, more importantly, ask questions. But instead of answering the children's questions, they allow and motivate other children to help their peers. The children are empowered and authority is transferred from the teacher to the whole classroom culture with its rules and regulations, resulting to a calm and quite but very active, lively and creative classroom, where problem finding and problem solving solutions are usually not adopted from adults.
Observations, conclusions and implications

After studying and describing the physical and philosophical context of the Lab School and learning more about the children's personalities, I focused on observing children's problem solving during classroom and playground activities, describing in detail the situations and the actions of the children involved. For my observations, I was selecting areas of the classroom or playground where there was some planned activity going on, either by individual children or small groups of children. The context, settings, and tools of the activities, as well as children's expressions, gestures and actions, were described through fieldnotes. Children's conversations with peers and teachers were also recorded. My data recording sheets were organized in description of space, objects, actors, and actions for every observed case \ incident \ activity that I was focusing on in the classroom and on the playground [Appendix A].

The observed actions were initially studied and categorized according to the type of problem that the children encountered. This categorization was based on the description from related literature of the types of problems that young children solve, and on personal insight and experience. My specific goal was to decode children's body language, verbal expressions and interactions to find out if they were consciously or unconsciously facing and trying to solve a problem. The children's main goals were categorized based on the nature of the problem they encountered.

Children's activities involved technical or practical, conceptual or expressive, and interpersonal problems. Technical or practical problems were related to materials
and their physical properties. They were rooted in children's initial difficulty in using the materials due to undeveloped sensorimotor skills or unfamiliarity with new objects and situations. In Case 2 (p.280), for example, Walden was looking for new materials, apart from sand, to build castles with. He was not familiar with the practical properties of his tools and materials, the plastic molds and dirt, and chose to experiment to find out. The same child in Case 11 (p.284) was immersed into his writing but also found connecting the markers interesting or fun and therefore, had to solve the practical problem of how to keep the markers connected and be able to write at the same time. Practical problems can be as simple as choosing materials and finding resources (Case 16, p.286), deciding how to spread paint on a printing tool, how to cut paper, how to clean up a paint spill or how to make a stable base for a paper structure.

Children also imposed conceptual problems when they were trying to decide how to materialize their ideas and how to create symbols of concepts. The Lab School teachers constantly reminded the children to think of their ideas "inside their heads" and make choices. In order to achieve this, children had to solve conceptual problems. In Case 10 (p.283), for example, the child who liked his friend's idea of making animal planets and wanted to try it herself, had to solve the conceptual problem of how an animal planet would look like. Would it look like an animal or would it look like a typical planet with only animals as its habitants?

Children's attempts to materialize their ideas were often related to choosing tools and supplies to achieve this. In most observed cases that involved expressive problem solving, the process also included practical problem solving. After having an
idea and deciding to try to materialize it, the children were observed trying to deal with practical problems, such as: What supplies to use to materialize the idea and where they can be found (Case 16), how can the available supplies can be used to materialize the idea (Case 2), and how can we become more physically comfortable without disrupting peer play (Cases 14 and 15). The overall nature of problem solving in the Lab School classroom is complex. Because of the fact that children are let free to make their own choices and engage in uninterrupted activities, one problem that they encounter and solve leads to another and the problem solving process becomes multidimensional.

Interpersonal problems were related to everyday relationships, whether the children were trying to draw the teacher’s attention or participate in peer culture. Interpersonal problems needed to be solved when one child's personal goals were conflicting with the ideas of their friends and play partners. In Case 5 (p. 281), Ellie chose to play with marbles individually but when her friends approached her and asked if they could join her, she had to solve the problem of how to keep the marbles where she initially wanted them to be and play with her friends at the same time. The interpersonal nature of the problem of sharing tools and play space with peers when you have different goals, is also evident in Case 6 (p.282), when a group of children wanted to use the same space at the same time for their pretend play. In Case 12 (p.284), Walden's interpersonal problem was when and how to express dislike or disagreement towards peer actions and reactions. This type of problem solving is always encouraged by the Lab School teachers, who continuously remind the children
to listen and talk to other children and express their feelings verbally, in a "regular" voice.

From the observed cases at the Lab School, 37% of the problem solving situations that the children encountered involved interpersonal problems, 12.5% involved technical problems, 18.75% involved conceptual problems, and 31.25% involved a combination of practical and conceptual problems. A lot of the problems that the Lab School children have to deal with in their daily activities are interpersonal and more specifically, problems that are related to peer relationships. This could be due to the socioconstructivist approach to education adopted by the Lab School teachers. Socioconstructivist education is based on communication and emphasize the importance of children's communication strategies for introducing, expanding and solving problems, and producing situationally appropriate behavior (Kantor, Elgas and Fernie, 1993). The Lab School classroom is considered by parents and teachers a culture, where life is patterned and constructed over time by its members' interaction with and reaction to each other. According to existing literature, interpersonal problems can be caused by children's effort to (a) develop and maintain involvement and success in peer culture, and (b) maintain their peer culture without breaking the classroom rules and boundaries (Corsaro, 1992). My observation data have revealed another source of interpersonal problems: children's efforts to maintain personal goals and interests without conflicting the interests of their peers.

After studying the types of problems that young children encounter, the next step of my data analysis required focus on the cases that demonstrated solution of
problems. Research and literature on cognition provided descriptions of different thinking skills or qualities of thinking and my hypothesis was that some of them are related to problem solving. Related literature on these thinking skills and strategies was very broad and not discussed in relation to problem solving. The coding categories for my study, related to the thinking qualities during problem solving, were mainly derived internally, from within the data, by searching for patterns of behavior during children’s solutions to problems. The observed cases from the Lab School provided evidence that the qualities of thinking related to young children’s problem solving include: problem finding, investigation, planning, commitment, flexibility and imagination.

Problem finding is related to being receptive to ideas, even to those of other people. Children with developed sensitivity to problems usually respond to changes in their environment. Problem finding has its natural source in children’s play. In Case 1 (p.280), I studied how children react to changes, for example changes in the environment or availability of new materials. Walden and Maria discovered the task of playing with leaves for themselves and responded creatively to the changes of the environment. Problem finding was achieved by being receptive to new material and to each other’s ideas. Maria observed Walden’s actions and made an assumption about his goal and the necessary tools and strategies for that task. The problem of how to participate in Walden’s play was defined by her and at a next level she had to formulate a solution, which she did.
Investigation, which is related to exploration and curiosity, not only leads to problem finding but also facilitates generating solutions and additional problems. Young children's investigations are usually related to experimenting and testing the possibilities of tools and materials. In Case 2 (p.280), Walden found his own problem because he tried to explore the possibilities of a tool that he was already familiar with, by investigating how would new materials work with it.

Young children are capable of making plans about the near future and trying to maintain them. Carly, in Case 3 (p.281), was really immersed into the task of creating sand castles and she seemed to ignore all other activities that were taking place around her but were not directly affecting her. She was paying a lot of attention to details and she was very specific about the materials she wanted to use. Her focused attention was also demonstrated by the fact that she was only using a shovel and a bucket, the necessary tools for the task, and was not "tempted" to use the new fire tracks that were also in the sand area. She had a plan and she clearly expressed it by explaining to Sara that she was intending to make twelve castles. All the steps of creating a sand castle were clear to her and she was able to describe them to Sara in a clear and simple way.

Case 4 (p.281) is a demonstration of a young child's ability to commit to a task. Hugh spent the whole playground time digging, at first to find worms and then to find anything that was buried in the ground, such as rocks. Ike, Peter and Brian were also involved in looking for buried object but they soon became more interested in the act of digging itself and not its results. They brought fire trucks into their play and moved into racing them. Hugh was the only child who was more focused in the use of tools
since he was only using a shovel and a bucket and continued digging the next day. At
the end of the first day he asked Carly to "save" his bucket for him and he was also
looking for a "safe" place to leave it before going home because he was planning to
continue his play the next day.

Flexibility refers to the capacity to produce a variety of ideas that may cause a
shift from one thought pattern or category to another. It allows children to readily
adapt and adjust to new situations, consider other people's ideas and compromise,
when necessary, for solving problems. It also allows for diverse interpretations of
situations and multiple uses of materials. In Case 6 (p.282), for example, Hugh was
able to point out an interpersonal-technical problem. The problem was: Can you share
materials and space when you have different goals and how? Even if he was the one
who spotted the problem and in a way it was his problem, he was flexible enough to
overcome being upset and try to find a solution.

A common strategy observed for solving interpersonal problems of conflicting
personal and group goals, was imagination and storytelling (Cases 5 and 7). The Lab
School teachers constantly encourage the children to come up with ideas and try new
things. The Reggio Emilia literature on creativity explains how and in what situations
children develop creative behavior. Lorris Malaguzzi (1998), the founder of the
Reggio Emilia schools, stated that children are the best evaluators and the most
sensitive judges of the values and usefulness of creativity. This comes about because
they have the privilege of not being excessively attached to their own ideas, which
they construct and reinvent continuously. The Lab School teachers, like the Reggio
educators, do not consider creativity sacred and extraordinary but rather as likely to emerge from daily experience. Storytelling and creativity can turn a conflict between personal and interpersonal goals into a playful situation, where learning and developing peer culture are negotiated.

The above findings, related to the complexity and multidimensionality of young children's problem solving, support the need for further research in this area. In an environment where independent and negotiated learning is valued and encouraged, what is the role of the teacher in children's problem solving? After focusing on children and their thinking qualities related to problem solving, further study of the role of the teacher during daily activities and projects, was necessary for clarifying how a school's physical and philosophical context facilitates complex problem solving.
CHAPTER 5

RESEARCH METHODOLOGY

According to Gardner (1999), serious efforts have been undertaken in a number of American communities to re-create the Reggio Emilia approach. Gardner (1999) continues, however, that learning is situated, occurring in specific contexts with particular identifying features and purposes, and extending only slowly and uncertainly into new and unfamiliar environments. The Reggio education is an amalgam of: the democratic practices of the region; the people's sense of community and their socialistic government; their rich resources; the history of art reflected on the environment; the religious background; and the ideas and practices of Lorris Malaguzzi and the educational team that he assembled. Reggio staff members are highly skeptical about some American attempts to adopt the Reggio approach and view the notion of visiting Reggio Emilia for one week and then trying to replicate key features back home as illusory. The educators at the A. Sophie Rogers Laboratory School at The Ohio State University acknowledge the importance of situated learning and make serious efforts to adopt aspects of the Reggio Emilia philosophy that are relevant to the specific learning community.
I conducted a qualitative, descriptive case study, using observation and informal interviewing as the main inquiry methods. My study was an attempt to broadly describe young children's problem solving. Problem solving was studied in the Lab School's socioconstructivist context. Evidence was collected through children observations, teacher observations, settings observations, and teacher informal interviews. The collected data was interpreted through two levels of content analysis.

**Pilot study**

This study took place in the preschool classroom at the A. Sophie Rogers Laboratory School on The Ohio State University campus. The classroom was initially observed for conducting a pilot study. The purpose of my initial observations was to examine the school setting and atmosphere, and learn more about the teachers, the children and their group dynamics. Another purpose was also to identify children's thinking qualities related to problem solving. Bohem and Weinberg (1997) emphasize that no matter how important genes might be in determining characteristics and behaviors, environments have a major impact and classroom observers should, therefore, focus not only on the child, but also on those environmental characteristics that are critical to fostering learning.

During my initial observation and conversations with the teachers, I tried to focus on a detail description of the physical setting and the school's typical everyday atmosphere. The school is considered a community and classroom life is a process of creating culture. The first part of my pilot study was guided by microethnographic
research methods. Microethnography is the study of a small experience or a slice of everyday reality, such as instruction; it is a process of data collection and comparative analysis of everyday situations for the purpose of formulating insights. (Stokrocki, 1997). According to Geertz (1973), ethnography assumes that it is through individuals' behaviors that cultural knowledge finds expression.

I examined the school from a top-down as well as from a bottom-up perspective (Katz, 1993b). The top-down perspective typically takes into account such program and setting characteristics as the ratio of adults to children; the characteristics of adult-child relationships; the quality and quantity of equipment and materials; the quality of space; etc. Howes, Phillips, and Whitebook (1992) provide evidence to suggest that these program and setting characteristics do predict some effects of an early childhood program, therefore I consider studying them important. It is reasonable, however, to assume that the child's experience of a program is an important determinant of its effects. Researchers who use the bottom-up perspective study a setting from the children's point of view, answering questions trying to imagine how would it feel to be a child in a specific environment. Questions such as the following, served as guidelines for my observations of the school environment: Is the children's work displayed in the room? How? Are there any natural objects in the room? Where are the materials stored and how? Are they organized in any way? Is there a resource room? How are new materials presented to the children? Are there any permanent activity areas? When are children asked for their opinions/ideas/personal choices?
Miles and Huberman (1994) took a very pragmatic approach to qualitative research and developed ideas and concepts that assist in planning and organizing research stages. It is suggested that the nature of qualitative research means that data collection and analysis may, at least partly, occur simultaneously. Hampton (1999) adds that for the findings of qualitative research to be useful, it is important that the analysis process is evaluative and critical. The pilot study data from answering the above questions were analyzed based on the following analysis questions: Is the space planned and set up to facilitate encounters, interactions and communication among children? Does the arrangement and use of space for activities facilitate constructive exploration of materials? Does the arrangement of space consider children's own needs and interests? What is the image of the child based on the school's atmosphere and physical settings? This initial stage of data analysis, which is called by Hampton (1999) "familiarization and discovery", is concerned with beginning to familiarize oneself with the data and then to begin to identify initial themes. The purpose of this analysis was to set the context of the school and aspects of education perceived as important.

During the pilot study, three weeks were devoted to observing each individual child of the Lab School to learn more about their background and previous experiences and to identify their problem solving skills and personality traits that may have direct or indirect effect on problem solving. After a detailed description of the school settings and atmosphere, and a general description of the children's background and social attributes, I focused on observing children's problem solving during
playground and classroom activities, describing in detail the context, the children involved and the strategies used for solving the problem.

**Primary study**

Continuing the process of my pilot study, I observed different children's problem solving activities. While observing the activities, I wrote down children's conversations with peers and teachers, and took extensive descriptive fieldnotes about their actions. The fieldnotes of the different activities were first analyzed and categorized based on what type of problem were the children trying to solve. From the results of the pilot study and review of related literature, I found out that during their daily activities young children solve practical, interpersonal and conceptual problems. The primary study observations were then further categorized based on what strategies were used for finding a solution to the problem. A second level of analysis was focused on synthesizing the coded data around contextual issues related to situated learning, educational playfulness, and learning community and socioconstructivist problem solving.

**Purpose of analysis**

Through this study, I observed the A. Sophie Rogers Lab School's serious efforts to follow the Reggio Emilia guidelines for young children's learning. I focused on the different activities at the preschool classroom and tried to find out who made decisions about what took place, what types of problems did children encounter and
what strategies did they use to solve them, and what did the teachers consider when they made decisions about planning and implementing a curriculum directed towards problem solving, as well as creating an educational and resourceful environment for problem solving.

The questions for investigation were:

- Does context - physical and philosophical - facilitate problem solving in a preschool setting?
- What kinds of problems arise for young children during preschool activities and what are the main cognitive qualities that they use when they are trying to solve them?
- What is the role of the teachers in planning and implementing activities and in facilitating children's problem solving?

Paradigms and perspectives

According to Morse (1994) it is a misnomer to label research theory or concept driven studies, "for if theory actually guided data collection and analysis, inductive assumptions of qualitative research would be violated." (p. 221) Theory, however, is used to focus the inquiry process and justify the choice of specific questions, subjects, sites, strategies, and methods. The theoretical foundation of my study is based on social constructivist ontology, epistemology, and methodology. Broadly, ontology refers to conceptualizations - abstract and simplified views - what is reality. Epistemological approaches deal with how is knowledge and meaning constructed and
methodological approaches discuss how the constructed meanings are expressed and interpreted.

Constructivists assume a relativist ontology. According to Leavitt (1995), they "posit the fundamentally relational, social aspect of our existence and the inescapable fact that human beings are part of the world they study" (p. 5). It is believed that there are multiple realities and truths, local and specific in nature that come into existence in and out of our engagement with them in our world (Crotty, 1998). What is problem solving and what facilitates problem solving in a specific kindergarten, for example, is different from problem solving in any other context.

Socioconstructivist epistemology is subjective, since the knower and the subject create understandings. Knowledge and truth are created, not given or discovered by the mind; contextual, not absolute; mutable, not fixed (Belenkey, 1975). Learners do not transfer knowledge from the external world into their memories. The social constructivist epistemological approach argues that people construct meaning out of the events and phenomena they encounter in their lives. Knowledge is acquired through involvement with content instead of imitation or repetition (Kroll and LaBoskey, 1996). Abdal (1998) adds that learning activities in constructivist settings are characterized by active engagement, inquiry, problem solving, and collaboration with others. Similarly, the Reggio Emilia approach rests on the notion that there is an innate human drive to make sense of the world. It is believed that, instead of absorbing or passively receiving objective knowledge that is "out there", learners actively construct knowledge by integrating new information and experiences into what they
have previously come to understand, revising and reinterpreting old knowledge in
order to reconcile it with the new.

The concept of situated learning is embedded in constructivism. According to
Stein (1998), in the situated learning approach, knowledge and skills are learned in the
contexts that reflect how knowledge is obtained and applied in everyday situations.
Situated cognition theory conceives of learning as a sociocultural phenomenon rather
than the action of an individual acquiring general information from a decontextualized
body of knowledge. Stein (1998) continues that to situate learning means: to place
thought and action in a specific place and time; to involve other learners, the
environment, and the activities to create meaning; to locate in particular setting the
thinking and doing processes used by experts to accomplish knowledge and skill tasks.
Anderson, Reder and Simon (1996) identified four premises of situated learning
experiences which differentiate situated learning from other experiential form of
acquiring knowledge and can guide the development of classroom activities: 1.
learning is grounded in the actions of everyday situation; 2. knowledge is acquired
situationally and transfers to similar situations; 3. learning is the result of a social
process encompassing ways of thinking, perceiving, problem solving, and interacting
in addition to declarative and procedural knowledge; 4. learning is not separated from
the world of action but exists in robust, complex, social environments made up of
actors, actions, and situations. It is my belief that the Reggio Emilia approach
promotes situated learning and my study will provide specific examples for the four
premises from educational practice.
Knowing is experiential and it arises through participation with others. The outcomes of any inquiry should cause changes in the lived experiences of those involved in the process. This is how learning is viewed in Reggio Emilia. According to Reggio educators, children learn through interaction and communication and the teachers become researchers whose inquiry is planned to have direct effect on their own beliefs and practices and on the children. As Forman (1996) points out, constructivism can be seen in the manner that these schools encourage children to dialogue among themselves, to experience one another's perspective, and to build a group understanding of a theme. Teachers wait for the child to venture forth with an idea, a hypothesis, a conclusion and then encourage the children to scrutinize these initial propositions for coherence and feasibility.

Goodnow (1977) took a constructivist approach to children's drawing. Children's "graphic work" was regarded as "visible thinking". The features it displays "- thrift, conservatism, principles of organization and sequence - are features all problem-solving, whether by children or adults" (Goodnow, 1977, p. 145). According to Greene (1996), this is clearly a constructivist approach to children's modes of expression because of the emphasis on the ways in which children tend to create equivalents rather than replicas of what they actually perceive, and the ways in which the medium they use affects what they create. Greene (1996) believes that what the children produce is seldom to be called "art" in any serious mode, but might be viewed as adventures into meaning or into the modes there are of structuring what is sensed in the world around. In her own words:

100
Yes, children do create meanings by using paint brushes, pieces of chalk, triangles, gongs, by making shapes with their bodies in time and space. They construct what are accepted as 'unreal' worlds by improvising in theatrical spaces; coming together, they often engage in the construction of distinctive social realities that they can comfortably inhabit... (Greene, 1996, p.123).

Children's Hundred Languages in Reggio Emilia are not viewed as modes of artistic expression but as means of meaning making and expressing knowledge.

The assumed methodologies of constructivist research are naturalistic and consider the sociocultural context of phenomena. The researcher and the subject of study are interactively linked so that meaning making is "created" as the investigation proceeds (Guba and Lincoln, 1994). Reason (1994) describes inquiry processes, such as co-operative inquiry, and participatory research, as empowering for the participants to define their world. Methodological approaches come face to face with the social situations that reveal constructs and the taken-for-granted components of the world. Rather than sampling subjects to represent a population, researchers must be focused on a local view. As Graue and Walsh (1995) further explain, the lens of research must zoom in to a shot of the situated child. My goal was not to state generalized conclusions and theories about young children at the end of my study. My goal was to conduct an in-depth analysis of a specific setting and provide practical examples for educational theories, which could serve as guidelines and support for other attempts for implementing theories in similar contexts.

The theoretical foundation of this study is derived from the ontology, epistemology and methodology of social constructivist paradigms. Problem solving was studied within the specific Lab School context, which provides opportunities for
experiential learning through involvement with content. What is problem solving and what facilitates it in specific preschools, differs from problem solving in any other context. Preceding the data collection, an attempt was made to define what data would be potentially the richest and most likely to be fruitful, and what contextual information would inform the data analysis. These boundaries for the data collection, which were defined by the study of the Reggio Emilia literature and the pilot study observations, are related to children's behaviors as well as teachers' behaviors and school settings.

Boundaries for data collection

After studying the Reggio Emilia approach, it was my hypothesis that it provides children with opportunities for developing problem solving skills, not through formal instruction but through intrinsic motivation. The situated character of the Reggio education requires that any attempts to adopt this philosophy and practice are site specific. There are, however, some basic behavioral and contextual characteristics of the Reggio education related to problem solving, which are fundamental in any environment influenced by this approach. A challenge at the beginning of this study was to set up the boundaries for the data collection, through defining the conceptual and methodological impact on the OSU Lab School from Reggio Emilia. These boundaries played an important role in guiding my observations and collecting the data.
Children's behaviors

Teachers frequently overcome children's reluctance to work on tasks designed to aid the acquisition of basic skills by offering extrinsic rewards (Kohn, 1994), especially when their attention and persistence are difficult to secure by other means. By contrast, as Katz and Chard (2000) point out, Reggio learning relies on intrinsic motivation; it capitalizes on the children's own interest in the work and on the appeal of the activities themselves. They add that learning is more defused during self-motivated activities than in formal instruction and involves children in applying skills and knowledge in a variety of ways for a variety of purposes. Katz and Chard (2000) add that when children are intrinsically motivated, they respond in ways that strengthen their disposition to work independently of the teacher, for example, by helping one another. Further investigation of the development of thinking skills within a Reggio-related approach is therefore important for education. The children's interactions during intrinsically motivated activities were observed and analyzed to find out specifically how they cause problem finding and problem solving without the teacher's intervention. A bigger challenge for the study, however, was to identify the effect of teacher-directed activities on children's problem solving.

Katz and Chard (2000) describe how in formal teaching the teachers are the experts responsible for instruction according to their diagnosis of the child's level of proficiency. They direct and monitor skill practice, often through sequences of preconceived activities. They are the experts on the skills being taught and on how they are best learned. In Reggio-related schools, children are empowered and
encouraged to make choices, assess their own proficiencies in applying skills, monitor their own activities and select their own tasks. Tasks used for projects are undertaken in a context that makes sense to the children. By observing the Lab School activities, I tried to identify occasions when children were encouraged to make choices, plans and decisions, and find out how that affected their problem solving.

School settings and teacher’s behaviors

The development of socioconstructivist learning requires specific physical settings, materials and teacher’s actions, that are related to communication and inquiry. A detailed description of the Lab School setting, tools, materials and other resources available to the children was one of the goals of my study. The environment is considered the third teacher for the Reggio Emilia children along with the team of two teachers. Reggio educators view space as a "container" that favors social interaction, exploration, and learning. They also see space as having educational "content", that is, as containing educational messages and being charged with stimuli toward interactive experience and constructive learning. According to Gandini (1998), educators in the United States are well aware of the importance of outdoor spaces, however, they have always contended with funding limitations and thus been forced to make compromises with regard to indoor space. The unfortunate result, as seen by Gandini (1998) in many day care centers and schools for young children, has been a set of discouraging physical conditions, especially a lack of natural light and uncluttered space. My initial observations at the Lab School were focused on describing the school atmosphere and
setting and deciding if they can be considered both "containers" and "contents" and how that affects children's problem solving.

The Reggio teachers are researchers, co-explorers and facilitators of the learning process. Their role is to turn disputes into productive discussions and possible project opportunities, to support children’s efforts and provide resources, make decisions about project orientation and document the learning process. Edwards (1998) attempted to give a fuller picture and provide concrete examples of the abstract principles about the teacher’s role and offers four observation records drawn from videotapes taken at the Scuola Diana in 1988 and 1990. They illustrate different kinds of teacher behavior commonly seen in the Reggio Emilia preschools: getting children started, providing instruction in tool-use and technique, turning disputes into hypotheses to test, and encouraging children to solve their own disputes. I attempted to provide more examples of teacher’s behavior and its effect on children's problem solving.

According to Edwards and Springate (1995), when educators fully understand how exploration, representation, and communication feed one another, they can best help children achieve this potential. The Reggio approach is worth studying because it promotes intellectual goals for the children rather than academic tasks (Katz, 1999). Academic tasks are typically carefully structured by the teacher, sequenced, and decontextualized small bits of information that often require some small group or individual instruction by a knowledgeable adult. Intellectual goals, on the other hand, address dispositions, that is, habits of the mind that include a variety of tendencies to
interpret experience (Katz, 1993a). The intellectual dispositions include the dispositions to make sense of experiences, to theorize about causes and effects, to hypothesize explanations to account for observations, and to analyze and synthesize whatever information is available. Katz (1999) points out that these dispositions can be seen when children are engaged in investigations of things around them in the course of which they persist seeking answers to their questions and solutions to the problems they encounter. It was my hypothesis that the early childhood approaches derived from Reggio Emilia facilitate the development of children's intellectual goals and intellectual goals lead to self-motivated questioning, investigation, experimentation and other qualities of thinking related to problem solving.

**Procedures for data collection**

During a period of about six months, the Lab School morning activities were observed. Activities were randomly selected among all the action taking place in the classroom and data recording sheets were used for detailed descriptions of the space, objects, actors and actions of each activity. Solitary playing is not very common among the children at the Lab School, therefore, descriptions of most observed cases included transcribed children's conversations and interactions. An example of an observed case from the primary study is Case 17 [Appendix B]:

106
Case 17:
Space: center of the classroom space, where oval-time is held

Objects: jump rope

Actors: Maria, Carly

Actions:
Maria arrived with her father, holding a jump rope and ran to show it to the teacher. Maria's father tells the teacher that Maria has been practicing the jump-ropes all afternoon the previous day. Maria moves at the center of the oval, looks at the teacher and gets ready to jump. The shirt she is wearing is wide at the waist and the rope is caught on it. She tries again, two to three times.

Maria: It gets stuck on my shirt.

She takes her shirt off, hands it to her dad and tries the jump-ropes again. Turns to her dad.

Maria: Dad, taking my shirt off is not really a good idea because now the rope hits my back and it hurts.

Her dad gives her the shirt back and when she puts it on, he tries to tack it in her pants.

Maria: I almost did it. It's hard... It's hard...

Carly: I want to try. Can I try? I want to make a plan.

Maria gives the rope to Carly. Carly's first attempts are not successful.

Carly: I can't really do it with boots. Here's how you do it: Over... and jump. Over... and jump.

Table 2: Example of data recording sheet

Each activity was observed to identify problem solving by the children. If an activity progressed for about ten minutes without any occurring problematic situation, my focus and observations would shift to a different activity. After a problem was defined during children's activities, if attempts were made to solve the problem, those were also recorded until the focus of the children changed. The teachers' actions in relation to children's activity were also described in the fieldnotes. To identify problem solving situations, I was looking for patterns of behavior and verbal expression related to problem finding, investigation, planning, commitment, imagination, and flexibility, qualities of thinking that have been observed during young children's problem solving through my pilot study. After isolating incidents that
included behavior related to problem solving, the observed cases were labeled
deductively by the type of problem that was being solved and the problem solving
behavior demonstrated. I tried, however, to maintain openness and skepticism to allow
for the possibility of developing new categories. A second level of analysis led to
synthesizing the coded data around contextual issues related to situated learning,
educational playfulness, and learning community and socioconstructivist problem
solving.

Initial level of analysis

According to Krippendorf (1980), content analysis is a process of forming
convincing suppositions, that is, probable explanations, from data and their content.
Stokrocki (1997) points out that some researchers borrow categories from previous
research but other categories may emerge from the data. I have described the different
types of problems and the different qualities of thinking related to young children's
problem solving, after studying related literature and observing the Lab School
activities. Each observed problem solving case was initially analyzed in tables,
describing the problem, problem solving strategies and problem context. I will be
looking for evidence in each case to answer questions, such as: What was the type of
problem / conflict? What were the children's questions? What was the solution? What
evidence from the observations suggests problem finding, communication,
investigation, planning, commitment, flexibility, imagination, reasoning? What was
these strategies' effect on problem solving? What was going on in the classroom during problem solving? What was the teachers' behavior during problem solving?

**Coding system**

In order to be able to identify significant events, children's statements, teachers' statements, actions and interactions from the observed cases, a coding system was developed. The coding system was developed through literature review and holistic study of the pilot study observations. The categories were referring to the types of problems that young children solve, different thinking qualities that are related to problem solving, and the context of problem solving in Reggio-inspired settings.

The types of problems that young children solve during art-related activities were defined externally, after studying the existing related literature. Practical, conceptual and interpersonal problem solving were pre-determined categories derived outside the data, which were used to identify the initial significance of the pilot and primary study observations. In general, practical problems are related to materials and their physical properties. The physical properties of tools and materials cause problems when the children were unfamiliar with how to use them. Golomb's (1997) research on children's clay construction provides evidence to support that the "primitive" representations of young children do not result from cognitive immaturity or distorted conception of reality, but rather are related to the problems inherent in the nature of the medium and the lack of experience and practice that modeling technique
requires in order to be mastered. More specifically, practical problems occur with children's initial difficulty in using materials due to undeveloped sensorimotor skills, lack of experience and practice, and inability to organize them. Some practical problems have interpersonal attributes when they were derived from the unavailability of enough resources for all children. Other practical problems, however, have conceptual attributes when they were derived from children's attempts to change the physical characteristics of their work to match an initial concept / idea. Case 24 is an example of practical problem solving. Maria was playing with flubber and recalled other children's play and decided to try to make bubbles using the flubber and a straw. Her attempts were not successful. The problem of trying to find out what she was doing wrong while trying to make the flubbles was related to the physical properties of the tools and materials and her lack of practical skills in using them.
Case 24:

Space: flubber table

Objects: flubber, straws

Actors: Maria, teacher, Larry

Actions:
Maria is playing with flubber. She is using a straw and trying to blow bubbles but her attempts are not successful.
Maria: Anna-Lisa, I have trouble making "flubbles" (flubber bubbles).
Teacher: Do you know who's an expert in that? Larry.
Maria: Laaaryyy. I want to make flubbles and I don't know how.
Larry runs to the flubber area takes a straw and demonstrates how to blow the bubbles. Maria is looking at Larry's hands and flubber. He then goes back to his previous activity. Maria takes a larger piece of flubber than the one she was using before and tries again, looking at her flubber while blowing. She then stops.
Maria: Oh, you have to hold it real tied at the sides.
She continues blowing but puts both hands around the straw, holding the flubber tied instead of holding the straw with one hand and the flubber with the other. After a few more attempts she creates a bubble.

Table 3: Example of practical problem solving case

Conceptual problem solving is related to representational or expressive challenges, such as, choosing or inventing means of expression to represent and communicate ideas. They are mainly caused within the developed peer groups and by the personal differences among group members. According to Arnheim (1969), the human mind can be forced to produce replicas of things, but it is not naturally geared to it. Representational problems are "translation" problems, since the perception of something should be represented using a different language. Conceptual problems occur either when children are asked by teachers to make a decision or come up with an idea, or when the nature of their own activity requires conceptualization in order not to be disrupted. Case 30 is an example of conceptual problem solving, when two children were trying to find out what the writing on an envelope meant. Their problem
solving attempt was a form of translation of what was represented on the envelope into a different, comprehensible "language".

<table>
<thead>
<tr>
<th>Case 30:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Space:</strong> classroom</td>
</tr>
<tr>
<td><strong>Objects:</strong> Larry's birthday gift and card from Quincey</td>
</tr>
<tr>
<td><strong>Actors:</strong> Larry and Carly</td>
</tr>
<tr>
<td><strong>Actions:</strong> The day after the class celebrated Larry's birthday, Quincey brought a gift for Larry. She gave it to him as soon as she came to school in the morning. Larry opens it and Carly is standing by him, watching. Carly: Walky-Talkies? That's cool. Larry continues to unwrap the gift with one hand because in the other hand he has a red envelope from Quincey with something written on it. Carly notices the writing on the envelope. Larry: Hey Carly, look: trading cards! Carly: Oh, cool. What's this? Is it a card? What does this say? Larry: It's a name. See? Big letter. Carly: Quincey? It says Quincey? Larry: Hey, that's my name. Carly: Oh, Larry. It says Larry! Carly looks at the envelope for a few seconds and points at each letter saying Larry's name.</td>
</tr>
</tbody>
</table>

Table 4: Example of conceptual problem solving case

In general, interpersonal problems are related to developing and maintaining involvement in peer culture. Peer culture is defined by Corsaro (1992) as a stable set of activities, routines, or rituals, attitudes, artifacts, values, and concerns that children produce and share in interaction with peers. Interpersonal problems are, more specifically, related to sharing objects, planning play themes for group play, making collective decisions, and trying to draw peers’ attention. They are caused by children's attempts to modify their behavior around the daily program of the preschool to serve the purpose of developing and maintaining involvement and success in peer culture.
At the Lab School, for example, Sophia and Mackenzie both enjoy dress-up activities and, during the observed Case 34, they were exploring a wedding and marriage idea and both wanted to wear the wedding dress and play with Ike. Interpersonal problems had to be solved when Ike had to choose one play partner. Interpersonal problems are related to applying cultural knowledge to fit the moment and dynamics of any particular play episode or situation.
Case 24:

Space: block area

Actors: Ike, Sophia, Mackenzie, Rachel, Sterling

Actions:
A group of children at the block area are discussing who is going to go to Ike's wedding and who he is going to marry. Mackenzie is wearing a white dress and a veil from the dramatic play area.

Sophia: Ike are you going to marry me and Kenzie?
Ike: Yes, two girls.
Rachel: Oh, two girls.
Sophia: Yes, see he can marry you and me.
Ike: No, I can't be married to two girls. Only two people go to the wedding.
Sterling: I can do "eanie meanie minie mo".
Ike: Yeah, do "eanie meanie" to decide who is the littlest. Which one of you is the littlest? You have to come down here and stand next to each other.
Sophia: Down there?
Sterling: Yeah, and I do the "eanie meanie".
Ike: You do the "eanie meanie minie mo" and I'll say who's bigger. No, no... who is littler.
Sterling: Eanie meanie minie mo catch a tiger by its toe.
Ike: Whoever is little can marry me. Let's see, Sophia's 20 and 1/2 and you are 1 and 1/2.
Sophia: No, no.
Ike: So now Mackenzie is gonna marry me.
Sterling: OK.
Sophia starts to cry. A teacher explains that it is just for play, not for real, and suggests that she takes a deep breath. Ike is standing still, holding a lego piece by his mouth, looking at Sophia from a distance with a puzzled expression on his face.
Rachel: Now Sophia can go to New York with me.
Ike: No, no. I want to do "eanie meanie minie mo" again.
Sterling: We already did that plan.
Ike: Sterling, you say "eanie minie minie" again.
Sterling: "Eani meani minie mo".
Ike: I am seeing who is the littlest. Sophia, you gotta match, match together. Whoever gets 21 will marry me.
Sterling: Eani meanie minie mo catch a tiger by its toes and Sophia is the best.
Ike: You are 26 and you are 26.
Sophia: Tie?
Sterling: Eani meanie minie mo.
Ike: Ummm, 26 again and 26 again. Okay. Let me do it one more time. You are 21 and you are 21 too. I can marry two girls now.
Sophia (to Mackenzie): He can marry you and me.
Kenzie: OK.
Ike: Hey, guys look at my two wives.

Table 5: Example of interpersonal problem solving case
The coding system developed for this study also included internal categories, which were derived from within the pilot study data. After the observed problem solving cases from the pilot study were further examined in terms of children's language and behaviors when dealing with a problem, patterns of behavior and common themes emerged. These patterns of behavior served as keys for developing categories for the different thinking qualities related to problem solving at the Lab School context. The categories included problem finding, investigation, planning, commitment, imagination, flexibility, reasoning, and a more general category, communication.

**Problem finding.** Problem finding is related to being receptive to ideas and responding to changes in their environment. Case 1 provides evidence of problem finding having its natural source in children's play.

**Case 1:** As soon as they entered the playground, Maria and Walden run towards an area where a lot of leaves have fallen. They run and fall on the leaves and then start throwing them up and at each other. Walden covers himself completely with them. Maria pretends that she did not see him and asks, "Hey, where is Walden?". He jumps up and says, "Wake-up time!".

Problem finding was achieved by being receptive to new material and to each other's ideas. Maria observed Walden's actions and made an assumption about his goal and the necessary tools and strategies for that task. The problem of how to participate in Walden's play was defined by her and at a next level she had to formulate a solution, which she did.

**Investigation.** Investigation means pursuing understanding, looking for answers to questions, trying out some possibilities, and finding whether or not they
work. Young children’s investigations are related to experimentations with new resources, to observation of the environment - for patterning peers’ behavior and adopting goals or focus of activity, and for forming questions and seeking answers - and to studies of the visual qualities of representations and drawing conclusions. Case 2 is an example of investigation related to experimenting and testing the possibilities of tools and materials.

**Case 2:** Walden takes a plastic castle-shaped mold and a shovel from the sand area and starts walking around the playground. He stops at a spot where no grass is growing. He picks dirt with his shovel and fills the mold, turns it upside down and lifts it up. Seeing that this process did not result to creating a castle with dirt, he flattens the dirt with his shovel and walks back to the sand box.

Walden found his own problem because he tried to explore the possibilities of a tool that he was already familiar with, by investigating how would new materials work with it. During his experiment, the tool was his control variable and the material was his dependent variable. He hypothesized that using dirt instead of sand would have the same results and proceeded in testing his hypothesis.

**Planning.** Early childhood planning tends to be close in time to the actions it is guiding, to incorporate only one or few actions and to be aimed directly at meeting a goal. Later plans are removed in time from the actions they will guide, include more diverse actions and incorporate hierarchically organized subgoals. Case 3 shows how young children are capable of making plans about the near future and trying to maintain them.

**Case 3:** Carly is filling a bucket with sand using a shovel, after carefully removing grass or leaves from the sand in the shovel. She then turns the bucket upside down and pulls it up creating sandcastles. She moves a little and repeats the process.
After finishing each castle, she counts them all out loud. Sara approaches Carly and asks her how did she make the castles. Carly: I just fill the bucket and tip it over. I want to make twelve. Nebyat runs and kicks one of the castles. Carly asks him to stop and he leaves. She looks at the destroyed castle and tries to fix it by placing the bucket over the sand and pushing it down. The first attempt doesn't work so she tries two more times again with no result. She then starts the process from the beginning.

Carly was really immersed into the task of creating sand castles and had a plan for the process, which she clearly expressed to Sara by explaining that she was intending to make twelve castles. All the steps of creating a sand castle were clear to her and she was able to describe them to Sara in a clear and simple way.

Commitment. It is an indicator of curiosity. It is expressed through persistence in examining and exploring stimuli in order to know more about them, and unwillingness to give up. Case 4 demonstrates how committed problem solvers show interest in a task and their problem solving attempts become focused and repetitive.

Case 4: Maria and Aitana were playing with the sand but moved to a different area of the playground with their shovels. After digging the grass, they found worms. They were really excited and started running around the playground, shouting: Worms, worms! That drew the attention of other children, including Hugh, who joined the digging process. Hugh spent the whole playground time digging, at first to find worms and then to find anything that was buried in the ground, such as rocks. Ike, Peter and Brian were also involved in looking for buried object but they soon became more interested in the act of digging itself and not its results. They brought fire trucks into their play and moved into racing them. Hugh was the only child who was more focused in the use of tools since he was only using a shovel and a bucket and continued digging the next day. At the end of the first day he asked Carly to "save" his bucket for him and he was also looking for a "safe" place to leave it before going home because he was planning to continue his play the next day.

Imagination. Imagination refers to the capacity of pretending or engaging in fantasy-related thought processes. It can take the form of storytelling, playfulness and
humor. In Case 5, an imaginative child used strategies of storytelling and pretend play as problem solving techniques.

Case 5: Ellie is walking around the classroom and she sees a clear plastic vase with some marbles in it. She goes and gets a basket, returns to the vase and empties it in the basket. She holds the basket and skips around the classroom. She finds a small empty box, picks it up, puts the basket on a table and starts putting the marbles in the box, slowly, one at a time. Carly and Nebyat approach her.

Carly: Marbles! Can we play too?
Ellie: These are not marbles, they are rats. We need to put them in their house.
Carly smiles and puts the marbles in the box. One of them falls on the floor.
Ellie: Get that rat! Put that rat back in the house.
Carly: I'll get it, I'll get it.

Ellie was engaged in pretend play by herself. She was able, however, to develop divergent thinking by combining her personal goals with the goals of her friend who wanted to play with her.

Flexibility. Flexibility refers to the capacity to produce a variety of ideas that may cause a shift from one thought pattern or category to another. It allows children to consider their peers’ or adults’ ideas, readily adapt and adjust to new situations, and compromise, when necessary, for solving problems. Flexibility also allows for diverse interpretations of situations, multiple uses of materials and reconsideration of personal understandings. Another type of flexibility, which is based on commitment, is related to allowing oneself to deal with more than one problems, have more than one goals, prioritize them and move from one to the other without confusion. Case 6 shows how flexibility is expressed as tolerance, acceptance of others, sense of group, and peer culture.

Case 6: A group of children are playing at the block area. Hugh starts shouting to Ike, saying "No, stop". The teacher asks what is wrong. Ike and Walden say that
Hugh won't let them play with the structure that they had all built. The teacher says that Ike and Walden can play there too.
Hugh: But this is my computer, they can't put animals on the computer.
Teacher: You are going to have to make a plan.
They all stay quite, staring at each other for a few seconds.
Hugh: I have an idea: this can be my computer (pointing to the upper part of the structure) and this can be for the animals (pointing to the lower part of the structure).
The other children accept Hugh's solution and continue to play.

Hugh was able to point out an interpersonal-technical problem. The problem was: Can you share materials and space when you have different goals and how? Even if he was the one who spotted the problem and in a way it was his problem, he was flexible enough to overcome being upset and try to find a solution.

Reasoning. Reasoning can be related to verbally explaining cause and effect situations. Young children's reasoning during problem solving is demonstrated when individual children's problems are expressed and explained verbally to other children or the teachers.

Case 7: On the playground Amanda is playing in the sandbox, she hears the noise of a bicycle, turns and looks at Carly riding Ellie's bicycle.
Amanda: Hey Carly, come here.
Carly says no and continues riding the bike. Amanda stands up and keeps looking at Carly. Carly makes a circle and returns to the sand box area.
Amanda: Carly you have to come.
Carly: Why?
Amanda: Because my dog won't get up.
Carly: Amanda, it's OK. He made a choice. He is just taking a nap.
Amanda (in an angry and disappointed tone): No, he is not taking a nap. He is dying.
Amanda goes back to the sand box.

Amanda was dealing with a problem which had interpersonal attributes and in order to draw Carly's attention, she had to express her reasoning behind her request. Amanda
explained that she needed Carly to go to her because a serious and important situation was taking place.

*Communication.* Verbally expressing reasoning is a form of communication.

Another form of communication is reminding other children what the classroom rules are. In general, the types of communication that affect problem solving are meaningful, fruitful and healthy conflict, constructive discussion, negotiation of learning and verbal reasoning.

**Case 10:** The children expressed high interest in space play and Walden suggested to the teacher that they could make planets and hang them from the ceiling, the way they did with the snowflakes they created. The teacher asks him to talk about his idea during circle time. The children made plans about the necessary materials and the teachers had them all ready in the art area. Walden decided that he was going to make a dog planet (a planet for dogs) and Maria thought that it would be a good idea to make a cat planet (a planet that looked like a cat). Aitana asked the teacher assistant to show her how to spell M. The teacher assumed that her planet would be Mars but Aitana informed her that her planet was going to be a "mom planet".

The fact that Walden shared his ideas with the rest of the classroom members, motivated other children's explorations and personal interpretations of the initial theme to evolve. New problems were defined and various personal solutions achieved.

Apart from the types of problems and children's thinking qualities during problem solving, the coding system for the observed cases included categories related to the physical, philosophical and social context of problem solving. These categories were described both internally and externally. During the pilot study, characteristics of the classrooms physical environment and specific teachers' behaviors were analyzed and were found to have an important effect on the context of problem solving. Also,
other teachers' behaviors and beliefs derived from the Reggio literature were viewed as factors affecting problem solving. More specific sub-categories were derived from the data through successive analyses based on the initial general categories.

The physical context is related to tools, materials, and space. The philosophical context included categories from the Reggio Emilia pedagogy, such as group work, expressing and investigating personal interests, freedom of using the classroom resources, making choices, communication to make thinking "visible", children responsible for what takes place in the classroom, children as experts, and playful character of activities. Lab School learning is community-based, therefore, the social context of the classroom has an important effect on problem solving. The main characteristics of the social context were producing situationally appropriate / inappropriate behavior, classroom rules, peer culture (rules, routines, common interests), discussion, collaboration, group decision making and communication. The following table shows the different categories, which were used as a coding system for analyzing each observed case.
<table>
<thead>
<tr>
<th>Case # :</th>
<th>Problem</th>
<th>Problem solving strategies</th>
<th>Problem context</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Type of problem</td>
<td>Problem finding</td>
<td>Physical context</td>
</tr>
<tr>
<td></td>
<td>Children's conflicts</td>
<td>Cognitive strategies: Communication, investigation, planning, commitment, flexibility, imagination, reasoning.</td>
<td>- tools, materials, space</td>
</tr>
<tr>
<td></td>
<td>What are the questions raised by the children?</td>
<td>Thinking skills: Enabling skills: observing, comparing/contrasting, grouping/labeling, categorizing/classifying, ordering, patterning, prioritizing. Process skills: inferring, cause/effect, making predictions, analyzing assumptions, identifying points of view, analyzing information.</td>
<td>Philosophical context</td>
</tr>
<tr>
<td></td>
<td>What was the solution to the problem?</td>
<td>Which of these strategies were present / not present? How were they evident? What was their effect on problem solving?</td>
<td>- group work, expressing and investigating personal interests, freedom of using the classroom resources, making choices, communication to make thinking “visible”, children responsible for what takes place in the classroom, children as experts, and playful character of activities.</td>
</tr>
<tr>
<td></td>
<td>Was the solution to the problem successful?</td>
<td></td>
<td>Social context</td>
</tr>
</tbody>
</table>

Table 6: Coding system for initial analysis of observed cases.
To develop complexity through coding the data, a set of questions was generated for detailed description of problems and to relate thinking qualities and classroom context to problem solving. After describing the nature of each problem, questions, such as, what are the questions raised by the children, what was the solution to the problem, and was the solution to the problem successful, were also answered for looking further into the category. Additionally, attempts were made to relate the thinking qualities' category and the context category to the types of problems.

Data interpretation

The general purpose of the initial data analysis was to examine each individual case in detail, study the actions and behaviors, describe the problems, thinking qualities and context, and make connections between them. Each observed case was analyzed from the three perspectives defined by the coding categories, the types of problems, the thinking qualities and the context of problem solving. Data analysis sheets were used for each case. What follows is an example of an analyzed case.
CASE #: 17

<table>
<thead>
<tr>
<th>Problem</th>
<th>Problem solving strategies</th>
<th>Problem context</th>
</tr>
</thead>
</table>
| • Practical  
What prevents the rope from reaching over my head and turning in front of me? (physical properties of rope)  
• Conceptual  
How could the obstacles throughout the jump-rope process be avoided/overcome? (expressive challenge)  
• Practical  
How can I avoid the physical pain that the rope causes when it hits my back? (physical properties of rope)  
• Taking the shirt off was the solution that Maria came up with for solving the problem of avoiding obstacles for the rope but that solution created a new problem: rope causing pain when hitting her back. Putting her shirt back on but tacking it in was a successful solution to the problem of the rope getting caught.  
• Carly’s solution was to slow down the pace of her jump-rope attempts and break the process into steps.  | • Problem finding - It was the girl's own choice to engage in that activity. Both the teacher and the parent were just observers of the process because the child asked them to be. No comments were made by adults concerning the rope or the child's shirt.  
• Investigation - Maria was investigating if her shirt was the rope's obstacle. She hypothesized that it was and took it off to check her hypothesis.  
• Commitment - The process was repetitive and the attempts were lasting a long time and as the father informed the teacher, they had been taking place since the previous day.  
• Flexibility - Maria demonstrated flexibility because when a new problem occur after she took her shirt off, she was willing to undo her original idea and think of another one.  
• Reasoning - Maria verbally expressed why she thought taking her shirt off was not a good idea. Explaining why her first solution to the problem was unsuccessful, was based on thinking about cause and effect, which is a thinking process that requires reasoning.  
• Planning - Was evident in Carly's analysis of the process into smaller steps. As a result, more attention was paid to the process rather than the product, and her attempts were slowed down and became more careful.  | • Situationaly appropriate behavior - The children's behavior was situationaly appropriate because it was taking place in a space which was safe for them and where the process would not interfere with other children's work.  
• Classroom rules - It is a school rule that any time during the classroom activities when the children feel they want to engage in any type of physical activity (running, jumping, chasing, etc.), that they do so in the circle area where there is enough space for their bodies and other children's to be safe. The jumping-rope was taking place in the circle, therefore the process was not disturbed.  
• The Reggio Emilia and the Lab School children are allowed and encouraged to bring objects from home to school. This makes the school experience a continuation of the experiences from the rest of the community and the school problem solving more meaningful to the children. Maria was engaged in the jump-rope process when she was at home and the school philosophy allowed her to continue her problem finding in the school environment as well. |

Table 7: Example of analyzed case.
I looked for patterns of behavior to describe the categories of the problems that children tried to solve and identify general strategies that they used to solve them. Finally, I looked for any consistencies, repetitions or patterns between my observations of children's problem solving and the observations of the nature of the activity, setting and teacher's role. The results were summarized in narrative form. The analysis of the data was organized in three main sections: interpersonal problems, conceptual problems, and practical problems. Each section includes an explanation and comparison of the nature and main characteristics of the problems, a description of the most commonly observed thinking qualities during each type of problem solving, and an analysis of how the context of problem solving, including the classroom environment and teachers' behavior, affected each type of problem solving.

Second level of analysis

On a second level of data analysis, the main thinking qualities and contextual characteristics, derived from the initial analysis, were studied throughout all the cases, in order to make generalizations about their common effects on problem solving. More specifically, the contextual factors related to situated learning and the Reggio Emilia philosophy, educational playfulness and the Reggio philosophy, and the concept of a learning community and the theory of social constructivism, were studied through all the cases and generalizations were made about their effect on problem solving. The overall purpose of the process was to create a more valid and robust understanding of
children's problem solving by linking existing knowledge to the new knowledge created in the case study.

**Coding system**

The coding system for the second level of analysis was mainly developed internally, from within the results of the initial level of analysis. The categories were referring to contextual factors that affect problem solving and are related to situated learning and the Reggio Emilia philosophy, educational playfulness and the Reggio philosophy, and the concept of a learning community and the theory of social constructivism.

Concepts from the theory of situated learning and the Reggio Emilia philosophy that were used for the second coding system are: Activities grounded in the actions of everyday situations; activities grounded in negotiating understanding; activities grounded in children's interests and concerns. It was hypothesized that in contexts where learning is situated, problem solving becomes part of everyday life. Problem solving as an everyday situation is facilitated by allowing children to engage in playful theme explorations. It was also hypothesized that playful problem solving is meaningful to the children, which makes their problem solving attempts focused and committed. The method of emergent curriculum facilitates situated problem solving. Activities at the Lab School grounded in interactions for negotiating understanding lead to problem finding and problem solving. Negotiated problem solving may take
place among children who have developed communication skills that enable them to interact and exchange ideas in an open-minded manner.

The second category was referring to educational playfulness and the Reggio Emilia philosophy and included the following sub-categories: Children being responsible for their own learning (autonomy, spontaneity, control of problem solving); children engaged in constructive play (manipulating objects); sociodramatic play (imagination). Rather than offering direct instruction to young children, attempting to design a classroom context that would stimulate learning and retrieve problem solving skills, leads to the facilitation of play in the classroom environment. Playfulness is facilitated by allowing children to make choices and plan their activities based on their needs and interests. The spontaneity, autonomy and control of planning, which characterizes children's actions when they are engaged in play activities, lead to spontaneous problem finding and spontaneous problem solving. Constructive play involves manipulation of objects, which may also lead to problem finding, investigations, and hypothesis testing for problem solving. Symbolic play is imaginative and based on pretend situations and may lead to planning, reasoning and flexibility, which are thinking qualities related to problem solving.

A third category for the second level of interpretation was referring to the concept of a learning community and socioconstructivist problem solving. The sub categories were: Communication and interactions; observing others; peer tutoring; cooperative learning; peer collaboration; peer / teacher modeling. The category of communication and interaction is a general category that includes: verbally expressing
reasoning, ideas and choices, expressing and enforcing classroom rules and routines, meaningful / fruitful / healthy conflict, and constructive discussions and negotiations. Peer tutoring is a didactic transmission of information from one child to another, ordinarily from an expert to a novice. Cooperative work is accomplished by the division of tasks among participants in an activity and each individual is responsible for a portion of the problem solving. Peer collaboration, in contrast, occurs when novices work together on tasks that neither can do separately. Modeling refers to information or behavior transferred by imitation.

According to the Reggio Emilia philosophy, the child should be valued as sensitive and responsive to others, able to easily learn procedures for interactive learning during which they are eager to ask questions and solve problems with others. They are communicators, and have a natural desire and deserve the right to use many materials in order to discover and communicate what they know, understand, wonder about, question, feel, and imagine. It was hypothesized that verbal communication plays an important role during children's problem finding and problem solving. It involves expressing ideas, choices and reasoning, reminding other children what the classroom rules were, having meaningful conflicts and discussions.

Data interpretation

After each category was defined in detail for the second level of analysis, an attempt was made to synthesize the interpretations from the first level of analysis around the second coding system. The second data interpretation was more holistic.
than the first because it moved the analysis from the study of single cases to the study of groups of cases connected by the different categories. Synthesizing the cases and the categories from the first level of interpretation, allows for generalizable conclusions. What follows is an example from the analysis based on the second level of interpretation:
SITUATED LEARNING AND THE REGGIO EMILIA PHILOSOPHY

<table>
<thead>
<tr>
<th>CONTEXTUAL FACTORS</th>
<th>CASES</th>
<th>EFFECT ON PROBLEM SOLVING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activities grounded in the actions of everyday situations</td>
<td>20, 21, 23, 26, 28</td>
<td>• Play is part of children's everyday lives. Play, especially group play, becomes part of the Lab School classroom life as well. When children attempt to plan play themes, assign roles, join peer's game or manipulate objects, interpersonal as well as practical problems may occur. Children's play at the Lab School is an everyday situation because children are encouraged to freely explore play themes that interest them. Cases 20, 21, 23, 26 and 28 describe everyday, ordinary situations during morning activities at the Lab School, when children are free to make choices and express ideas. During these cases, children chose to plan play themes or participate in peer play. Their spontaneous attempts of finding play partners, led to interpersonal problem solving. Playful theme explorations are spontaneous and voluntary by the children because they are part of their everyday life. In the classroom context, they lead to problem finding and spontaneous, voluntary and self-motivated problem solving attempts.</td>
</tr>
<tr>
<td>Play situations and interaction</td>
<td></td>
<td>• An important aspect of everyday life, according to the Reggio Emilia and the Lab School philosophy is communication and interaction among the members of a community. During children's play, the teachers encourage small group work, communication and interaction to the point when children interact with peers on their own. Activities grounded in everyday interactive situations mainly cause interpersonal problem finding and problem solving</td>
</tr>
</tbody>
</table>

Table 8: Example from second level of analysis
The purpose of the second level of data analysis was to make generalizations about contextual factors at preschool settings and their common effects on problem solving. An attempt was made to create a more valid and robust understanding of children's problem solving by linking existing knowledge to the new knowledge created in the case study. First, the main thinking qualities and contextual characteristics, derived from the initial analysis, were studied throughout all the problem solving cases. The contextual factors related to situated learning and the Reggio Emilia philosophy, educational playfulness and the Reggio philosophy, and the concept of a learning community and the theory of social constructivism, were studied through all the cases and generalizations were made about their effect on problem solving.

Summary

This study was an attempt to get a closer look at the A. Sophie Rogers Laboratory School, which is a preschool that is influenced by the Reggio Emilia, Italy, educational approach. The purpose of the study was to describe the physical and philosophical context of the preschool classroom and examine how it affects children's problem solving. The data was collected through children observations, teacher observations, settings observations, and teacher informal interviews. The collected data was interpreted through two levels of content analysis.

A pilot study was conducted initially for describing in detail the school settings and atmosphere, and more generally describing the children's background and social
attributes. Then I focused on observing children's problem solving during playground and classroom activities, describing in detail the context, the children involved and the strategies used for solving the problem. Continuing the process of my pilot study, the primary study was focused on observing different children's problem solving activities in the classroom. While observing the activities, I wrote down children's conversations with peers and teachers, and took extensive descriptive fieldnotes about their actions. The fieldnotes of the different activities were first analyzed and categorized based on what type of problem were the children trying to solve. From the results of the pilot study and review of related literature, I found out that during their daily activities young children solve practical, interpersonal and conceptual problems. The primary study observations were then furthered categorized based on what strategies were used for finding a solution to the problem. A second level of analysis was focused on synthesizing the coded data around contextual issues related to situated learning, educational playfulness, and learning community and socioconstructivist problem solving.
CHAPTER 6

DATA ANALYSIS AND INTERPRETATION

Continuing the process of my pilot study, I observed children's classroom activities at the A. Sophie Rogers Lab School, at the Ohio State University and recorded children's conversations with peers and teachers. The data collection process involved taking extensive descriptive fieldnotes about children and teacher actions [Appendix B]. The fieldnotes of the different activities were first analyzed and categorized based on what type of problem were the children trying to solve and then they were further categorized based on what strategies were used for finding a solution to the problem. Finally, I looked for relationships between my observations of children's problem solving and the observations of the nature of the activity, setting, and teacher's role. The cases that demonstrated the same type of problem were compared and contrasted in terms of the nature of the problem, the solution strategy, and the context. The analysis of the data is organized in three main sections: interpersonal problems, conceptual problems, and practical problems. Each section includes an explanation and comparison of the nature and main characteristics of the problems, a description of the most commonly observed thinking qualities during each
type of problem solving, and an analysis of how the context of problem solving, including the classroom environment and teachers' behavior, affected problem solving.

Interpersonal problems

At the beginning of the school year, half of the children were new to the preschool classroom and needed time to get used to the school context and learn the school rules and routines. During this period, the children encountered a lot of interpersonal problems. Some of these problems were related to sharing the classroom's tools and materials, planning play themes for group play, lack of communication, or trying to draw peers' attention. To solve these problems, children used strategies such as reasoning, communication, imagination and flexibility. Additionally, my observations demonstrated that interpersonal problem solving is facilitated by the context of purposeful playfulness among children in the Lab School classroom and also by the educational context created by the teachers' actions and interactions with the children.

What are interpersonal problems related to?

The classroom was full of interesting objects, tools and materials that drew children's attention, and encouraged sensory play and experimental manipulation. The children were motivated to use a variety of objects and try different activities throughout the day but when more than one children chose to use the same objects at
the same time, problematic situations would occur. In Case 23 (p.288), for example, Maria, a child that had been a member of the classroom community for a long time, was willing to play and share objects with Sidney, one of the new children. Maria explained to Sidney the rules of her game when Sidney approached the table where Maria was sitting. When, however, Sidney decided to keep one of the cards, Maria's game was disrupted and she was not comfortable with that. Since Sidney was unable to listen to Maria's reasoning, Maria chose to seek teacher's help for solving the problem.

Interpersonal problems of sharing objects were also caused by the fact that children could bring one toy from home to play with at the beginning of the morning activities. The children who chose to do this, usually brought toys that they really liked, either because the toys were new or because the children were emotionally attached to them. Sidney, for example, would bring her favorite black stuffed animal to the classroom almost every day, for comfort, Larry would bring his power-ranger figures to play "rescue-heroes" with his friends, and Carly one day brought to school a musical instrument that she made during the Wexner Center for the Arts' Family Day. Children's toys from home drew their peers' attention because they were new additions to the classroom environment. It was a classroom rule that when children completed their play with their toys from home, they should put them in their cubbies. Otherwise, if other children found a toy in the classroom "with nobody's hands on it", they could play with it if they chose to do so and then the owner would have to make a plan with them about getting the toy back. This rule was not set to provide children with ready-
made solutions for their interpersonal problems but to encourage them to think ahead, make decisions about sharing their toys and plan their actions accordingly. In Case 25 (p.291), Carly seemed frustrated at first, when she saw a group of children playing with her toy but the teacher reminded her of the classroom rules and helped her realize that she had to accept responsibility for her actions and make a plan with the other children.

Interpersonal problems in the classroom can also be related to planning play themes for group play. When groups of children try to make decisions for organizing their play, and assigning roles within the group, their interest differences may cause interpersonal problems. In Case 20 (p.289), Mackenzie and Raen, both new to the classroom, were planning their dramatic play and one of them assigned the roles. Mackenzie wanted herself to be a ballerina girl and her friend to be the boy. Raen did not like that idea and expressed her dislike. Mackenzie was not happy about that and her strategy to make her friend change her mind was to tell her that she would not talk to her anymore. This was a strategy that was against the classroom rules. None of the teachers noticed that incident and the girls' problem was not solved because of their lack of communication.

The early school year's lack of communication among children also caused another type of interpersonal problems, problems related to making collective decisions. Case 22 (p.290) was a situation that involved a child trying to solve a problem by making a decision for the whole group of children and stating what other children should do. The other group members did not feel comfortable with that and
left the group, expressing that they should be able to make their own choices. The Lab School children are always asked by the teachers to express their ideas and opinions about everything that is discussed and are used to having their opinions heard and respected. Case 22 was a situation when a ready-made solution to a practical problem was given to a group of children by a peer and that was not accepted and caused interpersonal problems.

Another type of interpersonal problems was caused when children were trying to draw their peers' attention. In Case 26 (p.292), Sterling was observed changing the set up of objects in a way that was opposite to how Maria was setting them up, which created a problematic situation and a conflict. Sterling's constant observation of Maria, after she refused to join his game, and his repetitive reactions to Maria's actions, showed that he was seeking her attention. Maria expressed her reasoning verbally and viewed their problem as a more generalized problem, one of the whole classroom community. When she moved away from Sterling, he stopped the actions that were causing the problem, which suggests that what he was doing was directly related to Maria's actions.

In general, interpersonal problems are related to developing and maintaining involvement in peer culture. Peer culture is defined by Corsaro (1992) as a stable set of activities, routines, or rituals, attitudes, artifacts, values, and concerns that children produce and share in interaction with peers. Sociocultural approaches to early childhood education (Elgas, Klein, Kantor, and Fernie, 1988) view classrooms as cultures where life is patterned, constructed over time by its members' interaction with
and reaction to each other. Play is a part of the power politics of the groups in which it occurs. Playing rescue-heroes without shirts on, bringing ballet uniforms to school, writing letters to each other, wearing hats and running around the oval area, talking about ear piercing, are some examples of activities, routines and rituals or concerns that groups of children shared at the Lab School and contributed to the development of peer culture. Interpersonal problems that children had to solve were caused by their attempts to modify their behavior around the daily program of the preschool to serve the purpose of developing and maintaining involvement and success in peer culture. For example, both Sophia and Mackenzie enjoyed dress-up activities and, during the observed Case 34 (p.295), they were exploring a wedding and marriage idea and both wanted to wear the wedding dress and play with Ike. Interpersonal problems had to be solved when Ike had to choose one play partner. Interpersonal problems were related to applying cultural knowledge to fit the moment and dynamics of any particular play episode or situation. According to Kantor, Elgas, and Fernie (1993), cultural knowledge includes shared object possession and language.

At the same time that children were exploring the preschool environment, developing the desire to create, participate and maintain a peer culture, and constructing the social identity of peer or friend, they were also running up against boundaries or barriers represented in the reactions and rules of teachers. In Case 35 (p.296), a group of children that shared an interest in action figures, decided to build robot structures at the block area. The children's initial plan was to build individual structures, but other children's structures were taking up a lot of space and some of the
members of the group had already built their structures in the remaining space. The children's attempt to satisfy the needs of all the members of the group and the restrictions set by the small space available and by the classroom rule, according to which other children's structures should not be disturbed if they have a "save" sign, caused problems that required an interpersonal solution. As Corsaro (1988) pointed out, adult ideas, materials, rules, and restrictions can be seen as frames or boundaries within which features of peer culture emerge and are played out. Interpersonal problems at the Lab School were directly related to developing peer play themes, sharing objects and language, and coordinating ideas for producing peer culture, but they were also indirectly related to boundaries or barriers represented in adult reactions and rules.

Thinking strategies during interpersonal problem solving

A strategy that was observed to be successful for children's interpersonal problem solving is expressing reasoning through verbal communication. Approaches that have been developed for viewing the social aspects of play, such as Kantor, Elgas, and Fernie's (1993), emphasize the importance of children's communication strategies for introducing, expanding and solving problems of play themes, coordinating their ideas with others, and producing situationally appropriate verbal and non verbal behavior. In Cases 23 (p.290) and 33 (p.295), when individual children's problems were expressed and explained verbally, other children or teachers were able and willing to help. In a situation when two children were having an argument, one of
them got frustrated and put her fingers in her ears pretending she wasn't listening. This frustrated the other child even more and the problematic situation was getting far from solved. One of the teachers who noticed what was going on, explained to the child who refused to listen to her peer that what she was doing was not a choice in their school and that she should always listen to other children's words. Older children, who had been members of the Lab School community for a longer time, were observed solving their conflicts before they turned into more serious interpersonal problems, through communication. In Case 33, Maria initially had a practical problem to solve, since she was trying to find her paper. Maria's efforts turned an interpersonal problem when Carly refused to allow her to look at the piece of paper that she had in her hands. Maria's ability to communicate her thoughts verbally and Carly's ability to listen to her peer's reasoning, prevented the development of a more serious conflict or a long-term interpersonal problem between the two children.

Apart from expressing thoughts and ideas, another form of communication that affected interpersonal problem solving was reminding other children what the classroom rules were. In Cases 22 (p.290) and 27 (p.292), a child attempted to set up the rules of a group game in a way that allowed her to be in charge of deciding how the materials should be distributed and used among the group members. The rest of the group members expressed their dislike towards the situation and said that they wanted to be able to use the materials the way they wanted to. The interpersonal problem was solved when the group reminded the first girl that she could not tell them what to do and that they could make their own choices.
Imagination, in the form of storytelling, playfulness and humor, was another cognitive strategy for interpersonal problem solving at the Lab School. According to Mitchell and Stueckle (1983), imagination refers to the capacity of pretending or engaging in fantasy-related thought processes. It may take the form of narrative, pure visual imagery, or abstract relations. During interpersonal problem solving by the Lab School children, imagination took the form of visual imagery, narrative, as well as abstract relations. Raen, for example, was one of the new children to the community who used to express mild separation anxiety after her parents would drop her off at school every morning. She would look sad and often say to the teachers that she missed her mommy. Her interpersonal problem, however, was solved and she would more easily participate in the daily activities after spending some time at the writing table. During the first month of becoming a Lab School community member, Raen was often observed creating imagery that had visual qualities and characteristics similar to writing, even if she could not write. When asked what was she doing, she would say that she was writing a letter to her mom. Raen's imaginative strategy helped her feel more comfortable in the classroom community and solve her interpersonal problems.

Narrative or storytelling was another imaginative strategy, which helped children solve interpersonal problems. In Case 31 (p.294), Maria's unwillingness to share a doll with other children, led to the development of an interpersonal problem. Maria allowed her imagination to develop in terms of detaching herself from the tangible world and moving beyond concrete situations. Without being restricted to the
immediate perceived world, she internalized her perceptions of doctors, nurses and illnesses, and brought together and integrated those perceptions and experiences. She created a scenario, which was supported by the context of their pretend play (setting and costumes), narrated and acted it out to achieve her goal of keeping the doll. At the same time, the play situation was continued and the confrontation was avoided.

Humor is another form of imaginative expression that helped solving an interpersonal problem at the Lab School classroom. Case 21 (p.289) is an example of what often takes place during the morning circle time, when children talk about their plans for the rest of the day. Each child who believes he/she was engaged in an interesting activity before circle time or has a plan for an activity after circle-time, is encouraged to share his/her ideas with the rest of the group. Often children express who they would like to play with, rather than who they were playing with. This may cause interpersonal problems. In Case 21, Sophia said that she was going to play with Carly and Amanda but the two girls seemed to have other plans and rejected Sophia's play idea. That created tension between the children but Sophia chose to use humor to solve the problem. The interpersonal problem of tension created between children and the problem of convincing other children to participate in a planned play situation, were solved when Sophia managed to make her peers laugh.

As friendship groups began to form, a quality of thinking that often facilitated interpersonal problem solving, was flexibility. Flexibility refers to the capacity to produce a variety of ideas that may cause a shift from one thought pattern or category to another. In Case 25 (p.291), Carly demonstrated flexible thinking when her attitude
changed from crying and pulling her toy from Sophia's hands to listening to the teacher's reasoning and allowing the other children to play with her toy. Also, in Case 34 (p.295), a group of children encountered an interpersonal problem during a wedding play idea because two girls expressed that they wanted to be Ike's pretend wives. Ike had verbally expressed his conceptual knowledge of the fact that a person can only have one wife and that emphasized the problem. Ike, however, chose to compromise, shift from his initial idea, and express that he was going to marry both girls. Flexibility allows children to consider their peers' or adults' ideas, readily adapt and adjust to new situations, and compromise, when necessary, for solving problems.

Flexibility also allows for diverse interpretations of situations and multiple uses of materials for solving interpersonal problems. In Case 35 (p.296), a group of children decided to use their previously created block constructions for a robot game. In the process of trying to decide which person would play where and with what, the children found out that they had to share space and materials. The interpersonal problem of sharing, which was about to develop, was solved when one of the children suggested that they use the materials from all individual structures to build a larger one for everybody. Instead of focusing on the interpersonal problem, that boy expressed flexible thinking by looking at the play situation from a different perspective, that of a group rather than an individual effort. Flexibility enabled him to achieve the group's goals through a diverse use of the available materials.

Verbal communication was the most commonly observed interpersonal problem solving strategy. The nature of interpersonal problems, that is, the fact that
more than one children are usually involved in a problematic situation related to interpersonal conflicts, requires development of interpersonal strategies and communication fulfills this requirement. Communication was a successful strategy children's interpersonal problem solving because it involved expressing reasoning and reminding other children what the classroom rules were. Imagination, in the form of storytelling, playfulness and humor, was another cognitive strategy for interpersonal problem solving. The imaginative problem solutions were easily accepted by children because they involved fantasy and role play, which are favorable processes by the majority of young children. As friendship groups began to form, another quality of thinking that often facilitated interpersonal problem solving, was flexibility, which was observed as the ability to shift from one thought pattern to another and achieve diverse interpretations of situations and multiple uses of materials. Even if the nature of interpersonal problems and the children's strategies for solving them were directly related to peer relationships, the school context and teachers' behavior were also indirectly affecting interpersonal problem solving.

**School context and teacher's behaviors affecting interpersonal problem solving**

The Lab School classroom environment was offering an educational playful context for the children. Spodek and Saracho (1987) made a distinction between educational and noneducational play. The difference is not in the activity but in the purposes ascribed to the activity: Educational play is designed to further children's learning. It may be used to help children explore and gain information from their...
world as well as process that information to create meaning. It can further physical, social, and cognitive goals and help children better understand and cope with their feelings. Play becomes educational when the teachers modify unstructured play so that it has educational value in term of physical, social, and/or cognitive development. The Lab School teachers were encouraging all children, on a daily basis and usually more than once a day, to plan their play and describe their ideas for the day. Spontaneous play was always acceptable behavior in the classroom but it was the Lab School teachers' philosophy that children's planning and progressive decision making makes their play purposeful and educational, and gives the teachers the opportunity to bring tools and materials in the classroom to facilitate related learning.

The role of the adults in the Lab School classroom, during children's play, was neither that of an instructor nor an entertainer, but rather of a supporter and facilitator, whose presence insured the quality and appropriateness of the experience. According to one of the teachers, one important aspect of their practice was understanding that they trust and respect the children, enough to encourage them to their own experiences and learning. For this reason, they considered it important not to intrude on the children's play with too much conversation or questions. Not only were the children encouraged to make their own choices about their experiences and activities, but they were also considered responsible for trying to solve their own problems and conflicts.

The Lab School environment was empowering children, encouraging autonomous problem solving, and facilitating playfulness and creativity, but it was not too open ended and did not cause confusion or chaos. At the same time when teachers
were encouraging the children to engage in purposeful spontaneous play, they were also acting as models for developing positive problem solving strategies. Through years of teaching experience and children observation, as well as extensive study of the philosophy and practice of the Reggio Emilia schools, the Lab School teachers worked out strategies for assisting children's problem solving. For example, repeating and continuously enforcing related classroom rules, created a positive context for problem solving. The development of skills, such as listening to the ideas of others or being flexible and changing initial plans for covering the needs of others, which were facilitated by the Lab School teachers, are also values that enhance healthy and fruitful social interaction and, therefore, successful interpersonal problem solving.

Case 19 (p.288) provides examples of how the teachers set an example for the children, of allowing everybody to make their own decisions and choices, taking all the ideas seriously, valuing and respecting them. Voting is a very democratic decision making process that was often used at the Lab School, which shows that all the ideas were valued and that everybody's ideas were considered before making a collective decision. Even “silly” ideas that were expressed to make the group laugh, were not simply disregarded. Those ideas were dealt with seriousness and the impossibility of considering them as voting options, was explained by the teachers in clear and simple ways. Following the teachers’ example, the children were observed using the similar strategies in different contexts to solve their interpersonal problems. In Case 21 (p.289), when a group of children were planning their play, one of them tried to make a collective decision without considering the other group members’ ideas. Another
child, however, pointed out that choices couldn’t be made for them, and their initial
conflict did not develop into a more serious interpersonal problem.

Apart from setting an example through their own behavior, the Lab School
teachers were observing what the children were doing, constantly repeating the school
rules and clarifying what was considered acceptable school behavior and what not. In
Case 25 (p.291), for example, an interpersonal problem was developing among
children. The teacher reminded them that, according to their school rules, when
someone wants to use something but someone else has his/her hands on it, then a plan
needs to be made among the children to decide who will be using it, when and for how
long. The teacher also reminded the children that if they don’t want other children to
use something that they brought from home, the object should go in their cubbies.
After this reminder, the children were able to make a plan about when each of them
would use the toy and their problem was solved. Teacher behavior encouraged
children to produce situationally appropriate verbal and non-verbal behavior, which
had direct effect on interpersonal problem solving.

Most of what the Lab School teachers were doing, revolved around and was
influenced by their "image of the child". As one of the teachers explained,

that image includes our belief that the child is communicative in many ways,
and that they have countless theories and questions and ideas and
possibilities to communicate. An enormous part of our responsibility is
learning to 'tune in' to the communication that we know they are capable of
and to support the on-going development of communication skills... The
communication between children is often much more effective than anything
we can share with them. It's not uncommon for children to communicate in
ways that adults don't even understand and never will. We respect their right
to these relationships, which are very powerful with regard to communication
and with regard to all aspects of growth and development, and perhaps especially cognitive development.

Communication is considered by the Reggio Emilia and the Lab School teachers as a strategy for all types of problem solving, but especially interpersonal problem solving. The children were encouraged to verbally express and communicate their thoughts and explain their problems to the teachers, as well as other children. In Case 23 (p.290), for example, Sidney, was a girl whose continuous crying made her unable to attempt to solve the occurring interpersonal problem. The teacher encouraged her to develop a practical strategy to relax and stop crying so that she could communicate her thoughts and ideas. A context of communication at the Lab School was facilitated for assisting children with their problem solving. The Lab School teachers encouraged the children to talk to adults and peers and try to come up with a solution to their problems by themselves but they were, however, closely observing children's interactions and always being ready to guide them and negotiate solutions with them. Their practical strategies for facilitating communication for cognitive development in the classroom were further explained by one of the teachers:

The first strategy is almost always listening and watching so that we can discern what theories and questions the children are pursuing. It is the child's basic right and need to be heard. Another important strategy is asking open-ended, divergent, thought-provoking questions...Another strategy is to act as a scribe and historian for the children's ideas, recording their conversations with notes and reflections.

At the beginning of the year, the Lab School teachers were encouraging the children to try to solve their interpersonal problems by themselves and were facilitating the
children's attempts only when necessary. Rather than just having the role of a care provider and entertainer, the Lab School teachers viewed themselves more as researchers, co-explorers and facilitators of the learning process. Their role at the beginning of the year was observed to be turning disputes into productive discussions, supporting children's efforts, and document the learning process.

Summary

In general, interpersonal problems are related to developing and maintaining involvement in peer culture. They were, more specifically, related to sharing objects, planning play themes for group play, making collective decisions, and trying to draw peers' attention. Communication was a successful strategy children's interpersonal problem solving because it involved expressing reasoning through verbal expression and reminding other children what the classroom rules were. During interpersonal problem solving by the Lab School children, imagination was also a frequently observed thinking quality in the form of producing visual imagery, narrative or storytelling, as well as expressing abstract relations. Humor was another form of imaginative expression that helped solving an interpersonal problem at the Lab School classroom. As friendship groups began to form, a quality of thinking that often facilitated interpersonal problem solving, was flexibility. Flexibility allowed children to consider their peers' or adults' ideas, readily adapt and adjust to new situations, and compromise, when necessary, for solving problems. Flexibility also allowed for
diverse interpretations of situations and multiple uses of materials for solving interpersonal problems.

The Center for Research on Education, Diversity and Excellence (CREDE) has developed five pedagogy standards for effective teaching and learning for all students: (1) teachers and students producing together, (2) developing language and literacy across the curriculum, (3) connecting school to students' lives, (4) teaching complex thinking, and (5) teaching through conversation. According to CREDE (1998), these standards emerge from principles of practice that have proven successful in numerous classrooms in several states. The described indicators for the CREDE's standards related to developing language across the curriculum can also be considered as a summary of the educational practices that the Lab School teachers use to facilitate children's development of communication skills for cognitive growth:

1. Listen to children talk about familiar topics, such as home and community.
2. Respond to students' talk and questions, making on-the-spot changes that directly relate to their comments.
3. Assist language development through modeling, eliciting, probing, restating, clarifying, questioning, and praising, as appropriate in purposeful conversation.
4. Interact with children in ways that respect their speaking style, which may be different from teachers', such as paying attention to wait-time, eye contact, turn-taking, and spotlighting.
5. Connect children language with literacy and connect area knowledge through speaking, listening, reading, and writing activities.
6. Encourage children to use content vocabulary to express their understanding.

7. Provide frequent opportunities for children to interact with each other and with the teacher, even during instructional activities.

The Reggio Emilia educators speak first and foremost about the image they have of the child. According to Gandini (1993), "all children have preparedness, potential, curiosity, and interest in constructing their learning, in engaging in social interaction, and in negotiating with everything the environment brings to them" (p.6). The Lab School teachers seemed deeply aware of children's potentials and constructed their work and the environment of the children's experience to respond appropriately.

Conceptual problems

Later during the year, when children started forming peer culture and getting used to the classroom rules and routines, a lot of the problems shifted from interpersonal disputes to situations related to conceptual and practical problem solving. When peer culture was developed and common interests were discovered, the majority of children were observed being more comfortable at expressing their ideas freely and asking for their friends' support to materialize them. In most observed cases, the problems encountered by the children combined both conceptual (expressive/representational) and practical aspects. The children were encouraged to solve conceptual problems by making plans and setting up goals for activities and at the same time, solve practical problems by choosing the media to achieve their goals and dealing with the physical properties of objects.
According to Forman and Fyfe (1998), the "Hundred Languages" of children, an important Reggio Emilia concept, refer to various means of creative expression that children could use if the classroom culture would allow it. Forman and Fyfe (1998) emphasize that children should be encouraged and guided to move beyond the level of making symbols into a level of inventing different means of expression and communication. It is the nature of the relation among the symbols that converts the medium into a message; and it is the presence of an intended message or the need to present / represent a solution to a problem that motivates children to negotiate shared meanings and to co-construct knowledge. Conceptual problem solving at the Lab School was related to choosing or inventing means of expression to represent and communicate ideas.

**What are conceptual problems related to?**

Conceptual problems occurred either when children were asked by teachers to make a decision or come up with an idea, or when the nature of their own activity required conceptualization in order not to be disrupted. In Case 48 (p.302), for example, the teacher directly asked the children, not only to come up with ideas for the daily activities, but to also make plans about how they were going to try to materialize those ideas. When they are not teacher generated, problems of coming up with ideas and planning how to materialize them can also be rooted in children’s interpersonal and practical challenges. Case 43 (p.300) is an example of how a child that expressed interest in participating in peer play, he had to think of an idea, a role for him self,
which would allow him join Amanda’s game, without disrupting what was already taking place. In Case 45 (p.301), a child’s practical difficulty of keeping the markers he already used separated from the ones he had not used, also required conceptual problem solving. Similarly, during Case 17 (p.287), Maria had to come up with an idea so that her jump-rope attempts would not be disrupted. Conceptual problem solving at the Lab School was sometimes rooted in children’s interpersonal and practical challenges and was related to thinking about or reconsidering the focus, purpose or goals of personal actions.

Conceptual problems were also caused by children’s representational or expressive challenges. Children solved conceptual problems when they were trying to decide how to create or express representations and symbols of concepts, how should their ideas look or sound like. In Case 32 (p.294), for example, Amanda decided to play Blue’s Clues and had to reconsider the resources for materializing her idea. The problem was related to physical properties of objects because of the fact that Amanda needed something blue but the nature, goal and purpose of the problem were conceptual. Her task was to find a way to represent an idea. The Lab School teachers were constantly reminding children to think of their ideas "inside their heads" and make choices for activities. In order to achieve these, children had to face representational and expressive challenges.

Golomb (1992) points out that earlier accounts of children’s art works attributed to children the unsuccessful intention to copy nature. In the past, children, as well as adult artists, were seen as aspiring toward realism in art. Therefore, it was the
task of the investigator to identify the factors that led to the typical false imitations exhibited. Instead, Golomb (1992) continues, we have come to view artistic activity in the child as a process in which lines and forms merely "stand" for objects that differ vastly from the materials with which the artist works. Representation does not aim for one-to-one correspondence between the elements that constitute an object and the depicted image, nor is it meant to produce copies of the original. Representational problems at the Lab School were "translation" problems, since children were attempting to represent the perception or understanding of something using a different language. Those translation problems involved more than one means of expression. In Case 30 (p.293), two children were trying to "read" the writing on an envelope. They were facing a representational challenge because they were trying to translate written language into a verbal message that would make sense to both of them. Case 44 (p.300) also involved a translation problem because the children were trying to perceive / recognize something that was taken from reality (Larry's hand) and was represented in a different language (photography).

At the Lab School, where collaboration among children was valued and facilitated, expressive/representational problems were also caused by children's attempts to clarifying the purpose or goal of a group activity in which they were trying to participate. In Case 36 (p.297), a group of children, who were often observed playing as a group, were standing around the writing table working on different coloring images that one off them, Larry, brought from home. Larry's choices of colors and his comments to Brian, expressed that his goal was to paint the
representations the way they are in nature. Brian’s initial focus was on the physical action of painting. At times, he was painting while looking around him instead of looking at the image, was not taking time to pick colors, and was not paying too much attention on what was represented and how he would want to color it. Larry’s conceptual concern about Brian’s painting was that apples are red, therefore they shouldn’t have been painted blue. Larry verbally expressed his concern to Brian and that idea caused Brian a different conceptual problem. Brian’s problem was not related to the real color of fruits because he knew and had verbally expressed that apples are red. The fact that he stopped his previous drawing process and was looking at his painting, showed that his goal was reconsidered and had changed from engaging in purely motor activity, to engaging in a more conceptual activity. Conceptual problems were rooted in differences between personal goals and ideas among individual members within a group.

Conceptual problems were both teacher and children generated. They occurred when teachers asked children, not only to come up with an idea for their daily activities, but also make plans about how to materialize those ideas. When the problems were not teacher generated, they were rooted in children’s interpersonal, practical and expressive or representational challenges.

Thinking strategies during conceptual problem solving

A lot of the observed conceptual problem solving cases were based on children's problem finding. Getzels and Csikszentmihalyi (1976) believe that the main
elements of problem situations, are the formulations of the problem or problem finding, the adoption of a method of solution, and the reaching of a solution. Problem finding is related to being receptive to ideas and responding to changes in their environment. During Case 29 (p.293), the teachers had not talked about the carpet company representative who was going to work in their classroom. It was Carly’s own decision to follow his activity after noticing his presence in the classroom. Carly had been a member of the Lab School community for a long time and looked for problems and investigation even in situations that were not planned by the teachers for problem solving. Another example of problem finding was related to children’s reaction to the availability of new materials. In Case 30 (p.293), Carly and Larry decided to find out what the writing on an envelope said, on their own, instead of ignoring its existence. They were not asked to do so by the teachers, parents or other children. The Lab School children who tended to respond positively to any changes of the environment, defined their own problems. These cases offer support for the Reggio Emilia philosophy concerning the power of the environment as the third teacher. According to this aspect of the Reggio philosophy, when children come in contact with new materials and situations, they learn to ask question and become self-motivated investigators. Being receptive to new situations, objects, materials etc. leads to problem finding.

Apart from responding to the physical environment, conceptual problem finding was also achieved by being receptive to the social environment and more specifically, to each other’s ideas. In both Cases 41 (p. 299) and 43 (p.300), Sterling
spent some time observing his peers' activities and then attempted to join them. He
was observing peer play ideas and made assumptions about their goal and the
necessary tools and strategies for that task. The problem of how to participate in peer
play was defined by Sterling and at a next level he had to formulate a solution, which
he did. Conceptual problem finding may have interpersonal attributes.

Experimenting with new resources and using each other as sources for ideas,
were also related with investigation, which was another frequently observed thinking
quality during conceptual problem solving. Investigation means pursuing
understanding, looking for answers to questions, trying out some possibilities, and
finding whether or not they work. It was my hypothesis that young children's
investigations are related to experimenting and testing the possibilities of tools and
materials. After observing the Lab School problem solving, evidence was found that
investigation during conceptual problem solving was related to children's:

1. Experimentations with new resources. In Case 17 (p.287), for example, Maria was
practicing with a jump-rope which was a new process for her. After she defined the
problem of being unable to pull the rope over her head, she decided to experiment
with it. She was investigating if her shirt was the rope's obstacle. She hypothesized
that it was and took it off to check her hypothesis.

2. Observation of the environment for:

   (a) Patterning peers' behavior and adopting goals or focus of activity. During Case
43 (p.300), Sterling's problem was how could he participate in Amanda's play. Sterling
observed what Amanda was doing and found out what the theme of her play was. He
then adopted Amanda's "mommy bathing the baby" idea and pretended to be the
daddy bringing hot water. Sterling investigated Amanda's play, studied it through peer
observation and patterned her behavior to find out what her play goals were.

(b) Forming questions and seeking answers. In Case 29 (p.293), Carly was
investigating a situation which was not planned by the teachers for problem solving.
Her investigation was related to problem finding because she formulated questions
after observing a change in the classroom environment. It was also related to problem
solving because an attempt was made to find answers to those questions. Investigation
related to asking questions and seeking answers was also observed during Case 44
(p.300), in the context of constructive discussion among peers.

3. Studies of the visual qualities of representations and drawing conclusions. In Case
30 (p.293), Carly and Larry were studying the writing on an envelope and trying to
find out what it meant. They first noticed that the first letter of the word was
capitalized and assumed it was a name. After further study of the letters, Larry
recognized his own name and Carly's study verified Larry's conclusion. Children's use
of investigative methods in the form of constructive discussion is also evident in Case
44 (p.300). A group of children were investigating studying the properties of the visual
representation of one of their past activities. The cognitive value of children's studies
of visual representations is described by the Reggio Emilia literature on the
importance of documentation. Documented past experiences serve as children's
"memory" (New, 1990). They offer children the opportunity to return to an idea and
enrich their experiences. According to Malaguzzi (1998), the ability to go over a
problem after having taken some distance from it, helps children find new solutions. A working space for this purpose supports the creative process.

Communication, in the form of meaningful, fruitful and healthy conflict, constructive discussion, negotiation of learning and verbal reasoning, was important during conceptual problem solving. In Case 30 (p.293), the children's task was to find out what the writing on an envelope stood for. It would have taken longer time for the individual children to find out what the card was saying, if they were working by themselves. By collaborating on solving the problem, their discoveries and explanations were built upon each other’s, step by step, until a satisfying solution for both children was achieved. According to Katz (1987), in early childhood, knowledge consists of facts, concepts, ideas, vocabulary, and stories. A child acquires knowledge from someone's answers to his questions, explanations, descriptions and accounts of events as well as through observation.

After studying the Reggio Emilia approach, Edwards and Springate (1995) pointed out several aspects of young children's learning which are important to consider when implementing teaching through their various means of expression. They believe that young children are developmentally capable of classroom experiences which call for, and practice, higher level thinking skills, such as analysis, synthesis and evaluation. Analysis refers to the ability of breaking down material into component parts to understand the structure, and to see similarities and differences. Synthesis (Case 44, p.300) is the ability of putting parts together to form a new whole and evaluation is judgment of material based on definite criteria. When children
collaborate and exchange ideas to try to understand concepts, what takes place is an exchange of understandings. Children who have developed communication skills, learn to question their own understandings when they are in conflict with the understandings of other children. In Case 44, for example, a group of children were studying the posted photographs of children's hand gestures depicting the letters of sign language. The children had different opinions about which photograph was representing a specific child's hand. Amanda focused on the visual characteristics of the photographs and recognized which photograph was depicting Larry's hand by identifying the visual characteristics of Larry's hand. Brian focused on the conceptual characteristics of that photograph and the letter it represented, which was not Larry's initial. She managed to convince Brian that her idea was right. This process is called by Ngeow (1998) "transformation of knowledge". This is where children in their groups engage in activities to "reshape" the information each of them has on a topic by organizing, clarifying, elaborating, or synthesizing concepts. Encouraging and motivating children to collaborate and join their efforts and unique skills and abilities, helps them learn from each other and solve problems successfully, in a way that may seem simple but hard to teach. As Damon (1984) points out, when children explore new possibilities jointly, their thinking is not constrained by an expert who "knows better", but rather is limited only by the boundaries of their mutual imaginations.

Communication that leads to reconsideration of personal understanding requires flexibility of thinking. In Case 39 (p.298), a discussion evolved among a small group of children around the questions: Are our big brothers the same? Is there a
difference between two big brothers' age? Ike is one of the children who has been a member of the Lab School community since birth and is used to the classroom context related to communication, exchanging ideas and respecting each other's opinions. During the observed Case 39, he was open-minded and flexible because he listened to the other children's ideas carefully. His initial understanding was: I have an older brother, Maria has an older brother; therefore, our brother's are the same. His conversation with his peers helped him compare ages from a different perspective. He was able to compare the brothers' ages (numbers seven and six), excluding his and his peers' ages from the comparison. The problem solving process was clarified and simplified because of the flexible thinking that can be developed as a communication skill.

Verbally expressed reasoning can also be considered a result of developed communication skills, which affected problem solving. Often, the Lab School teachers asked children to talk about their ideas and choices. The fact that there was always an adult available to listen and pay attention to each child and the fact that children's unique ideas were always valued, motivated children to think about, express, explain and evaluate their ideas. During Case 17 (p.287), when Maria was engaged in a jump-rope activity and took her shirt off to prevent the rope from getting got on it, she later verbally expressed why she thought taking her shirt off was not a good idea. She verbally explained why her first solution to the problem was unsuccessful, based on thinking about cause and effect, which is a thinking process that requires reasoning. In Case 18 (p.287), Carly also expressed her reasoning by trying to explain the source of
her problem and making an assumption about cause and effect. The fact that conceptual problem solving sometimes involved interpersonal conflicts, expressing reasoning was required for overcoming the interpersonal obstacle and focus on the conceptual problem. During Case 33 (p.295), Maria had to explain her reasoning to justify her actions and get permission from Carly to look at the paper that she was holding. Reasoning during conceptual problem solving was related to verbally explaining and evaluating personal ideas and choices.

Conceptual problem finding was mainly related to being receptive to ideas and responding to changes in the environment. Changes in the environment included introduction of new objects, materials and social situations, which were both teacher-generated and children-generated. Conceptual problems were solved through investigation and communication. According to Tudge and Caruso (1988), when children of different developmental levels are encouraged to work together, share perspectives and attempt to arrive at a common perspective, problem solving becomes a valuable part of the curriculum.

School context and teacher's behaviors affecting conceptual problem solving

The lack of well-developed peer culture caused interpersonal problems in the Lab School community at the beginning of the school year. By the middle of the year, peer culture was already evident among small groups of children and interpersonal conflicts were avoided but children's personal differences among the members of groups, caused conceptual problem finding. Case 36 (p.297) demonstrates how...
conceptual problem solving can be rooted in differences of personal focus or goals among the members of a group of children who share a friendship. The problem that the children encountered was: What is the group’s goal in this activity and how can it be materialized? Larry’s conceptual concern about Brian’s painting was that apples are red, therefore they shouldn’t have been painted blue. Larry verbally expressed his concern to Brian and that idea caused Brian a different conceptual problem. Brian’s problem was not related to the real color of fruits because he knew and had expressed that apples are red. The fact that he stopped his previous drawing process and was looking at his painting, shows that his goal was reconsidered and had changed from engaging in purely motor activity, to engaging in a more conceptual activity.

Similarly, in Case 41 (p.299), one child’s decision to join a peer’s dramatic play when they were both previously engaged in dramatic play of different nature, caused conceptual problem solving. Developed peer culture can be the cause of conceptual problems.

Children’s purposeful play is based on themes and these themes offer guidance for solving conceptual problems. Case 31 (p.294) demonstrates how a child solved a conceptual problem, which required interpersonal negotiation, through pretend play. Maria came up with an imaginary scenario, a story, for materializing her idea of individual play with a doll. Fantasy play and imaginative storytelling are not mentioned by the resources on the Reggio Emilia approach as contexts which facilitate conceptual problem solving. The Reggio literature seems to emphasize a more scientific method for conceptual problem solving, such as studying real life resources,
drawing from nature, interviewing experts, etc. At the Lab School, when conceptual problems have an interpersonal aspect, problem solving is often achieved in the context of children's imaginative play. Case 34 (p.295) is another example of a conceptual problem with an interpersonal aspect, which was solved in the context of pretend play. Ike was dealing with a conceptual problem because, like he verbally expressed, he knew that marriage involves only two people. He, however, wanted to play with both girls, so the problem had an interpersonal aspect to it. Ike was searching for an idea that would conceptually make sense to the group and justify the fact that he wanted to “marry” play with both girls and he achieved that through play. When children play, they can create their own rules for their games and can make justifiable conceptual and interpersonal decisions.

The Lab School teachers do not interrupt or interfere in children's play but, as observed in Case 34 (p.295), they try to help the children distinguish between reality and pretend play in situations when pretend play becomes upsetting for specific children. Also, when children's imagination seems to be the reason why their ideas cannot be materialized and conceptual problems solved, the Lab School teachers try to help them find a happy medium between limitless imagination and feasible problem solving. In Case 32 (p.294), the teacher pointed out that Amanda's initial idea would not be possible because of the limitations that Amanda was creating. Children's ideas may become so imaginative that it may be impossible to materialize them. Usually, the Reggio Emilia and Lab School teachers allow children to choose what resources they would like to use to materialize their ideas, when the ideas are carefully planned and
may lead to deeper investigation or project work, even if they know that it wouldn't be
the “best” choice. Children are allowed to try the materials and discover themselves if
they could use something else instead. In Case 32, it was not possible for the teacher
to provide what that individual child needed, so she clearly explained to the child why
that idea would not be materialized and pointed out the need for a different plan,
which would involve a more concrete study of the available resources.

The Lab School teachers provide the appropriate settings and tools for
exploring ideas and solving conceptual problems, after observing the children's
activities and interests. For example, the majority of the children already had or were
about to have younger siblings and demonstrated some interest in "big sister" \ "big
brother" ideas for dramatic play. One of the teachers suggested that they could turn the
dramatic play area into a baby station and asked the children during circle time if they
thought that might be a good idea. The children thought it was a good idea and
suggested that the staffed animals should be moved in the quiet room or with the
puppets. Later, the teacher had been asking individual children which shelf they
thought should be used to store the bottles and blankets and which one they would like
to see turned into a changing table. The teachers also discussed the idea with each
other and decided to add to the baby station panels with photographs of babies and of
children's dramatic play with dolls. The Lab School teachers’ constant observations of
children’s interests and activities, enable them to offer the children new resources
related to their play themes, to facilitate conceptual problem solving.
The way the classroom tools and materials are organized is in itself a source for conceptual problem solving. It encourages the children to have some initial thoughts about what could be used for the realization of their ideas before experimenting with a variety of media. For example, the markers that used to be in the writing area, were moved to the art area by the teachers, after observing that the children were not making conscious choices about what colors to use, using instead the markers that were closer to them. The markers were moved to the art area and a group of children decided to organize them by color in various containers. The children also kept extra empty containers and placed them next to the marker containers, to make the process of carrying markers from the art area to the writing area easy. The same group of children announced during circle time that anybody who chose to move markers from the art area to other areas of the classroom, would be in charge of returning the markers to their original space after he/she finishes. Children may have an idea but not think about its representation in detail, using instead what is more easily available to them. Having to go to a different space and choose materials, helped them take time to think about their ideas further.

Lab School observations offer support for the Reggio Emilia philosophy concerning the environment as a "third teacher". Malaguzzi talked about space this way: "We value space because of its power to organize and promote pleasant relationships between people of different ages, creates beauty, provides changes, and promotes choices and activities" (Gandini, 1991). When children come in contact with new materials and situations, they learn to ask questions and become self-motivated.
investigators. Being receptive to new situations, objects, materials etc. leads to problem finding. Carly (Case 29, p.293), for example, has been a member of the Lab School community for a long time and looks for problems and investigation even in situations that are not planned by the teachers for problem solving. Through conscious use of space, color, natural light, attractive, interesting and appropriate materials and displays of children's work, the Lab School environment serves as another teacher and is inviting to children, teachers, families and visitors.

The Reggio Emilia image of the child includes the idea that the children are responsible individuals and can be in charge of their own learning. In the Lab School classroom the children were also empowered by being considered responsible for what took place in their environment. In Case 19 (p.288), a teacher initially suggested voting for problem solving. Later when the problem was not solved because more than one ideas received the same amount of votes, the children were asked to come up with a different plan. Children were familiar with the process of voting for decision-making. In this case, they took the voting concept a step further by deciding to consider the ideas of the children who were absent. Allowing children to assume responsibilities for situations that were concrete and that they could relate to, motivated them to expand their thinking and follow different paths for solving problems.

When asked what the lab School philosophy is concerning the educational role of young children attempts to plan their activities, one of the teachers responded:

167
The main benefit from asking the children to plan their activities is that it respects the child's thinking and abilities to bring focus and intent to their work, their play. "Plan" is a common word we use in guidance and discipline, in supporting children's ideas, in support of classroom community - in really lots of levels of interactions.

The fact that the teachers emphasized the need for making plans for activities did not limit children's spontaneity. According to a teacher:

By encouraging the children to describe their "plan" or by asking thought-provoking questions about their work, expansion and/or deepening of their thinking is most often the result. If we say to the child "What's your plan for using that..." and they decide to then not use it, we could usually conclude that they didn't really have any meaningful work/play idea in mind and couldn't (intentionally or spontaneously) think of why they should be using whatever it was. Their time would be better spent - their mind would be better used - engaged in some meaningful activity. Meaningful activity can, and often is, spontaneous... By entrusting the children to have plans for their play, it brings depth and more long-term purpose to their play, their work, their relationships, their thinking.

In Case 48 (p.301), the teachers asked children to say what their plans for the day were. When Carly asked if she could paint, she was additionally asked to think about what she was going to be painting and what colors she would use, for making the easel set-up easier for the teacher. Not only was the teacher going to set-up everything that the children asked for, but she was also going to bring additional resources that she thought the children might find useful. She also reminded the children that if they needed any other colors, tools or materials during their play, they could ask. The Lab School teachers were encouraging children to ask for new tools and materials any time they decide to do so even if they were not mentioned in their initial plans. Planning made the play process focused, organized and purposeful.
Summary

Conceptual problem solving at the Lab School was, generally, related to choosing or inventing means of expression to represent and communicate ideas. They were mainly caused within the developed peer groups and by the personal differences among the members of the groups. Conceptual problems occurred either when children were asked by teachers to make a decision or come up with an idea, or when the nature of their own activity required conceptualization in order not to be disrupted. Conceptual problems were also caused by children’s representational or expressive challenges. Children solved conceptual problems when they were trying to decide how to create or express representations and symbols of concepts, that is, how should their ideas look or sound like. In those cases, the problems were "translation" problems, since children were attempting to represent the perception or understanding of something using a different language.

A lot of the observed conceptual problem solving cases were based on children's problem finding by responding to the physical environment and being receptive to the social environment and to each other's ideas. Investigation was a frequently observed thinking quality during conceptual problem solving and it was related to experimenting with new resources, observing the environment, and studying the visual qualities of representations and drawing conclusions. Communication, in the form of meaningful, fruitful and healthy conflict, constructive discussion, negotiation of learning and verbal reasoning, was also important during conceptual problem solving.
Play themes offered guidance for solving conceptual problems in an environment where the teachers do not interfere in children's play but try to help them find a happy medium between limitless imagination and feasible problem solving. The way the classroom tools and materials are organized is in itself a source for conceptual problem solving. It encourages the children to have some initial thoughts about what could be used for the realization of their ideas before experimenting with a variety of media. The Lab School teachers' image of the children as responsible individuals who can be in charge of their own learning, leads to empowering the children by considering them responsible for what takes place in their environment. Teachers' constant observations of classroom activities enable them to offer children organized resources to facilitate, not only conceptual problem solving, but practical as well.

**Practical or technical problems**

The multidimensionality and complexity of problem solving in the preschool classroom was particularly evident during the observations of conceptual problem solving. When the children were observed trying to discover an idea or express and represent a thought, most of the times, they were also observed trying to deal with the physical properties of objects related to the initial concepts. Conceptual or expressive problems, that is, problems of materializing ideas, were related to choosing appropriate objects and media. Subsequently, conceptual problem solving led to manipulating objects and media for materializing an idea, and that often caused practical or technical problems.
What are practical/technical problems related to?

Practical or technical problems are related to materials and their physical properties. Kantor and Whaley (1998) described how a group of young children faced practical problems due to their decision to use concrete and cement as their building materials. Not only they had to think where they could find these materials, but also discover how to use them. At the end, they became more realistic and decided to create their art works using the recycled materials at their disposal. Similarly, during the observed Case 35 (p.296), a child wanted to build a structure using the big wooden blocks at the block area. The fact that there were a lot of "saved" structures at the block area which were utilizing the whole space and the fact that the specific blocks that the child chose to work with were large and required a lot of space to be handled, caused practical problems. The physical characteristics of the blocks in relation to the available space, were the sources of the problem. It is important to mention, however, that the source of this specific practical problem had social / interpersonal attributes, as well. The child who wanted to build a new wooden structure encountered a practical problem because he showed respect towards peers' creations and did not choose to destroy them to create space for his own structure. In the Lab School environment, where each child's work was valued and respected, children's practical problem solving was multidimensional because it involved interpersonal aspects.

Golomb's (1997) research on children's clay construction provided evidence to support that the "primitive" representations of young children do not result from
cognitive immaturity or distorted conception of reality, but rather are related to the problems inherent in the nature of the medium and the lack of experience and practice that modeling technique requires in order to be mastered. The analyzed cases from this study also support that practical problems were rooted in children's initial difficulty in using the materials due to undeveloped sensorimotor skills or unfamiliarity with new objects and situations, rather than being rooted in children's cognitive immaturity. A child, for example, who was trying to keep a plastic folder open and paint in one of its pages at the same time (Case 50, p.303), did not have the physical skills to achieve both tasks and had to develop a strategy for achieving her goal. After she came up with the idea of using another type of weight, instead of her arm, to hold the page open, she had to choose the appropriate object for that purpose. Practical problems can be as simple as choosing materials, deciding how to spread paint on a printing tool, how to cut paper, how to clean up a paint spill or how to make a stable base for a paper structure.

Practical problems are inherent in the nature of the medium and the lack of experience and practice that a skill or technique requires in order to be mastered. In Case 24 (p.290), for example, Maria had a clear idea of what she wanted to achieve but her attempts had no practical success. She wanted to make bubbles by using a straw to blow air through flubber (a form of play-dough). She repeated the same process a few times without changing anything. She was unable to achieve her goal because she was not holding the flubber closely around the bottom of the straw and therefore allowed the blown air to come out from the sides of the straw instead of
pushing the flubber to create bubbles. She was repeating this process, not because she was physically unable to try a more successful way, but because she did not have extensive previous experience with flubber. Later, when she kept practicing the technique, she managed to achieve her goal.

Case 40 (p.299) also demonstrates how practical problems can be related to the nature of the media and young children's lack of extensive experience in using them. At the beginning of the school year Carly demonstrated increasing interest in writing. In her writing, all the words were represented phonetically correct. During her first attempts to write sentences, each word was not separated from the previous and following word. During Case 40, she asked for the teacher's help in writing a letter. After she wrote the word "dear", the teacher told her to leave some space and write an M. This was a new task for Carly and she had to solve the practical problem of how to decide how much space to leave between the words. After an unsuccessful attempt, Carly was able to develop a practical strategy for solving her problem. Practical problems can be caused by the lack of practice that is required for mastering specific skills and techniques but commitment to problem solving leads to both practicing and mastering those skills and techniques.

Other practical problems were related to children’s inability to organize the materials due to unfamiliarity with using them, which made their working process difficult (Case 45, p.301). Jacob was a new, young child in the classroom community, whose motor skills in holding writing tools were not yet developed and who was rarely engaged in any writing activity in the classroom. During Case 45, he...
demonstrated unfamiliarity with the classroom routines in choosing and using markers for drawing. Usually, the children would first find a container, go to the art area and put the markers that they were thinking of using in their container and then carry the container to the writing area, if that was where they wanted to work. Jacob was observed looking confused during the whole process of carrying the markers and finding paper. He seemed like trying to do everything at once, without having a clear plan of a step-by-step process for gathering his tools and materials. Since he did not use a container to carry the markers to the writing table, they were rolling on the table away from him and falling on the floor. His actions demonstrated that he had a clear idea of what he wanted to do; he wanted to use every color once but his inability to organize the markers imposed a practical problem on him. During his drawing process, his task became to find a practical way to keep the already used markers separated from those not used yet.

Technical problems, related to children’s practical difficulty in materializing an idea, were also caused by limitations derived from unavailability of enough resources for all children who wanted to participate in the same activity. In Case 47 (p.302), two children's idea of having the same task as their peer, defined a practical problem. Maria and Carly were both working with a teacher on creating a classroom calendar for the new month. Both children were comfortable in taking turns, did not seem impatient, and were enjoying sharing the same task. After both taking the same number of turns, there was only one more number on the calendar that needed to be written and since the children were two, they had to change their normal way of
working. The problem in Case 47 was not derived from children's unwillingness to share and did not become interpersonal. In Case 22 (p.290), on the other hand, the practical problem was also related to unavailability of enough resources, but the problem became interpersonal because the children were not working as a group and did not consider each other's perspectives before their decision-making. Practical problems caused by unavailability of materials led to interpersonal problem solving related to sharing.

During specific cases of practical problem solving, what the children intended to achieve, their conceptual and expressive goal, was clear and in most cases was verbally expressed. Sometimes, what the children ended up creating did not look, sound, or feel like their original idea and they tried to change the physical characteristics of their work to match the initial concept. In Case 46 (p.301), Larry drew a rectangular form with two legs, colored it, and started cutting it around the outline. After cutting the outline of the first leg he stopped at the second and verbally expressed that it was too long. The second leg was completely detached from the shape, a small part of it was cut and then the rest of it was attached to the shape, where it originally was. It is not possible to know if Larry’s original idea was to make two legs of that specific size or just two legs of the same size? His later idea, however, which was expressed verbally, was to have the second leg looking like the first one. Larry’s practical or technical problem solving was related to the task of changing the visual characteristics of his work. In this case the complexity and multidimensionality of problem solving is evident. Even if practical problems are inherent in technical
aspects of media, they can also be related to the conceptual aspects of an activity. When the children have an idea, stay focused on it, and try to change the physical characteristics of their work to match that initial concept, they also have to deal with practical problem solving.

In general, practical problems were related to materials and their physical properties. The physical properties of tools and materials caused problems when the children were unfamiliar with how to use them. More specifically, practical problems occurred with children's initial difficulty in using materials due to undeveloped sensorimotor skills, lack of experience and practice, and inability to organize them. Some practical problems had interpersonal attributes when they were derived from the unavailability of enough resources for all children. Other practical problems, however, had conceptual attributes when they were derived from children's attempts to change the physical characteristics of their work to match an initial concept / idea.

Thinking strategies during practical/technical problem solving

As Beetlestone (1998) points out, the idea that young children cannot concentrate and that they have "butterfly minds" is a myth. Torrance (1969) viewed commitment as an indicator of curiosity. It is expressed through persistence in examining and exploring stimuli in order to know more about them, and unwillingness to give up. When the problem is defined by the children themselves and is related to objects of personal interest, such as toys from home, the children stay committed to solving the problem for relatively long periods of time. In Case 17 (p.287), for
example, it was the children's own choice to engage in the jump-rope activity. Both the teacher and the parent were just observers of the process because one of the girls asked them to be. No comments were made by adults concerning the rope or the child's shirt. The children were investigating processes and exploring the physical properties of objects because of personal interest and stayed committed to their investigations. Their attempts were repetitive and as the father informed the teacher, those attempts had been taking place at home since the previous day.

Investigation during practical problem solving was expressed as testing a hypothesis, observing others to pattern their behavior, and experimenting with new resources and methods. In Case 17 (p.287), for example, Maria was investigating if her shirt was the rope's obstacle during her jump-rope problem solving. She hypothesized that it was, and took her shirt off to check her hypothesis. In Case 24 (p.290), Maria was carefully observing what Larry was doing when he was demonstrating the process of making flubbles and she found out what the steps of the process were. She later used them repeatedly until she was able to achieve her goal.  During Case 40 (p.299), Carly thought of a new method for achieving a wanted result. The new method was incorporated in her working process and tested until the results were evaluated and approved.

Flexibility was, surprisingly, observed in cases when the problem solving process became more complex, multidimensional and deeper. This type of flexibility, which was also based on commitment, was related to allowing oneself to deal with more than one problems, have more than one goals, prioritize them and move from
one to the other without confusion. In Case 17 (p.287), Maria's practical goal was to play jump-rope and achieve pulling the rope over her head without having it caught on her shirt. After she hypothesized and investigated that if she took her shirt off the problem would be solved, another practical goal became to avoid hurting her back. Flexible thinking allowed her to prioritize her goals, undo her original idea and think of another one to achieve both goals.

Flexibility also allowed for interpersonal solutions to practical problems. During Case 35 (p.296), the block area was filled with children's "saved" structures and the practical problem that other children were facing was that there was not enough space for their structures. An interpersonal / conceptual solution was given to the problem by deciding to collaborate and share space and materials for a new play idea. Even if each child initially had an individual construction idea (vehicle / robot / spaceship), they were willing to compromise and focus on similarities (action play), rather than detail differences of their individual goals. Flexibility was expressed as tolerance, acceptance of others, sense of group, and peer culture. In Case 47 (p.302), children playing together on a daily basis were observed saying and doing what the other was, engaging in the same activities, sharing objects, hence, developing peer culture. Attempts of developing peer culture was the source of interpersonal problems at the beginning of the year but developed peer culture was later the source of finding solutions to conceptual and practical problems. Children within friendship groups expressed compassion and support towards other members of their group and became open minded, flexible and inventive for successful problem solving.
Reasoning during practical problem solving was related to verbally explaining cause and effect situations. In Case 17 (p.287), Maria verbally expressed why she thought taking her shirt off during her jump-rope play was not a good idea. Explaining why her first solution to the problem of overcoming the obstacles of the rope was unsuccessful, was based on thinking about cause and effect, which is a thinking process that requires reasoning. Thinking about cause and effect helped her rethink her problem solving process and consider a better solution to the problem.

Recalling past experiences is a thinking strategy that is related to both problem finding and problem solving. Children who had been members of the classroom community for more than a year and had been familiar with the rules and routines, were observed being more confident in using the different resources and more independent in dealing with difficulties. In Case 18 (p.287), for example, Carly’s problem finding and problem solving were based on past experiences with using the same materials in the art area of the classroom. Usually, when the teachers set up the easel, they put one brush in each paint container or they let each child pick one brush and fill a separate container with water so that the children can wash their brush before using another color. Carly chose to use only one brush and also decided not to mix the colors. By recalling previous experiences for how to achieve painting without mixing the colors, she concluded that she needed water in the empty container that was already there.

Recalling past experiences helped children plan their attempts for practical problem solving. Early plans tended to be made close in time to the actions they were
guiding, to incorporate only one or few actions and to be aimed directly at meeting the goal (Cases 17, 45, 46). Later during the school year, children began to form plans that were further removed in time from the actions they guided, that included more diverse actions, and that incorporated hierarchically organized subgoals (Case 48, 51). During Case 35 (p.295), a group of friends were playing by the block area and one child's practical problem was dealt as a group problem. Other group members suggested possible solutions to the problem and finally, a plan was made which combined all children's ideas and included everyone in the play. Each child's role was defined and a group idea evolved which offered a solution to the initial problem. When children's collaborative planning efforts included sharing task responsibilities, their problem solving was quick and successful.

The main thinking strategies observed during practical problem solving were commitment, investigation, flexibility, reasoning, and recalling past experiences. Commitment was expressed through persistence in examining and exploring stimuli and unwillingness to give up, with repetitive attempts to solve a problem. Investigation was observed in the form of testing a hypothesis, observing others to pattern their behavior, and experimenting with new materials and resources. Flexibility allowed children to deal with more than one problems, have more than one goals, prioritize them and move from one to the other without confusion. Flexible thinking also allowed for interpersonal solutions to practical problems. Reasoning was related to verbally explaining cause and effect situations. Finally, recalling past experiences helped children remember the classroom rules and routines and appear
confident and independent in using the classroom resources. At the same time, being familiar with classroom rules and routines, contributed to children's planning attempts.

School context and teacher's behaviors affecting practical/technical problem solving

According to the Lab School teachers, problem solving related to the physical properties of objects and materials is very important and useful for children's lives because the solutions to practical problems are the ones that would make children's ideas feasible. The teachers encouraged children to solve practical problems by making a variety of tools and materials available for materializing their ideas. The children at the Lab School and the Reggio Emilia schools are allowed to use the materials in any way they want to as long as they are safe. In Case 18 (p.287), the teachers did not state the problem. Children's freedom of using the classroom resources led to problem finding. The Lab School children were encouraged to plan their own activities and make choices among a variety of available resources, which motivated them to think about and investigate the physical properties of media, and solve practical problems.

The freedom that the children had at the Lab School to choose and plan their activities on their own and the way more power is shifted from teachers to children, were not chaos-causing situations. The Lab School teachers' respect of children's ability to choose what was useful and interesting for their lives, affected what was considered situationally appropriate behavior at the Lab School. Playing jump-rope (Case 17, p.287), for example, is not a common classroom activity in most preschool
environments. At the Lab School classroom, however, children's freedom of choices was respected as long as all children were safe and followed the classroom rules. In Case 17, even if jump-rope was a physical activity, it was considered situationally appropriate by the teachers because it was taking place in a space of the classroom which was safe for the children and was not interfering with other children's work. Allowing children to involve in physical activities satisfies their need to release energy and physically manipulate objects. Exploring the physical properties of objects from home led to problem finding and problem solving.

Apart from using objects from home, children's free use of the classroom resources also facilitated problem solving. During Case 18 (p.287), for example, a child who was painting at the easel was facing a practical problem of how to avoid mixing the colors, using only one brush. It was not a classroom rule that the paints shouldn’t get mixed. The children at the Lab School and the Reggio Emilia schools are allowed to use the materials in any way they want to, as long as they are safe. In Case 18, the teachers did not state the problem. Children’s freedom of using the classroom resources led to problem finding. In the same case, after the child stated her problem of not having water by the easel, the teachers did not hesitate to express that they were responsible for that. The Lab School teachers take responsibility for situations that happen or do not happen in the classroom and create problems. Instead of dealing with problems as mistakes, the teachers consider them and refer to them as normal everyday situations.
Sylva, Bruner, and Genova (1976) examined the contribution of play to children's subsequent approaches to a practical problem. The results showed that children in play groups required fewer hints to solve problems than those in group that observed the principle. The play groups approached the task in a different and more successful way than other children. Play groups at the Lab School were created early during the school year based on children's common interests. On a daily basis, specific children were observed playing together, sharing similar or compatible ideas. Children who had developed peer culture through their daily play seemed more excited when they thought of an idea for solving a problem, than children who were trying to solve problems individually (Case 47, p.302). Case 35 (p.296) is another example of how practical problem solving is easily solved within a play group. This group of children shared the same interest in action play (outer space, superheroes) and played together as a group every day. The fact that they had already developed routines and discovered their common interests, helped them deal with the limitations of the environment as a group. They were eager to try the solution to their problem, continuous in their efforts to solve it, and flexible in their solving attempts.

According to one of the teachers, both spontaneous and educational play are valued at the Lab School and the teachers would not think of them as separate thing. The context they try to create to support this approach is emergent curriculum. As the teacher explained:

We spend much of our time observing and documenting the children's work / play. What we are looking for most is their questions. What is it that they are trying to construct knowledge about? Then we offer access, freedom and
time to work on those questions - access to people and things that supports this process, freedom to choose whatever best supports their thinking, and as much time as it takes... Play is fragile. The adults are available to add support if play is deteriorating, but also will stay uninvolved if the play is productive and meaningful on its own.

The Lab School learning context is supported by the Reggio Emilia epistemology, which holds that knowledge is gradually constructed by individuals becoming each other's students, by taking a reflective stance toward each other's constructs, and by honoring the power of each other's initial perspective for negotiating a better understanding of subject matter. This theory of knowledge leads to practices described by Gardner (1999) as education that is based on helping the children study their ways of making meaning and their negotiations with each other in a context of symbolization and communication. In the context of emergent curriculum at the Lab School, young children were allowed to make choices and receive feedback from others to construct knowledge.

When a practical problem was teacher generated, the way it was stated and the way the process was guided, affected the problem's nature and focus. In Case 19 (p.288), for example, the teachers reminded the children that a decision needed to be made about where to hang their two new framed Chinese prints. The children started brainstorming to the point when their ideas became too imaginative and would not serve as solutions to the practical problem. The teachers tried to focus children's attention on their senses and to stimulate their perception of the physical properties of the objects related to the problem. The concrete nature of the problem related to the physical world was emphasized by carrying the pictures and holding them where each
child suggested they should be. The Lab School teachers consciously tried to facilitate children's commitment and focus their attention on problem solving process when the problem was teacher generated.

The image of the child, derived from the Reggio Emilia philosophy, affected, not only interpersonal and conceptual problem solving, but practical problem solving as well. Children were considered knowledgeable individuals when they come to school and their already formed skills and abilities were valued. According to the Lab School teachers, the children know a lot more than most educators give them credit for and than what they let us believe they know. The Lab School teachers empowered the children by considering them experts in some fields and they often encouraged them to demonstrate their abilities by guiding peers. In Case 24 (p.290), a child asked for teachers help for achieving a practical task. Instead of just giving the child instructions for how to achieve what she was after, the teacher simply stated that another child had extensive knowledge on the specific activity and that he might be willing to help. The Lab School teachers did not pretend that they knew everything about children's interests, concerns and practical skills and they motivate peer guidance and support during children's problem solving.

When children asked for teachers' help during practical problem solving and peer guidance was not available, the teachers responded to the child's initial request for help and offered basic guidelines, without creating any limitations for the problem solving process. In Case 40 (p.299), a child asked for help in writing a letter. She had already written the word "dear", so the teacher told her to leave some space and write
the first letter of the second word. The teacher did not demonstrate how exactly should
the process be done. The guidelines were left open, not too specific but not too
abstract either and that allowed the child to have more questions and seek answers by
herself.

Summary

In general, interpersonal problems that children had to solve were caused by
their attempts to modify their behavior around the daily program of the preschool to
serve the purpose of developing and maintaining involvement and success in peer
culture. More specifically, interpersonal problems were related to applying cultural
knowledge to fit the moment and dynamics of any particular play episode or situation.
Cultural knowledge includes shared object possession and language. Interpersonal
problems at the Lab School were directly related to developing peer play themes,
sharing objects and language, and coordinating ideas for producing peer culture, but
they were also indirectly related to boundaries or barriers represented in adult
reactions and rules. Communication was a successful strategy children's interpersonal
problem solving because it involved expressing reasoning through verbal expression
and reminding other children what the classroom rules were. During interpersonal
problem solving by the Lab School children, imagination was also a frequently
observed thinking quality in the form of producing visual imagery, narrative or
storytelling, as well as expressing abstract relations. Humor was another form of
imaginative expression that helped solving an interpersonal problem at the Lab School

186
classroom. As friendship groups began to form, a quality of thinking that often facilitated interpersonal problem solving, was flexibility. Flexibility allowed children to consider their peers’ or adults' ideas, readily adapt and adjust to new situations, and compromise, when necessary, for solving problems. Flexibility also allowed for diverse interpretations of situations and multiple uses of materials for solving interpersonal problems.

Conceptual problem solving at the Lab School was, generally, related to choosing or inventing means of expression to represent and communicate ideas. They were mainly caused within the developed peer groups and by the personal differences among the members of the groups. Conceptual problems occurred either when children were asked by teachers to make a decision or come up with an idea, or when the nature of their own activity required conceptualization in order not to be disrupted. Conceptual problems were also caused by children’s representational or expressive challenges. Children solved conceptual problems when they were trying to decide how to create or express representations and symbols of concepts, that is, how should their ideas look or sound like. A lot of the observed conceptual problem solving cases were based on children's problem finding by responding to the physical environment and being receptive to the social environment and to each other’s ideas. Investigation was a frequently observed thinking quality during conceptual problem solving and it was related to experimenting with new resources, observing the environment, and studying the visual qualities of representations and drawing conclusions. Communication, in the form of meaningful, fruitful and healthy conflict, constructive discussion, negotiation
of learning and verbal reasoning, was also important during conceptual problem solving. Play themes offered guidance for solving conceptual problems in an environment where the teachers do not interfere in children's play but try to help them find a happy medium between limitless imagination and feasible problem solving. The way the classroom tools and materials are organized is in itself a source for conceptual problem solving. Teachers' constant observations of classroom activities enable them to offer children organized resources to facilitate, not only conceptual problem solving, but practical as well.

Practical problems were related to materials and their physical properties. More specifically, practical problems occurred with children's initial difficulty in using materials due to undeveloped sensorimotor skills, lack of experience and practice, and inability to organize them. Some practical problems had interpersonal attributes when they were derived from the unavailability of enough resources for all children. Other practical problems, however, had conceptual attributes when they were derived from children's attempts to change the physical characteristics of their work to match an initial concept / idea. Teachers' most commonly observed behavior during children's practical problem solving included providing tools and materials as well as guidance in tool-use and techniques, reminding children about classroom rules, emphasizing planning, and encouraging children to communicate and solve their own disputes. The teachers made clear that any problem that children faced was important and that they were willing to invest as much time as necessary to help the children solve their problems. The context of free play and use of objects from home and of the
classroom resources facilitated practical problem finding and problem solving. Children who had developed peer culture through their daily play at the Lab School, seemed more excited when they thought of an idea for solving a problem, than children who were trying to solve problems individually. When a problem was teacher generated, the Lab School teachers consciously tried to facilitate children's commitment and focus their attention on the problem solving process. The teachers' image of the child, derived from the Reggio Emilia philosophy, affected, not only interpersonal and conceptual problem solving, but practical problem solving as well.
CHAPTER 7

FINDINGS AND CONCLUSIONS

After observing children's classroom activities at the A. Sophie Rogers Lab School and recording children's conversations with peers and teachers, fieldnotes of the different activities were first analyzed and categorized based on what type of problem were the children trying to solve. Then they were further categorized based on what strategies were used for finding a solution to the problem. Finally, I looked for relationships between my observations of children's problem solving and the observations of the nature of the activity, setting, and teacher's role. The initial analysis of the data was organized in three main sections: interpersonal problems, conceptual problems, and practical problems. Each section included an explanation and comparison of the nature and main characteristics of the problems, a description of the most commonly observed thinking qualities during each type of problem solving, and an analysis of how the context of problem solving, including the classroom environment and teachers' behavior, affected problem solving. A second level of interpretation led to more generalized conclusions about socioconstructivist
approaches to young children's learning and problem solving in a context that promotes playfulness, interaction, communication and independent learning.

The findings of the study revealed an interaction of contextual elements with cognitive abilities and personality traits. The Reggio Schools and the Lab School are educational environments which offer situationally relevant experiences for the specific children and becomes part of their everyday lives. In such settings, it is hard to define when an observed behavior is based on contextual factors or dispositions and cognitive abilities. Playfulness, for example, can be rooted in children's personality traits but its use or expression can also be facilitated by the school atmosphere and physical settings. The conclusions of this study, however, were an attempt to identify how the teachers' actions and beliefs, and the school settings and atmosphere facilitate the development of specific dispositions and cognitive abilities for the children and what effect does that have on problem solving. In this chapter, problem solving is discussed in relation to: Situated learning and the Reggio Emilia philosophy, educational playfulness and the Reggio Emilia philosophy, and learning community and socioconstructivist learning.

Situated learning and the Reggio Emilia philosophy

As Brown, Collins and Duguid (1989) point out, many teaching practices have inevitably limited effectiveness because they implicitly assume that conceptual knowledge can be abstracted from the situations in which it is learned. The activity and context in which learning takes place are often regarded as merely supplementary
to learning - pedagogically useful, but fundamentally distinct and even neutral with respect to what is learned. Investigators of learning, such as Lave (1997), however, challenge this separation of what is learned from how it is learned and used. Drawing from recent research on cognition as it is manifested in everyday activity, Brown, Collins and Duguid (1989) argue that knowledge is situated, being in part a product of the activity, context, and culture in which it is developed and used. They suggest that, by ignoring the situated nature of cognition, education defeats its own goal of providing useable, robust knowledge. They also argue that approaches that embed learning in activity and make deliberate use of the social and physical context, are more in line with the understanding of learning and cognition that is emerging from research.

One of the hypotheses of this study was that the Lab School educational philosophy and practice, influenced by the Reggio Emilia approach, promote situated learning. The Lab School teachers share the idea that children are strong, emotionally rich, and capable. Children are valued as children, active and participatory, as apprentices, rather than targets for learning. It is believed that they all have preparedness, potential, curiosity, and interest in constructing their learning, negotiating with everything their environment brings them. The child is especially valued as sensitive and responsive to others. Children easily learn procedures for interactive learning in which they are eager to ask questions and solve problems with others. They are communicators. They have a natural desire and they are given the right to use many materials in order to discover and communicate what they know,
understand, wonder about, question, feel, imagine, and negotiate. Rinaldi (2001) points out that one of the fundamental points of the Reggio philosophy is an image of the child who experiences the world, feels a part of the world right from birth, is full of desire and ability to communicate from the start of his/her life, and is fully able to create maps of his/her personal, social, cognitive, affective, and symbolic orientation. The Reggio and Lab School image of the child situates learning. Thought and action are facilitated according to the specific children, are negotiated among the classroom community members and are placed in a specific place and time.

The analyzed observations of the Lab School activities, which are based on the Reggio philosophy, provide specific examples for the premises of situated learning. The four premises of situated learning, reviewed by Anderson, Reder, and Simon (1996), differentiate situated learning from other experiential forms of acquiring knowledge and guide the development of classroom activities: 1. Learning is grounded in the actions of everyday situations; 2. knowledge is acquired situationally and transfers to similar situations; 3. learning is the result of a social process encompassing ways of thinking, perceiving, problem solving, and interacting in addition to declarative and procedural knowledge; 4. learning is not separated from the world of action but exists in robust, complex, social environments made up of actors, actions, and situations. The premises of situated learning will be further discussed in this chapter using examples from the Lab School observations in relation to the Reggio Emilia literature.

193
Everday problem solving

Play is part of children's everyday lives. Play, especially group play, becomes part of the Lab School classroom life as well. When children attempt to plan play themes, assign roles, join peers' game or manipulate objects, interpersonal as well as practical problems may occur. Children's play at the Lab School is an everyday situation because children are encouraged to freely explore play themes that interest them. Cases 20, 21, 23, 26 and 28 describe everyday, ordinary situations during the morning activities at the Lab School, when children are free to make choices and express ideas. During these cases, children chose to plan play themes or participate in peer play. Their spontaneous attempts of finding play partners, led to interpersonal problem solving. Playful theme explorations are spontaneous and voluntary by the children because they are part of their everyday lives. In the classroom context, they lead to problem finding and spontaneous, voluntary and self-motivated problem solving attempts.

An important aspect of everyday life, according to the Reggio Emilia and the Lab School philosophy is communication and interaction among the members of a community. During children's play, the teachers encourage small group work, questioning, communication and interaction. The daily circle-time, for example, is time devoted to children's sharing of ideas, stories and experiences to plan their activities for the day (Case 21, p.289). The Lab School teachers encourage expression of interests and asking questions, to the point where the children interact with peers and other community members on their own. In Case 29 (p.293), the classroom had a
visitor who was there to measure the room for a new carpet. The teachers did not talk about the visitor of their classroom and his job, but one of the older members of the classroom community, Carly, approached him and started asking him questions. It was Carly's own decision to follow his activity around the room, after noticing his presence. This case provides evidence of how the children learn to express their interests through questions, which turn their curiosity into conceptual problem finding and investigations for problem solving.

Activities grounded in everyday interactive situations also cause practical and interpersonal problem finding and problem solving among peers. In Cases 22 (p.290) and 23 (p.290), children's play was disrupted by a peer, causing practical and interpersonal problems. The teacher became involved only to ensure that children's interactions were based on situationally appropriate behavior that followed the classroom rules. Interaction and communication as an everyday observed behavior at the Lab School leads to conceptual, interpersonal and practical problem finding and problem solving. The teachers' actions are focused on directly helping the children develop communication skills by following the classroom rules. Teachers' encouragement of children to use those skills as part of their daily lives, indirectly enables them to solve their problems.

Holidays and celebrations, such as Halloween, Thanksgiving and birthdays, which are everyday situations in the broader community, are also brought in the Lab School classroom. During Case 32 (p.294), for example, Amanda had a Blue's dog costume at home and expressed her choice to play Blue's Clues in the classroom as
A problem was defined when the teacher pointed out that Amanda’s idea would not be possible because the preschool did not have a Blue’s costume. Amanda had to deal with the conceptual problems of how could the idea of role play as Blue’s Clues characters be materialized and what dress-up ideas are practically possible in the classroom that would serve as a Blue’s disguise, since an actual costume is not available in the classroom? Usually, the Reggio and Lab School teachers allow children to choose what resources they would like to use to materialize their ideas, when the ideas are carefully planned and may lead to deeper investigation or project work, even if they know that it wouldn’t be the “best” choice. Children would be allowed to try the materials and discover themselves if they can use something else instead. In this case, it was not possible for the teacher to provide what that one child needed, so she clearly explained to the child why that idea would not be materialized and pointed out the need for a different plan which would involve a more concrete study of the available resources. Amanda’s problem was solved through consideration of the available classroom resources. She decided that anyone who wants to be Blue can use the blue face paints from the art area and mark his/her face. When situations that are taken for granted in the community or the children’s home, are brought in the classroom, problems may occur for the children because of the classroom’s physical limitations compared to the broader community, such as the unavailability of all resources for children’s ideas and reproduction of the situations that they are familiar with outside the classroom.
Problem solving itself is considered as an everyday occurrence in the Lab School classroom. In Case 18, for example, Carly found out that there was no water in the containers at the easel. When she pointed that out to the teachers, they dealt with it with humor but apologized to the child for forgetting to fill the container with water. This case offers evidence of how the Lab School teachers do not hesitate to take responsibility for the creation of a problem. Instead of dealing with problems as mistakes, they discuss them with children as normal everyday situations. This attitude encourages problem finding.

Summary

Play is a natural part of young children's lives. The Lab School children are encouraged to express their interests and freely explore play themes on an everyday basis. Play becomes part of the classroom's daily life. When children play, they plan themes, assign roles, attempt to become members of groups, manipulate objects and try to materialize ideas. These functions cause interpersonal, practical and conceptual problem solving. Playful activities are spontaneous and voluntary and problem solving within these activities becomes self-motivated, spontaneous and voluntary as well. Everyday problem solving is also caused by the communication and interaction that is strongly facilitated in the Lab School. Children's expression of ideas and interests is a form of communication, which turns their curiosity and interests into problem finding and investigations for problem solving. Everyday situations from the broader community, such as holidays and celebrations, that are brought in the classroom, may
cause practical or conceptual problems because of the classroom's physical limitations compared to the community. The teachers' attitude of discussing problematic situations with children, instead of dealing with them as mistakes, also encourages problem solving and problem finding. Teachers became involved in the problem solving process only to ensure that children's interactions were based on situationally appropriate behavior according to the classroom rules.

Curriculum planning for meaningful problem solving

According to Lave and Wegner (1991), the conception that the theory of situated learning carries connotations of particularity with it, is a misinterpretation and should not generate resistance against the theory. They point out that even so-called general knowledge only has power in specific circumstances. Generality is often associated with abstract representations, with decontextualization. But abstract representations are meaningless unless they can be made specific to a situation at hand. Additionally, forming or acquiring an abstract principle is itself a specific event in specific circumstances. Lave and Wegner (1991) claim that what is called general knowledge is not privileged with respect to other "kinds" of knowledge. It too can be gained only in specific circumstances. "The generality of any form of knowledge lies in the power to renegotiate the meaning of the past and future in constructing the meaning of present circumstances" (Lave and Wegner, 1991, p.34). The Reggio Emilia educators try to make knowledge meaningful to the children by contextualizing
it, through short- and long-term projects, which also offer opportunities for negotiating meaning.

At the Lab School, curriculum is based on what is situationally important to the children and that leads to general knowledge and skills acquired in specific circumstances. In Case 30, two children were encouraged to open their birthday gifts. The children's attention was spontaneously drawn to a birthday card and definition of the problem of what the writing on the envelop meant. Through discussion and assumptions based on the specific occasion, they managed to find out what the writing represented. Similarly, when another group of children during Case 39 (p.298) developed a conversation about age and dealt with the problem of comparing ages, their problem was solved and knowledge was starting to develop when their conversations became very specific, concerning specific individuals that they all knew and their school levels. Abstract representations can be contextualized and become meaningful to the children through situationally specific problem solving activities.

The Reggio Emilia approach offers children opportunities for learning through activities that are relevant to, or rooted in their social and physical environment or school context. The method of emergent curriculum used by the Reggio and the Lab School teachers is a result of the socioconstructivist, situated approach to learning. Malaguzzi (1998), the founder of the Reggio preschools, described pre-planned curriculum as teaching without learning. Rinaldi (1998), a pedagogista, stated that "...the potential of children is stunted when the endpoint of their learning is formulated in advance." (p.104) Any Reggio-inspired theoretical foundation for
curriculum development is manifested through the idea that children learn through engagement with the environment and should be given the opportunity to explain what they have experienced. The process of emergent curriculum planning begins as teachers observe and interact with children. Reggio teachers define planning as a method of work in which they lay out general educational objectives, but do not formulate the specific goals for each activity in advance (Rinaldi, 1998). Instead, they express general goals and make hypotheses about what direction the activities might take, consequently, they make appropriate preparations. These hypotheses are flexible and adapted to the needs and interests of the specific children in a specific place and time.

During my Lab School observations, the teachers were observing children's activities, interactions and conversations and were analyzing their fieldnotes in collaboration with other teachers to find out what were the children’s current interests and questions. For example, a group of children's increasing interest in construction play and the use of their block structures to talk about buildings, was soon noticed by the teachers and a lot of activities related to construction were facilitated. A visit to a local construction site was planned for observing the role of the different people involved in the process of building a structure and the materials used. New pieces of wood were added to the classroom block area, yellow "caution" tape was made available, and miniature children's construction tools and tracks were brought to the classroom to enhance play. All these elements were introduced gradually after the teachers observed that children's interest in construction was continuously growing.
After field observations at the construction site of the roles of all the individuals involved in the building process, the children attempted to reconstruct them in the classroom environment through role play. Assigning roles and planning group activities leads to interpersonal problem finding but children's focused interest in the theme leads to commitment and problem solving. The yellow "caution" tape was a new symbolic material that was introduced to the children during their site visit. In the classroom environment, it caused conceptual problems because the children tried to define its symbolic meaning in a new environment. Their decision was to use the "caution" tape instead of their "save" signs for the structures that they would like to keep undisturbed. Children's observations and interest in construction tools, such as hammers and pliers, led to practical problem solving in the classroom. Based on their observations and discussions, the children learned that physical strength is required while using different tools during construction work. Using plastic tools and styrofoam instead of wood in the classroom, they soon found out that different practical skills were necessary for using the classroom materials. Children's everyday interests and interactions were the basis for classroom problem solving, which was, at the same time, connected to the broader sense of community. Emergent curriculum is a result of the Reggio Emilia philosophy and views learning as grounded in everyday situations, a result of a social process, not separated from the world of action.

All the problem solving cases of this study were observed during Lab School activities that were based on children's interests. Activities are initiated either by teachers, who observe children's interactions and expressions of interests, questions or
concerns, or by the children themselves. The teachers respect children's ideas but don't force all children to participate in an activity that may seem beneficial or important to one of them. Children are free to organize or join activities that are based on their own interests. In an attempt to have continuity between the school context and the broader environment of the children, the teachers encourage them to bring objects of interest and concerns from home to school. Maria (Case 17, p.287), for example, was trying to accomplish the jump-rope technique at home, dealing with practical problems due to her undeveloped motor skills. The Lab School philosophy allowed her to continue trying to solve the same problem and made the classroom experience more meaningful to her. Teachers listen to children talk about familiar topics from home and the community. Individual and group activities that are based on children's interests and concerns develop committed problem solvers. Commitment is expressed through persistence in trying to solve a problem, and repetitive attempts focused on specific goals. Gandini and Golhaber (2001), however, emphasize that having respect for the children's interests does not mean that the teachers should blindly follow all their ideas but they should think about them to determine which ones should be pursued and how they might be supported. Maria's explorations of interests in Case 17 were encouraged in the classroom because they were based on situationally appropriate behavior which ensured children's safety and purposeful character of activities.

Emergent curriculum, based on the Reggio approach, may lead to the development of projects, which are defined by Firlik (1994) as interactive activities that develop a deeper understanding by offering multiple perspectives of a
phenomenon(a) over an undetermined period of time. During project work, children use sophisticated symbolic representations to reflect on their own thinking and formalize their practical knowledge and they also develop constructive conflicts to heighten the logic of their final solutions to problems. This approach encourages students to ask questions and seek answers, and to collaborate with peers. During the period of my Lab School observations, I did not have the opportunity to observe a long-term project. The emergent character of the Lab School program does not allow the observer or the teachers to know when a project would evolve. The fact that there is always a project going on at the Reggio Emilia schools, is due to the different circumstances and different sense of community between Reggio schools and the Lab School. Most Reggio Emilia preschool children are with the same teacher and group of peers for three years (Edwards, Gandini, Forman, 1998). My Lab School observations started at the beginning of the school year, when nine of the twenty children were new to the school environment and three were transferred to the preschool classroom from the infant-toddler room, and were trying to adjust and develop understanding of the rules and routines. The eight older children (four and five year-olds) who had been members of the preschool classroom for at least a year, were trying to understand the new group's dynamics and develop peer culture. This was evident in my initial observations because the majority of the observed problem solving cases were caused by interpersonal conflicts. Project work, however, is usually caused and more easily/naturally takes place when conceptual problem solving and common interests and questions are developed among small groups of children.
During later observations a lot of conceptual problem solving took place and two small groups of children with shared interests were developed but those interests slowly faded out. The activities of both groups were based on children's common interests but did not include asking questions and seeking answers through investigations. The first group of four girls, who named themselves "The Sparkly Pattern Group", developed an interest in patterns and started using beads to create necklaces. Their ideas for each necklace were planned and organized. Then it was suggested to find other materials to create patterned necklaces and the children started bringing objects from home, such as different shapes of pasta, and painting them for creating new patterns. Their creations were then moved from being used as necklaces to the function of decoration and were used to decorate a tree that they put together for that purpose. The second small group developed among the children who shared the same interest in space/action play. The four boys named themselves "The Power Team" and decided to create a space ship to enhance their play. They first created a small three-dimensional cardboard model and then started thinking about the materials and tools that they needed to create a big one. They painted cardboard pieces, assembled them, cut out windows, and added lights. The process was continuing but the group was not expressing the need for regular meetings like they used to have at the beginning of the process.

Lab School theme explorations did not develop into long-term projects because the children's activities were based only on shared interests. The children were not guided to continuously ask questions and explore ideas to find answers. Their interest
in patterns could have developed into deeper explorations if the teacher, for example, encouraged them to look for patterns in the natural and social environment and study their importance. Patterns are commonly found on artifacts. Exploring patterns through studying different artifacts at the classroom, home or museum environment, would have helped the children develop a better understanding of the meaning of patterns and motivate them to create their own and assign them meaning that would have been relevant to their own lives. An important opportunity for studying patterns outside the classroom would have been, in my opinion, a visit to the textile museum which is at the same building as the Lab School. During an informal conversation with one of the teachers about the "Sparkly Pattern Group", I mentioned that quilts offer opportunities for studying patterns. The teachers' response was that the children were more interested in accessories and the quilt idea seemed to be discarded. This does not suggest that children's activities were not purposeful or beneficial for their development. Each individual activity had a specific focus and was meaningful to the children but were too open-ended and led to short-term explorations of ideas instead of long-term projects. The Lab School teachers' attempts to plan a meaningful curriculum for children are focused around children's interests and other factors for choosing appropriate topics for long-term investigations, described by the Reggio literature, are not considered.

The Reggio Emilia educators define a number of factors that should be taken under consideration by the teacher before deciding if a topic or a theme would offer opportunities for long-term investigations and continuous problem finding and
problem solving. According to Katz and Chard (1998) a topic or idea is appropriate for
projects if:

1. It is directly observable in the children's own environments.
2. It is within the children's experiences.
3. First-hand direct investigation is feasible and not potentially dangerous.
4. Local resources (field sites and experts) are favorable and readily accessible.
5. It has good potential for representation in a variety of media.
6. Parental participation and contributions are likely, and parents can become involved.
7. It is sensitive to the local culture and culturally appropriate in general.
8. It is potentially interesting to many of the children, or represents an interest that adults consider worthy of developing in children.
9. It is related to curriculum goals and standards of the school or district.
10. It provides ample opportunity to apply basic skills.
11. It is optimally specific—not too narrow and not too broad.

The activities related to construction work at the Lab School had potentials of becoming in-depth explorations of children's ideas because they fulfilled most of the above criteria. The "Sparkly Pattern Group" pattern activities, on the other hand, were based only on children's interest but did not fulfill all the other criteria for long-term investigations. According to Gandini and Edwards (1988), three types of project work can be observed at the Reggio schools: Those resulting from a child's natural encounter with the environment, those reflecting mutual interests on the part of the teacher and children, and those based on teacher concerns regarding specific cognitive and/or social concepts. It is evident that the role of the teacher is not underestimated at the Reggio schools during curriculum planning. When the curriculum becomes too child-dependent, deep investigations and continuous questioning and problem solving may become confined.
Summary

At the Reggio Emilia schools, educators try to make knowledge meaningful to the children by contextualizing it through short- and long-term projects, which offer opportunities for negotiated meaning-making. At the Lab School, curriculum planning is also based on what is important to the children and problem solving becomes situationally meaningful. When problems are meaningful to the children, their problem solving attempts are focused and committed. Emergent curriculum is a result of the Reggio philosophy and is based on the view that learning is grounded in everyday situations, a result of a social process, not separated from the world of action. It provides opportunities for theme explorations and committed conceptual, practical, as well as interpersonal problem solving. When, however, emergent curriculum becomes too child-dependent and based only on children's interest, classroom activities would not develop into long-term investigations and continuous problem solving.

Problem solving in contexts of negotiating understanding

Reggio Emilia educators point out that knowledge is created or negotiated through the interactions of the learner with others and the environment. Activities at the Lab School grounded in interactions for negotiating understanding, lead to problem finding and problem solving. When children during small group activities
have the same goals, focus, interests or questions, common problems are defined. In Cases 30, 39, 44 and 47 even if the problem was initially stated by one of the children, it was communicated to and accepted by the other child. Children's interactions became focused on the defined problem, for example, of what does the writing on the envelope mean? (Case 30, p.293) The group members may have different ideas for what the solution to the problem is but interaction and communication allow for solutions to be negotiated. Negotiated problem solving was observed as reaching a solution that is accepted by all group members, after presenting and trying to support individual solutions. When children develop the communication skills to be able to interact with each other and exchange ideas with an open-minded attitude, problem solving is negotiated and solutions are more likely to be successful.

When children in small groups activities don't share the same goals or focus, problems may be defined by one of the group members and expressed for negotiating a solution. In Case 36 (p.297), for example, the children had different views on the nature of art making. Larry viewed drawing as an individual process. He was at the writing area first and the other boys joined him later. Larry's goal was to paint the representations the way they are in nature. Brian viewed drawing as a social process and was changing his focus/goal to match that of the group. Brian's initial focus was on the physical action of painting. He was drawing sometimes without looking at the images and was not spending time choosing colors, that is, he was not paying too much attention on what was represented and how he would want to color it. Larry's conceptual concern about Brian's painting was that apples are red, therefore they
shouldn't have been painted blue. Larry verbally expressed his concern to Brian who acknowledged the problem and proceeded to solve it. If the definition and importance of the problem are convincing to the other group members, then the focus of all members may shift towards that problem and a solution could be achieved. Whether or not the children involved in an activity have the same goals or ideas, problems are solved when communication skills and interaction are developed among children who have developed communication skills and value peer ideas.

In cases when friendships and peer culture are not developed, children don't have the required interpersonal skills to communicate ideas and convince peers to negotiate problem solving. In Case 20 (p.289) a girl asked a peer to participate in her symbolic play and assume the role of a boy dancer. When the second girl expressed that she did not like that idea, the first girl told her that she wouldn't talk to her, instead of explaining and trying to convince her or negotiate ideas. Case 22 (p.290) is another example of how problems are not solved when children don't have the required interpersonal skills to negotiate solutions. Sophia, Mackenzie and Rachel were playing with flubber and when another girl needed to use the materials that the three girls were using, Rachel tried to impose an idea instead of negotiating one. If a teacher happened to be observing this situation, she would have asked the children to talk about their problem and reach a mutual decision for a solution, even if the children did not ask for help. When children don't have the required interpersonal skills to negotiate problem solving, the problems are either not solved or solved based on one child's idea rather than a commonly discovered and accepted idea. The teachers' role is not observe the
problem solving situations and make sure that group decisions are made and solutions negotiated. It is impossible, however, for one teacher to observe all problem solving situations taking place in the classroom, therefore, some problem may not be negotiated or stay unsolved.

The community approach to problem solving through purposeful and focused interaction and communication is encouraged by what is considered situationally appropriate classroom behavior. The teachers' constant reminders of listening to each others ideas (Case 21, p.289), taking each others ideas seriously (Case 19, p.288), and calmly and clearly expressing personal ideas (Case 23, p.290), make interaction and negotiating problem solving seem like part of the classroom rules (Case 25, p.291). Negotiating understanding leads to successful problem solving because it is a process that requires clarification and expression of personal goals/understandings and revisiting/reshaping understanding after listening to the ideas of others. The Lab School teachers provided children with organized opportunities for interacting with each other, with the teacher and with other community members. As demonstrated in Case 19, during early childhood, children often act first and discuss later (Tudge and Caruso, 2000). The Lab School teachers played a vital role in children's problem solving by helping them clarify their goals and the problem before they attempted to solve it and by even verbalize the children's objectives for further clarification.
Summary

Activities at the Lab School grounded in interactions for negotiating understanding led to problem finding and problem solving. When children, during small group activities, have the same goals, focus, interests or questions, common problems are defined. When they don't share the same goals or focus problems may be defined by one of the group members and expressed for negotiating a solution. Negotiated problem solving is observed as reaching a solution that is accepted by all group members. Whether or not the group members share the same goals, solutions are negotiated among children who have developed communication skills that enable them to interact and exchange ideas in an open-minded manner. Solutions are not negotiated and problems are not solved when children haven't developed the required communication skills. The teachers' role during negotiated problem solving is to observe children's attempts, encourage verbalization of objectives and planning mutually agreed upon ideas.

Conclusions

According to the theories of situated learning, knowledge is grounded in the actions of everyday situations, is the result of a social process encompassing ways of thinking, perceiving, and interacting, and is not separated from the world of action but exists in robust, complex, social environments made up of actors, actions, and situations. The findings of this study provide evidence to support that the Lab School educational philosophy and practice, influenced by the Reggio Emilia approach,
promote situated problem solving. The teachers encourage children to play, express and explore their needs and interests, interact and communicate. These educational strategies create facilitative contextual factors for children's decision making, self expression, questioning, explorations, investigations and negotiations, thinking qualities that lead to spontaneous and voluntary problem finding and committed problem solving. Problem solving at the Lab School is situated because it is based on everyday situations, is a result of social processes, and is highly connected with the children's physical and social environment.

Children's play at the Lab School is an everyday situation because children are encouraged to freely explore play themes that interest them. Play as part of children's everyday lives facilitates planning of and decision making about play themes, making choices, self expression, spontaneous manipulation of objects, which cause interpersonal as well as practical problems. The teachers at the Lab School provide children with materials and encourage playful theme explorations. Because play is part of children's everyday lives, in the classroom context it leads to problem finding and spontaneous, voluntary and self-motivated problem solving attempts.

An important aspect of everyday life, according to the Reggio Emilia and the Lab School philosophy is communication and interaction among the members of a community. During children's play, the teachers encourage small group work, questioning, communication and interaction, expression of interests and asking questions, to the point where the children start interacting with peers and other community members on their own. They learn to express their interests through
questions, which turn their curiosity into conceptual problem finding and investigations for problem solving. Problem solving itself is considered as an everyday occurrence in the Lab School classroom. The Lab School teachers do not hesitate to take responsibility for the creation of a problem. Instead of dealing with problems as mistakes, they discuss them with children as normal everyday situations. This attitude encourages problem finding.

At the Lab School, curriculum is based on what is situationally important to the children and that leads to general knowledge and skills acquired in specific circumstances. Abstract representations are contextualized and become meaningful to the children through situationally specific problem solving activities. More specifically, the Lab School curriculum, influenced by the Reggio Emilia approach, offers children opportunities for learning through activities that are relevant to, or rooted in their social and physical environment or school context. The method of emergent curriculum used by the Reggio and the Lab School teachers is a result of the socioconstructivist, situated approach to learning. Children's everyday interests and interactions, as observed by the teachers, become the basis for classroom problem solving. The teachers respect children's ideas but don't force all children to participate in an activity that may seem beneficial or important to one of them. Children are free to organize or join activities that are based on their own interests. Teachers listen to children talk about familiar topics from home and the community. Individual and group activities that are based on children's interests and concerns develop committed problem solvers. Commitment is expressed through persistence in trying to solve a
problem, and repetitive attempts focused on specific goals. The role of the teacher is not underestimated at the Reggio schools during curriculum planning. During my Lab School observations, when the curriculum becomes too child-dependent, deep investigations and continuous questioning and problem solving were confined.

When teachers observe children's conflicts, they encourage verbalization of objectives and planning mutually agreed upon ideas. Activities at the Lab School grounded in interactions for negotiating understanding led to problem finding and problem solving. When children, during small group activities, have the same goals, focus, interests or questions, common problems are defined. When they don't share the same goals or focus problems may be defined by one of the group members and expressed for negotiating a solution. Negotiated problem solving is observed as reaching a solution that is accepted by all group members. Whether or not the group members share the same goals, solutions are negotiated among children who have developed communication skills that enable them to interact and exchange ideas in an open-minded manner. Solutions are not negotiated and problems are not solved when children haven't developed the required communication skills.

**Educational playfulness and the Reggio Emilia philosophy**

Problem solving at the Lab School, as a situated learning process, is grounded in the actions of everyday situations. This claim means that the potentialities for problem solving cannot be fully described and understood independently of the specific situation, the context. The goal of the Lab School teachers is to develop a
learning environment that facilitates children's acquisition and spontaneous recall of problem solving thinking skills described by the Reggio Emilia philosophy and practice, such as communication, planning, reasoning and creative expression. Problem solving at the Lab School took place during children's everyday activities and it was implicit in the experience rather than in subject matter structured by the teachers. It was derived from within children's spontaneous and planned play, both in the classroom and on the playground. The Lab School classroom was a continuation of everyday life. Particular concerns and problems from children's lives outside the classroom were generalized to school situations (Cases 17, 32).

As researchers, the Lab School teachers rather than offering direct instruction to the children, attempt to design a classroom context that stimulates learning and retrieve problem solving skills. Their attempts to make the learning context meaningful to the children, led to the facilitation of play in the classroom environment. Eliason and Jenkins (1999) emphasize that "play gives children opportunities to express thoughts and ideas. It provides occasions to organize, plan, discover problems, reason, try out solutions and skills, create, and explore" (p. 26). Many experimental studies, including Bruner, Jolly, and Sylva, (1976), provide a basis for the hypothesis that play behaviors with objects foster problem-solving skills. My study describes a specific preschool setting, which is rich in carefully chosen and well-maintained materials by adults who are convinced that play is vital for optimal learning strategies. In this specific environment, children were able to become increasingly self-directed and intrinsically motivated problem solvers.

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Children responsible for their own learning and problem solving

Learning environments that allow play to evolve are often considered child-centered or child-oriented (Eliason and Jenkins, 1999). Child-oriented learning engages students in the learning process more deeply because the children take more responsibility for their own learning. The call for child-centered learning is becoming ever-present, with many educators, such as Chard (1992) and Smith (1993), suggesting that this teaching approach is a key ingredient in improving educational practice. The teacher's role, however, should not be diminished in the name of child-centered education. Forman and Fyfe (1998) point out that the Reggio curriculum is not child centered or teacher directed; it is child originated and teacher framed. Allowing children to control as well as to construct their own learning is a central perspective in the Reggio Emilia and the Lab School philosophy and practice. The focus at the Lab School is on the children and their needs and interests rather than on any pre-designed curriculum. The teachers frame the curriculum around planned, purposeful, playful activities which allow children to work at their own pace and offer them choices rather than being coerced into their work.

The spontaneity, autonomy and control of planning, which characterize children's actions when they are engaged in play activities, lead to spontaneous problem finding and spontaneous problem solving. In Case 17 (p.287), for example, Carly and Maria decided to try to master the jump-rope process in the classroom, using a rope that Maria brought from home. It was the girls’ own choice to engage in
the specific activity which included problem finding and problem solving. The Lab School children are constantly asked to plan their daily activities and express their ideas. As demonstrated in Case 48 (p.302), part of the morning circle time is devoted to children expressing their plans for their daily activities. When children spontaneously express their ideas and make theme choices for daily activities, they may not consider the practical (Case 32, 35, 45) and interpersonal (Case 20, 21, 22, 27, 34) obstacles of the materials and the classroom environment. In their attempts to maintain their play ideas/themes, they have to solve practical and interpersonal problems. Children's planning goes beyond thinking and decision making about activity themes and rules. In Case 48, the children were asked to plan some play ideas for the day and one of them expressed that she wanted to play at the painting easel. However, her planning attempts were pushed further by the teacher who asked her to state some initial ideas about what she was thinking of painting and what colors she thought she might need. Planning was also observed as a strategy for solving problems on a personal and interpersonal level by analyzing processes in steps and following those steps, and by making agreements on how an object should be used, by whom and for how long. In Case 17, Carly and Maria were playing with the jump-rope. Carly tried to demonstrate the process of jump-rope by breaking it down into smaller steps. As a result, more attention was paid to the process rather than the product, and her attempts were slowed down and became more careful. On an interpersonal level (Case 25, p.291), Carly made plans with other children about when each of them could use a
toy she brought from home. Her planning was an important disposition that contributed to the solution of an interpersonal problem.

Teacher and parents choose to be observers of children's problem solving process, unless children's safety or children's questions require them to participate. During autonomous problem solving (Case 17, p.287), no comments are usually made by adults. The adults at the Reggio schools and the Lab School respect children's choices and don't interfere with them. Children's actions are spontaneous and under the control of children themselves. As a result, problem solving also becomes completely under the children's control. The Reggio Emilia educators, however, point out that they don't hesitate to give instructions to children on tool use because that saves them time for focusing their attention on solving more important conceptual problems. The Lab School teachers offer tool instruction only when the children ask and when, in rare cases, children's spontaneous choices and play ideas lead to unsafe situations or possible damaging of the classroom resources. For example, a group of children were playing at the light table, exploring color. Their plan was to put drops of diluted paint on the table and experiment with mixing different colors. At some point the children started emptying all the tubes of paint on the table, laughing, not realizing that too much paint might damage the light table, even after the teacher explained it. Instead of cleaning up the paint, they kept laughing until the teacher asked them to stop, listen and reconsider. When teachers allow children to be autonomous and responsible for their own learning, they should expect situations when children's focus shifts from purposeful problem solving to imitation of peer behavior for entertainment.
Autonomy and spontaneous choices may lead to unsafe play ideas and loss of problem solving focus.

Summary

As researchers, the Lab School teachers rather than offering direct instruction to the children, they attempt to design a classroom context that would stimulate learning and retrieve problem solving skills. Their attempts to make the learning context meaningful to the children, lead to the facilitation of play in the classroom environment. Playfulness at the Lab School is facilitated by allowing children to make choices and plan their activities based on their needs and interests. The spontaneity, autonomy and control of planning, which characterize children's actions when they are engaged in play activities, lead to spontaneous problem finding and spontaneous problem solving. Teacher and parents choose to be observers of children's problem solving process, unless children's safety or children's questions require them to become involved.

Constructive play and problem solving

The most commonly observed types of play at the Lab School were constructive play (Moningham-Nourot, Scales, Van Hoorn, and Almy, 1987) and dramatic or pretend play (Fein, 1981). In constructive play children manipulate objects to construct or create something. The Lab School children were, for example, capable of building elaborate block buildings (Case 35, p.296), designing intriguing art
projects from scraps, cardboard and found objects (Case 10, p.283), and even arranging and rearranging the classroom furniture (Case 26, p.292). Suttin-Smith (1972) would include this type of play under "exploration and testing" which describes play in which children use their physical capacities to discover and explore every aspect of their world, both human and nonhuman, or under "imitation", because children seemed to be trying to model their constructions on the known. This view of play supports the Reggio Emilia idea of children naturally employing all available resources to negotiate meaning and make their thinking visible through their Hundred Languages or means of expression.

The studies of Brown, Collins and Duguid (1989) also suggest that during specific problem solving situations, "the problem, the solution, and the cognition involved in getting between the two cannot be isolated from the context in which they are embedded" (p. 36). Even if students are sometimes expected to behave differently, Brown, Collins and Duguid's (1989) research showed that during problem solving, students always lean on whatever context is available for help. The majority of the problems observed at the Lab School were derived from within the physical and social context of the classroom. During their problem solving attempts, the Lab School children stayed focused and committed on manipulating objects and were trying to make the problem as specific as possible. Kim (1994) described Reggio Emilia children's problem solving approaches using resource room materials. She emphasized that manipulating objects stimulates children's use of thinking skills because it leads to "errors" in the context of play. Kim (1994) explains that "teachers and caregivers have
the tendency to prevent children from making errors, or to point out errors to them while giving explanations...This tendency is natural, but it is more important for children to find out for themselves and correct their own errors" (p. 1). In Case 30 (p.293), for example, a group of children were trying to find out what did the writing on an envelope mean. The teachers were observing the children's interaction and instead of pointing out the answer to their question when their attempts were not successful, they allowed the children to rethink their initial ideas until they reach a satisfying solution to their problem. As children explore different resources from their environment, they can discuss, argue, construct, and reflect, make accommodations with their previous understandings, and enhance their knowledge and skills.

Playing with and manipulating objects involve exploring and investigating the physical properties of tools materials and spaces. Children investigate and explore, for example, the properties of a jump rope (Case 17, p.287), of "flubber" and straws (Case 24, p.290), of big blocks in a small space (Case 35, p.296) and a cylindrical wood object (Case 42, p.300). Explorations and investigations lead to problem finding, such as: What prevents the rope from reaching over my head and turning in front of me? What am I doing wrong while trying to blow "flubbles"? Where can I build my block structure? How can I use the cylinder by myself? Problems rooted in manipulating objects are usually practical problems. After a problem is defined during play with objects, the problem solving process involves continuous manipulation of objects, investigations, and hypothesis testing. In Case 17 the physical properties of objects were investigated to test if the child's shirt was the obstacle for the rope, and in Case 22...
24 continuous attempts were made to adopt a peer's strategies for reaching a solution to the problem of discovering how to blow "flubbles". When individual problem solving attempts of object investigations affect the play process of other children, the problem may require an interpersonal solution. Interpersonal solutions can be achieved through imaginative thinking (Case 35, 42). Problems rooted in the physical properties of materials during constructive play can be solved both through investigations and through imaginative thinking.

Tamburrini (1986) emphasizes that it is necessary for the teachers to understand how play is related to intellectual development and describes three distinctly different kinds of relationships. These relationships can also describe the relationship between constructive play and problem solving at the Lab School. 

*Incidental problem solving* occurs during playful activities because children manipulate the object with which they play. As Tamburrini (1986) points out, it can be assumed that when manipulating materials children are incidentally dealing with properties of objects, such as texture, weight, shape etc. What cannot be assumed is that children are aware that they are dealing with texture, weight or shapes. Their focus is on the theme of their play rather than the materials. During incidental problem solving, solving the problematic situation subserves the play activity. Cases 35 (p.296) and 42 (p.300) are examples of incidental problem solving. The problematic situations were caused by the physical properties of the materials. In Case 35 there was not enough space for children's large block structures and in Case 42 there was not enough space for both children to sit in a wooden cylinder. However, the children's focus was
not on the characteristics of the materials but on the play theme or idea. Therefore, their problem required a conceptual solution. Incidental problem solving provides explanation of the multidimensional character of children's problem solving during play.

When the play theme dominates the actual use of specific materials, there might be a chance that any attempts to solve practical problems related to the materials would not be dealt with commitment and persistence. In Case 45 (p.301), Jacob's focus was on the markers he carefully picked from the art area. His focus was on using each color at least once, so he tried to solve the problem of keeping the ones he used separate from those he did not use. If his focus was on a preconceived theme about what to paint, the practical problem related to the materials might have been ignored or not defined at all.

*Instrumental problem solving* occurs when children encounter problems that need to be resolved for a particular play episode to continue. In contrast to incidental problem solving, the focus of children's attention shifts temporarily from the play theme to the problem to be solved. In Case 17 (p.287), for example, Maria's jump-rope play was interrupted by the problem of getting the rope caught on her shirt. Her focus moved momentarily from attempting to master the jump-rope technique, to solving the problem of her shirt. Case 45 (p.301) is another example of instrumental problem solving, during which Jacob stopped his drawing process to figure out a way to keep the markers he used separate from those he did not use. The main goal during instrumental problem solving is still achieving the play idea but the focus shifts for a
short period of time to solving a more immediate practical problem. Children who achieve instrumental problem solving have a clear focus or play idea and stay committed to it even when disruptive problems occur.

According to Tamburrini (1986), there is evidence that play is intrinsically related to the development of imagination and creativity and that all representational play involves imagination. Intrinsic problem solving during children's play occurs when attempts are made by children to symbolize or represent objects and situations by using other objects or situations. An example of intrinsic problem solving in a play situation is Case 32 (p.294) during which a child was trying to find out a way to represent a cartoon character by using the classroom's available resources. Symbolic expression is one function of imagination. Imagination at the Lab School was strongly related to representing situations through storytelling. In Case 42 (p.300), Quincey got in the cylinder by the block area, covered herself with a sheet and was sitting there. Ike saw her, smiled and stepped in the cylinder too, but there was not enough room for both of them to be sitting. Quincey stated that the cylinder was her house. Ike stood up, still being inside the cylinder and said that he had an idea. He said that every house should have a guard and that he needed a guard for that house, asking Quincey if she wanted to be his guard. Quincey stepped out of the cylinder, leaving all the space for Ike. By being inventive and expressing a play scenario, Ike managed to extend and transform Quincey's idea to align it with his personal goals and solve his problem. Imagination as a broader thinking quality, was used by the Lab School children during
29.4% of the observed problem solving cases and led to solutions of interpersonal, conceptual and practical problems.

Summary

Constructive play involves manipulation of objects, which leads to problem finding. Problems rooted in manipulating objects are usually practical. After a problem is defined during play with objects, the problem solving involves continuous manipulation of objects, investigations, and hypothesis testing for problem solving. When individual problem attempts of object investigations affect the play of other children, the problem may require interpersonal solution, which can be achieved through imaginative thinking. During problem solving within constructive play, children's focus can be either on the theme of the play or the materials. When the play theme dominates the actual use of specific materials, there might be a chance that any attempts to solve practical problems related to the materials would not be dealt with commitment and persistence.

Sociodramatic play and problem solving

Smilansky's (1973) observations of young children's sociodramatic play led to the conclusion that play behavior develops three main aspects in a child, all of which are essential parts not only of play, but also problem solving. The first main aspect is creativity, based on utilization of past experience and controlled by the demands of a particular framework. The second aspect is intellectual growth, which includes power
of abstraction, widening of concept and acquisition of new knowledge. The third aspect is social skills, which includes positive give and take, tolerance and consideration. All these aspects are related to the thinking qualities of imagination, recalling past experiences, reasoning and flexibility, which according to my Lab School observations, facilitate problem solving.

Play theory is not emphasized by the Reggio Emilia literature, but playfulness is discussed in relation to spontaneity, imagination and creativity. A great deal of research has been conducted examining the relationship between play and divergent or creative problem solving in preschool children. Lieberman (1965) found a relationship between quality of playfulness (i.e., spontaneity, joy, humor, which are also Lab School characteristics) in preschool children and certain measures of divergent or creative problem solving (i.e., ideational fluency, spontaneous flexibility and originality) As Malaguzzi (1998), the founder of the Reggio Emilia schools, points out, children are the best evaluators and the most sensitive judges of the values and usefulness of creativity because they have the privilege of not being excessively attached to their own ideas, which they construct and reinvent continuously. Creativity emerges from children's daily experiences and their natural tendency to explore, discover, and change their view points. According to Katz (1998), the Reggio Emilia children's extensive experience of drawing from observation does not appear to inhibit their desire to draw or paint from imagination. In other words, experience of observation and realistic representations of situations does not necessarily damage the competence or desire to engage in imaginative activities. Lab School observations
provide evidence that imagination was often part of children's play and problem solving.

Some educators, such as Curry (1992), refer to dramatic or pretend play as symbolic or fantasy play. Sutton-Smith (1972) calls it world construction. Weininger and Daniel (1992) suggest that imagination is the thinking function of pretend play. Free or spontaneous dramatic play can be non literal and free from any type of rules imposed from the outside (Rubin, Fein, Vandenberg, 1983). The Lab School context, however, is designed for facilitating educational play. Educational play is still imaginative but it is also purposeful, designed to further children's learning and to help them explore and gain information from their world as well as to process that information to create meaning (Spodek and Saracho, 1987). Smilansky and Shefatya (1990) clarified the elements necessary for dramatic play: 1. Imitative role; 2. Make-believe in regard to objects; 3. Make-believe in regard to actions and situations; 4. Persistence, through which the play episode lasts for at least ten minutes. To qualify as sociodramatic play, these researchers add two elements: 5. Interaction, involving at least two players; 6. Verbal communication. Sociodramatic play at the Lab School, expressed through imaginative story telling, was observed mainly during interpersonal problem solving.

Sociodramatic, pretend or symbolic play refers to children's activities that are based on world construction, for example, pretending to be ballerinas (Case 20), restaurant owners and animals (Case 26, 28), doctors and patients (Case 31), cartoon characters (Case 32), participants in a wedding ceremony (Case 34), store owners and
customers (Case 41), families (Case 43). Symbolic play can be even more fantasy-based and imaginative when themes are not rooted in children's physical reality but on their TV experiences, such as playing robots and superheroes (Case 35), which may be an important part of some children's world. Intrinsic problem solving may occur during sociodramatic play because the children are attempting to represent or enact situations by using the classroom resources. During symbolic play, children can have different personal goals or focus than their peers, disagreements when planning play themes or different ideas about the same tools and materials, situations that may cause interpersonal problems. Play is disrupted and problems are not solved when children are not flexible and don't communicate with their peers to negotiate a solution.

The open-ended character of symbolic play situations allows for the thinking quality of imagination to be used as a problem solving strategy, especially in the form of storytelling. In Case 31 (p.294), a group of girls wanted to play with the same doll. One of the girls who was dressed up as a doctor was holding the doll and came up with a play scenario of her being the doctor and the doll being a dying baby in need of a doctor's care. Even if the other children wanted to hold the doll themselves, the story was convincing to them and they proceeded to assume alternative roles within the same play theme. Through imaginative storytelling problems and conflicts were solved. An alternative strategy for solving this problem would have been planning, which is normally what is observed in similar problem situations at the Lab School classroom. If a teacher got involved, she would have asked the children to make a plan about how long each child should play with the doll and take turns. This strategy
would have solved the problem as well. However, if children are allowed to solve problems by themselves during playful activities, they can develop imaginative thinking for successful problem solving.

**Summary**

Sociodramatic, pretend or symbolic play refers to children's activities that are based on world construction. It can be based on themes rooted in experiences from children's physical reality, such as visiting a restaurant, going to the doctor's office, spending time with the family, or TV, such as superheroes or robots. During symbolic play, children can have different personal goals or focus than their peers, disagreements when planning play themes or different ideas about the same tools and materials, situations that may cause interpersonal problems. Play is disrupted and problems are not solved when children are not flexible and don't communicate with their peers to negotiate a solution. The open-ended character of symbolic play situations allows for imagination to develop and used as a problem solving strategy.

**Teacher's role**

The Lab School teachers intervene in children's problem solving when it takes place in imaginative play situations that may be upsetting to some children. When, for example, during Case 34 (p.295), a girl started crying because her friend said that he was going to marry another girl during their pretend play, the teacher reminded the girl that it was a pretend wedding and that the boy was still her friend. The Lab School
teachers do not try to limit children's imagination but they try to help the children distinguish between reality and pretend play when the imaginative situations are upsetting or unsafe for the children.

Teachers also start discussions about children's ideas when they become so imaginative that it may be impossible to materialize them. Case 32 (p.294) is an example of such situations, which took place during the morning circle time when children were asked to express their plans for the day. Amanda stated that she wanted to play Blue's Clues and that she needed a child with a Blue's costume to join her play. There is not, however, a Blue's costume in the Lab School classroom. The teacher pointed out that Amanda's initial idea would not be possible because of the limitations that she was creating. Sometimes, the Reggio and Lab School teachers allow children to choose what resources they would like to use to materialize their ideas, even if they know that children's decision is not the "best" choice. When children's ideas are carefully planned and may lead to deeper investigation or project work, children would be allowed to try the materials and discover themselves if they can use something else instead. In Case 32, it was not possible for the teacher to provide what that one child needed, so she clearly explained to the child why that idea would not be materialized and pointed out the need for a different plan. Children's imagination may cause practical problems for the classroom community. The Lab School teachers ask children to reconsider their highly imaginative solutions to the initial conceptual problem to avoid new hard-to-solve practical problems.
The playful character of problem solving observed at the Lab School does not diminish the important role of the teacher in the learning process. The Reggio Emilia educators describe learning in their schools as neither child-centered nor teacher-directed but rather as a collaboration and negotiation between all the members of the school community. The above idea is what also takes place at the Lab School classroom. Children's play has many elements of spontaneity but it is educational because it takes place in a context affected by the teachers and other children. During their play, the Lab School children were, for example, constantly reminded by the teachers to express what their plan was. By asking children to make plans and express the goals of their activities, purposefulness was added to their spontaneous play ideas and problem solving occurred. During Case 32 (p.294), for example, Amanda was asked to plan her dramatic play activities and the fact that she was trying to figure out how to materialize her idea, caused conceptual and practical problems. Similarly, during Case 48 (p.302), Carly was not only asked to make a choice of the nature of her morning activities, but to also express a more specific purpose or goal that would guide her activity and choice of materials. The educational nature added to children's spontaneous play through teachers' motivations for planning, led to conceptual problem solving.

Also, the children had to modify their actions according to the classroom rules and the teachers were there to remind them to do so. 17.65% of the observed problem solving cases were related to reinforcement of classroom rules. In 38.2% of the observed cases the teachers were involved in children's problem solving attempts by
trying to facilitate the process. When children's play involved experimentations with new tools and materials, the teachers were observed trying to affect the context of play and problem solving not by offering a definite solution to problems but by offering possibilities for other choices. In Case 45 (p.301), for example, Jacob seemed that he had an idea for what he wanted to achieve but his inability to organize the tools imposed a practical problem on him. The task he was trying to achieve was to keep the markers he used separate from those he had not. The teacher did not disrupt his personal attempts to solve the problem but she just presented a plastic container stating that it may be useful. Teachers' guidance and suggestions for solutions were more evident during practical problem solving, which supports the Reggio Emilia belief that children are benefited when the teacher does not hesitate to give guidance during practical problem solving because that would save children valuable time for mastering skills and solving conceptual problems. Children's play at the Lab School is based on their spontaneous ideas but it becomes purposeful and educational because the teachers facilitate and guide problem solving.

Summary

When imaginative situations during problem solving in the Lab School become upsetting for the children, the teachers choose to intervene in the process. The teachers goal is not to limit children's imagination but to help them distinguish between reality and pretend play when imaginative situations become upsetting or unsafe for the children. The teachers also ask children to reconsider highly imaginative solutions to
conceptual problems in order to avoid new, hard-to-solve practical problems. The educational nature added to children's spontaneous play through teachers' motivations for planning, leads to problem finding and problem solving.

**Promoting dispositions for problem solving**

The Lab School teachers, who were influenced by the Reggio Emilia approach, tried to develop and promote intellectual goals for the children rather than academic tasks. Academic tasks are typically carefully structured by the teacher, sequenced, and comprised of decontextualized small bits of information that often require some small group or individual instruction by a knowledgeable adult. An example of an academic task would be asking a group of children to paint a picture of an Ancient Egyptian after reading them a story or showing them a film about Ancient Egypt, in a classroom with no Egyptian children. This task is academic because it would include presenting information out of context and it would be set up by the teacher who is knowledgeable about the material. When dealing with the topic, there is no room for doubting the presented material and some memorization would be required. Intellectual goals, on the other hand, address dispositions, that is, habits of the mind that include a variety of tendencies to interpret experience (Katz, 1993a).

Intellectual dispositions include the dispositions to make sense of experiences, to theorize about causes and effects, to hypothesize explanations to account for observations, and to analyze and synthesize whatever information is available. Trying to make sense of an experience and drawing conclusions based on cause and effect...
principles, are evident in Case 17 (p.287). Maria was playing jump-rope and faced a practical problem when she realized that something was preventing the rope from reaching over her head and turn in front of her. She had to think about the effect of having the rope caught somewhere and what was causing this effect. The fact that she decided to take her shirt off and see if that would solve her problem, demonstrates that she was conducting investigations to theorize about causes and effects. Case 24 (p.292) demonstrates the Lab School children's ability to observe their environment, hypothesize and check their hypotheses. Maria expressed that she had difficulty creating “fluffles” and the teacher suggested that she asked Larry to help her. While Larry was demonstrating how to create “fluffles”, Maria was observing and was later able to hypothesize and check her hypotheses about the steps of the process of making “fluffles”. Analyzing and synthesizing available information is evident in Case 50 (p.303), during which Maria was dealing with practical difficulties when trying to draw in her journal. She was not comfortable drawing because the plastic folder wouldn’t stay open and she had to use one hand to keep the first page down. After defining her problem, she analyzed the situation to find out that a heavy object was needed to keep the folder open. By looking around the classroom and finding objects that could be used to solve the problem, she synthesized all the available information from the environment towards solving the problem. Not only did she find a heavy object but she also decided to utilize the classroom scissors and cut the page she was working on off of the folder. The dispositions described above were observed at the Lab School when children were engaged in investigations of things around them in the
course of which they persisted seeking answers to their questions and solutions to the problems they encountered. The tasks were intellectual rather than academic, since information was not presented out of context by a knowledgeable adult. When the children were dealing with the problems, there was room for doubting information and the problems were open to a variety of strategies for solution. Problem solving activities at the Lab School are contextualized and lead to the development of intellectual goals rather than academic tasks.

A strong focus on the intellectual disposition of planning was observed at the Lab School. The fact that children's play was sometimes spontaneously initiated by the children, does not imply that it was purposeless. The teachers' observations and guidance of children's activities were aimed towards helping the children make their play purposeful and focused by planning their actions. For example, when a child during the morning activities created a chain using plastic rings and was swinging it around for about five minutes, the teachers noticed that his activity was becoming repetitive and wanted to ensure that the child was thinking about his choices. A teacher approached him and asked him what his plan was with that chain and added that she thought his game was becoming a little "tricky". According to Vera and Simon (1993), typically, plans influence human action in two ways. First, plans may be used to determine what initial action will lead toward desired goals. Second, plans may be used to establish a set of subgoals along the route to some distant goal. Lab School children's planning during the observed play cases, was usually focused around solving immediate problems rather than thinking about the distant future. Children
were spontaneously stating that they wanted to make a plan specifically during interpersonal problematic situations related to sharing objects and materials. In Case 25 (p.291), for example, a group of children were using Carly’s toy from home, which was left on the floor, something that upset Carly. Planning during this problem solving situation was related to decision making about how a toy should be used, by whom and for how long. The teachers’ comments and questions, however, are intended to facilitate establishment of subgoals for children’s activities. The teachers ask all children every morning what their plans for the day are and what do they think they might need to materialize this plans. By encouraging the children to invest some time in thinking about what they would like to do, they help them define their goals and try to commit to them. Commitment led to successful problem solving.

Another frequently observed disposition at the Lab School was reasoning. As Johnson (1990) points out, "using representational knowledge to solve problems and mentally operate on symbolic objects to reason, to test hypotheses, or to produce divergent and potentially creative outcomes are all higher order thinking abilities related to play" (p. 217). During Lab School play, children often made plans, elaborated and reasoned about cause and effect during their problem solving. In Case 17 (p.287), during which a girl was dealing with practical problems while playing jump-rope, she was observed talking about what she thought was preventing the rope from turning over her head. She was expressing reasoning by thinking about cause and effect. She was also verbally expressing why she decided to take her shirt off and that demonstrated reasoning through explaining actions. Explaining choices and ideas is
another form of reasoning. In Case 30 (p.293), for example, two children were trying to find out what the writing on an envelope meant. Larry thought it was a name and Carly expressed that it might be the name on the girl who gave the envelope to Larry. After further investigation, they found out that it was Larry’s name. The explanation that the children gave about their ideas, led to reconsidering their thoughts and solve the problem.

Reasoning was a strategy that contributed to successful solution of practical (Case 17), interpersonal (Cases 33, 26) and conceptual problems (Cases 20, 22). Case 17 (p.287) described above is an example of a practical problem, which was investigated through reasoning. After Maria took her shirt off hypothesizing that it was the reason why the rope would not reach over her head, she verbally expressed that it wasn’t a good idea. Explaining why her first solution to the problem was unsuccessful, was based on reasoning. In Case 33 (p.295) Maria was looking for her drawing and wanted to look at the paper that Carly was folding to see if that was it. The paper that Carly was folding was her own letter to her mom and she refused to allow Maria to look at it. Maria’s interpersonal problem of how to convince Carly to show her the paper was solved when Maria expressed her reasoning to Carly. Maria verbally explained her problem, her reasoning justified her actions and the interpersonal problem was solved. In Case 48 (p.302), Carly’s conceptual problem was deciding what she would paint and what colors she would need to materialize her idea. Reasoning through making connections between the object that would be represented and color, helped her solve the problem.
When conceptual or practical problems had interpersonal elements (Case 20, 22) and one child's reasoning was not convincing to the other children, the problems were not solved. In Case 20 (p.289), for example, Mackenzie expressed that she wanted Raen to join her play and assume the role of the boy dancer. Raen asked why she had to be the boy. Mackenzie tried to explain how she came up with that idea and offer a reason for her choice, saying that since she was wearing a dress, she got to be the girl and she needed a boy. Raen chose not to participate in Mackenzie's play idea. Case 22 (p.290) is another example of a problematic situation that was not solved by children's reasoning. When Danah wanted to join Rachel, Sophia and Mackenzie at the flubber table, the three girls had to find a way to provide Danah with some of the materials that they were using. Rachel suggestion was: "One of you should give some to her, if yours is more". She was expressing some reasoning by attempting to compare concepts, such as giving if you have a lot, keeping if you have less. However, she excluded herself from the process of sharing and her problem solving strategy was based on what someone else should do rather than what she could do. The Lab School children knew that their ideas should be respected and that they had the right to make their own choices and decisions. If a child's reasoning does not express peer respect, the other children involved in the situation do not accept his/her solution to the problem.

When, on the other hand, a child's reasoning is related to classroom rules about children's rights, it is accepted by peers and problems are solved. In Case 49 (p.303), Amanda asked Carly if she liked bubble gum and Carly answered that she did not.
Amanda asked why, imposing a conceptual problem for Carly. After thinking about it for a few seconds, Carly replied: “That’s how my body was made. It was made not to like bubble gum, so I don’t like bubble gum”. Carly gave a reason for what she was claiming by stating her response as a fact that could not be doubted. Carly’s explanation was convincing and made sense to Amanda because it was based on the classroom’s philosophy and general atmosphere. The Lab School teachers often encourage children to control their bodies and use phrases, such as “When your bodies feel like running, come to the circle area”, “Keep your bodies safe”, “Calm your body down”, “If your body is not in pain, you don’t need to cry”. Case 51 is a similar problem solving situation where Carly explained to Amanda that she could eat the last waffle on the tray if her body needed it and because the teacher could bring more. Listening to the teachers and their commonly used phrases creates a specific classroom environment at the Lab School, where reasoning can be a successful thinking quality for problem solving.

Children’s ability to reason and explain their thoughts to teachers and especially peers, is related to flexible thinking. Children who are willing to consider other’s points of view in order to solve a problem, develop flexible thinking. The disposition of flexibility is developed early on at the Lab School classroom through the teachers’ encouragements and reinforcement of children’s interactions and communication. The Lab School teachers encourage children to debate and talk about their differences because, according to their teaching philosophy related to the Reggio Emilia philosophy, the flexibility of thinking developed through healthy conflicts.
leads to problem solving and meaning making. In Case 28 (p.292) flexibility was observed as willingness to modify initial idea according to peer play theme/rules to solve a personal problem. During Case 35 (p.296), each child had an individual play idea but they were willing to compromise and focus on the similarities of their individual goals. Flexibility was expressed as tolerance and acceptance of others and their goals, and led to practical, interpersonal and conceptual problem solving in the context of playful activities. Flexibility is also developed through the teachers' strategy of encouraging children to consider the available resources when their initial choices are not feasible. In Case 32 (p.294), for example, Amanda wanted to play Blue's Clues and stated that she needed a play partner who would be wearing a Blue's costume, which was not available in the classroom. The child's problem would have not been defined and solved if the teacher did not encourage her to try to think of another possibility for materializing her idea.

When a child, especially of young age, is asked to think beyond his/her emotions and not only explain his/her own ideas but listen to other individuals' ideas as well, flexibility is a required thinking quality. The disposition of flexibility is developed early on at the Lab School preschool through the teachers' encouragements and reinforcement of children's interactions and communication. At the Lab School the teachers were closely observing children's activities and interactions. When a conflict, argument or disagreement was observed, the children were never left alone to "get over it", no matter how upset they were. On the contrary, all conflicts were treated seriously and each child was asked to explain his/her point of view, listen to his/her
peers' point of view as well and discuss their differences. During Case 47 (p.302), for example, two children wanted to use the same materials available in an activity. Carly said she wanted to write the number “3” on the classroom calendar and Maria said she wanted to write that number too. The teacher asked them if they had any ideas about what to do and Carly said that she asked for number “3” first. Instead of stressing that as an easy solution to the problem, the teacher pushed the problem solving further by explaining that Maria wanted to do that too, therefore a different solution was required. Carly was encouraged to be more flexible and reconsider her initial thoughts based on her peer’s point of view. This strategy led to reaching successful solutions to problems, which covered the needs of all children involved. According to Hartup, Brady and Newcomb (1983), peer interaction, which focuses attention on the differences between children’s respective constructions of the world, provides a context in which cognitive skills can develop. The Lab School teachers encourage children to debate and talk about their differences, because according to their teaching philosophy, the flexibility of thinking developed through healthy conflicts leads to problem solving and meaning making.

Summary

Problem solving activities at the Lab School are contextualized and lead to the development of intellectual goals rather than academic tasks. Intellectual dispositions include the dispositions to make sense of experiences, to theorize about causes and effects, to hypothesize explanations to account for observations, and to analyze and
synthesize whatever information is available. Planning, reasoning and flexibility are dispositions that are facilitated by the Lab School teachers as important characteristics of a socioconstructivist learning environment. These dispositions become classroom rules for the children and they are successful problem solving strategies.

Conclusions

The findings of this study describe a specific preschool setting, which is rich in carefully chosen and well-maintained materials by adults who are convinced that playfulness is vital for optimal learning strategies. In this specific environment, children were able to become increasingly self-directed and intrinsically motivated problem solvers. As researchers, the Lab School teachers rather than offering direct instruction to the children, they attempt to design a classroom context that would stimulate learning and retrieve problem solving skills. Their attempts to make the learning context meaningful to the children, lead to the facilitation of play in the classroom environment. Playfulness at the Lab School is facilitated by allowing children to make choices and plan their activities based on their needs and interests. Teacher and parents choose to be observers of children's problem solving process, unless children's safety or children's questions require them to become involved. The spontaneity, autonomy and control of planning, which characterize children's actions when they are engaged in play activities, lead to spontaneous problem finding and spontaneous problem solving.
Constructive play involves manipulation of objects, which leads to problem finding. Problems rooted in manipulating objects are usually practical. After a problem is defined during play with objects, the problem solving involves continuous manipulation of objects, investigations, and hypothesis testing for problem solving. When individual problem attempts of object investigations affect the play of other children, the problem may require interpersonal solution, which can be achieved through imaginative thinking. During problem solving within constructive play, children's focus can be either on the theme of the play or the materials. When the play theme dominates the actual use of specific materials, there might be a chance that any attempts to solve practical problems related to the materials would not be dealt with commitment and persistence.

Sociodramatic, pretend or symbolic play refers to children's activities that are based on world construction. It can be based on themes rooted in experiences from children's physical reality, such as visiting a restaurant, going to the doctor's office, spending time with the family, or TV, such as superheroes or robots. During symbolic play, children can have different personal goals or focus than their peers, disagreements when planning play themes or different ideas about the same tools and materials, situations that may cause interpersonal problems. Play is disrupted and problems are not solved when children are not flexible and don't communicate with their peers to negotiate a solution. The open-ended character of symbolic play situations allows for imagination to develop and used as a problem solving strategy.
During children's playful problem solving, the teachers choose to intervene in the process when imaginative situations become upsetting or unsafe for the children. Their goal is not to limit children's imagination but to help them distinguish between reality and pretend play. They also ask children to reconsider highly imaginative solutions to conceptual problems in order to avoid new, hard-to-solve practical problems. The educational nature added to children's spontaneous play through teachers' motivations for well thought-out planning, leads to problem finding and problem solving. Planning, reasoning and flexibility are dispositions that are facilitated by the Lab School teachers as important characteristics of a socioconstructivist learning environment. These dispositions become classroom rules for the children and they are successful problem solving strategies. Problem solving activities at the Lab School are contextualized and lead to the development of intellectual goals, which include the dispositions to make sense of experiences, to theorize about causes and effects, to hypothesize explanations to account for observations, and to analyze and synthesize whatever information is available.

Socioconstructivist learning community

Play is seen as serving anticipatory socialization purposes for the young child (Denzin, 1977). At the Lab School, it is conceptualized as a form of social behavior that results in children learning to cooperate and interact with each other. As Denzin (1977) points out, a "social world" consists of patterns of communication and interaction that link individuals into ongoing discourse and experience.
Communication was a disposition of flexibility observed in the Lab School classroom.

Fruitful interaction and communication affect both problem finding and problem solving. The Lab School teachers intervene in children's problem solving when it takes place in imaginative play situations that may be upsetting to some children.

**Communication and interaction affecting problem solving**

Communication at the Lab School is a multidimensional process of transmitting and receiving messages in an unobstructed channel of interaction through various means of expression. The Lab School classroom environment was a successful channel of communication among children, peers and adults. The school's philosophy and practice concerning communication is derived from the Reggio Emilia philosophy, according to which the child is valued as sensitive and responsive to others. It is also believed that children easily learn procedures for interactive learning during which they are eager to ask questions and solve problems with others. They are communicators, and have a natural desire and deserve the right to use many materials in order to discover and communicate what they know, understand, wonder about, question, feel, and imagine.

Verbal communication played an important role during children's problem finding and problem solving. It involved expressing ideas, choices and reasoning, reminding other children what the classroom rules were, having meaningful conflicts and discussions. In Case 23 (p.290), Sidney needed help in finding an activity to participate in but instead of expressing her problem she started crying and her problem
was initially not solved. After settling herself down and talking to the teacher, Sidney's problem was solved because the teacher stated different options that she could choose from. Similarly, in Case 33 (p.295), Maria's problem was to try to find the paper that she was writing on and left at the writing area. She wanted to see if the paper that Carly was folding was her own missing paper but because she initially did not state her problem, Carly was not willing to allow her to look at it. After Maria verbally communicated the problem, Carly helped her solve it. When children's problems were expressed and explained verbally, other children and teachers were able and willing to help solving them. Solution to problems becomes easier when children clearly communicate them to other community members.

Support in problem solving is more likely when the problems are stated in a way that the importance of their solution is convincing to others. In Cases 22 (p.290) and 27 (p.292), the problems were solved when children reminded their peers what the classroom rules were, indirectly asking them at the same time to modify their actions to produce situationally appropriate behavior. Communication, in the form of meaningful, fruitful and healthy conflicts, constructive discussions and negotiations, was important especially during conceptual problem solving. In Case 30 (p.293), for example, the children's task was to find out what the writing on an envelope stood for. It would have taken longer time for the individual children to find out what the card was saying, if they were working by themselves. By collaborating on solving the problem, their discoveries and explanations were built upon each other's, step by step, until a satisfying solution for both children was achieved.

246
The Lab School teachers provide children with resources and encourage communication through visual expression, dancing, writing, singing, storytelling etc. Sociohistorical theorists, such as Lave (1988), focus attention on structure that is constructed in social activities. Knowledge, in this view, depends primarily on a person's learning to participate in activities in socially constructed domains of situations (Greeno, Moore, Smith, 1993). Ecological theorists, such as McCabe and Balzano (1986), also focus their attention on structures outside the mind, but they are concerned mainly with structures in the physical environment. Ecological theorists conceive action as interaction with the environment, often involving direct perception, rather than being mediated by mental representations. Based on my observations and informal interviews, the Lab School teachers share the orientation of both sociohistorical and ecological approaches to learning. They believe that their role in children's problem solving is to facilitate social interaction, purposeful discussions and constructive conflicts, as well as to offer environmental stimuli for provoking children's investigations. Specific teachers' practices that facilitate children's development of communication skills and affect problem solving, as observed at the Lab School are:

- Responding to children's questions. In Case 18, a child was wondering why there was no water in the water container at the easel. Instead of directly telling the child why there was no water, the teacher said, “What was I thinking?”, and acted as surprised as the child was. She presented the child’s questions as her own too. The teacher's response to children's question expresses respect towards what the children
are thinking about and encourages communication. The type of interaction demonstrated in Case 18 (p.287) motivates problem finding and staying committed to solving it, not hesitating to ask for help.

• Providing opportunities for children to interact with each other, with the teacher, and with other community members. In Case 19 (p.288) the teachers presented to the children two framed paintings that were donated to the school by two former classmates and asked the children to decide where they should be hung. This case is an example of how the Lab School teachers see everyday situations as opportunities for problem solving and present them to the children in a way that requires interaction and communication.

• Helping children clarify their shared goals. During early childhood, children often act first and discuss later (Tudge and Caruso, 1988). Lab School teachers play a vital role in children's problem solving by helping them clarify their goals before they attempt to solve it and by even verbalizing the children's objectives for further clarification. In Case 19 (p.288), for example, teachers listened to each child's ideas, asked them to explain and elaborate on their ideas and by holding the framed pictures where each child was pointing out, they helped children visualize their goals and be able to evaluate their own solutions to the problem before trying to materialize it.

• Facilitating purposeful communication through modeling, eliciting, probing, restating, clarifying, and questioning. In Case 24 (p.290) purposeful communication and problem solving was facilitated between a child who wanted to learn how to perform a task and a child who was presented as an expert in that task and could help
his peer learn more about the tools and materials. In Case 25 (p.291) a solution to the problem was achieved because the children were able to communicate with each other and make a plan. The teacher restated the problem. Even if the children were upset, they modeled the teacher's behavior of always following the classroom rules and a collective solution to the problem was reached.

Summary

According to the Reggio Emilia philosophy, children are communicators, naturally responsive to others and can easily learn procedures for interactive learning. Verbal communication and interaction at the Lab School played an important role during children's problem finding and problem solving. It involved expressing ideas, choices and reasoning, reminding other children what the classroom rules were, having meaningful conflicts and discussions. The context of communication and interaction is facilitated by specific teachers' strategies, which include responding to children's questions, providing opportunities for the children to interact with each other, with them and with other community members, helping children clarify their shared goals and facilitating purposeful communication through modeling, eliciting, probing, restating, clarifying and questioning.

Social behaviors and relations affecting problem solving

According to Katz (1987), in early childhood, knowledge consists of facts, concepts, ideas, vocabulary, and stories. A child acquires knowledge from someone's
answers to his questions, explanations, descriptions and accounts of events as well as through observation. The "social order" in environments such as the Lab School, that promote interaction and communication, consists, according to Denzin (1977), of rules, objects, situations, identities, and social relationships produced by a set of individuals through interaction. Rules are part of the negotiated elements of play and they can be modified, suspended, accepted, rejected, ignored, misunderstood, overlooked, deliberately set aside, or forgotten. When there is a disagreement during the play negotiations, problematic situations occur. Children's play at the Lab School is highly interactive, planned by small groups of children and is based on investigating common interests and questions while respecting the rules of the group and the classroom community. According to Lave and Wenger (1991), learners inevitably participate in communities of practitioners and the mastery of knowledge and skills requires newcomers to move towards full participation in the sociocultural practices of the community. Lave and Wegner (1991) talk about legitimate peripheral participation, which concerns the process by which newcomers become part of a community of practice. Lave (1997) described the process of situated learning as "way in" and "practice" (p.21). Way in is a period of observation in which the learner watches a master and makes a first attempt at solving a problem. Practice is refining and perfecting the use of acquired problem solving skills. The Lab School children were encouraged to observe peers (Case 24, p.290), reflect upon and draw implications from previous experiences, and immerse in and with new experiences.
Observing others and adopting their behavior or problem solving strategies is a commonly observed socioconstructivist problem finding and problem solving strategy at the Lab School preschool classroom. In Case 17 (p.287), after Carly watched Maria's attempt to play jump-rope, she soon became interested in that activity and expressed her interest in trying it. This case provides evidence of the fact that observing peers engage in an activity may lead to develop interest in that activity. Participating in someone else's activity that involves problem solving, means that the problem is shared between the original and the new participant. The new participant may have new insights on the problem that may make its solution easier. Peer observation may be initiated by the children and can lead to voluntary participation in peer problem solving when the observant discovers and follows his/her peers' goals. Peer observation is also suggested by teachers as a problem solving strategy when children ask for help in performing a task. In Case 24 (p.290), for example, a child stated that she wanted to create something but did not know how and the teacher asked another child to perform a demonstration. Observing her peer demonstrating helped the child discover the necessary techniques for achieving her goal and solving her problem.

The Lab School children were also offered opportunities to interact with adult members of the community, such as other children's parents, firefighters at the community fire station, a visiting musician from OSU band, a photographer. The school also paid frequent visits to the OSU library, dance studios, planetarium, and mirror lake. Children's exposure to social knowledge and communicative demands in
everyday activities with adults raise problems, through confusions and uncertainties. Corsaro (1985) has noted that these problems are later reproduced and readdressed in the activities and routines of peer culture. In these routines, Corsaro (1986) explains, children attempt to make the unfamiliar familiar, to transform confusions and ambiguities from the adult world into the familiar and shared routines of peer culture.

Situated problem solving in the Lab School classroom was mainly grounded in the context of producing and maintaining peer culture, communicating ideas, making choices, reinforcing the classroom rules, and using the classroom resources. It emerged from cues provided by the environment and from the dialogue among the members of the community. According to Hartup (1992), peer relations contribute substantially to children's both social and cognitive development. He continues that the single best childhood predictor of adult adaptation is not school grades, nor classroom behavior, but rather, the adequacy with which the child gets along with other children. Hartup (1992) claims that children who are generally disliked, who are aggressive and disruptive, who are unable to sustain close relationships with peers, and who cannot establish a place for themselves in peer culture, are seriously at risk. He points out that friendships can function as cognitive resources for problem solving and knowledge acquisition. The peer culture and the sense of community life developed in the Lab School classroom offers examples for what Hartup's (1992) views of peer relationships as cognitive resources. Educational contexts such as the Lab School, that value the development of peer culture, allow it to develop through peer tutoring, cooperative learning, peer collaboration, and peer modeling.
Peer tutoring is a didactic transmission of information from one child to another, ordinarily from an expert to a novice. In Case 17 (p.287) a child was observing her friend’s jump-rope problem solving attempts and spontaneously decided to demonstrate a technique. She analyzed the process, which was already familiar with, in steps and verbally explained each step with parallel practical demonstration. Peer tutoring can be children-generated and lead to problem solving if the children have developed communication skills to be able to clearly transmit information to their peers and to be flexible enough to consider other people’s suggestions and ideas for solutions to problems. Peer tutoring at the Lab School is also teacher-generated. At the Reggio Emilia schools and the Lab School, children are considered as knowledgeable individuals when they come to school and their abilities are valued. According to the Lab School teachers, the children know a lot more than most educators give them credit for and than what they let us believe they know. The Lab School teachers empower the children by considering them experts in some fields and they often encourage them to demonstrate their abilities for guiding peers. The Lab School teachers do not pretend that they know everything about children’s interests and concerns and they motivate peer guidance and support during children’s problem solving.

Cooperative work is accomplished by the division of tasks among participants in an activity and each individual is responsible for a portion of the problem solving (Roschelle and Teasley, 1995). It requires children to combine problem-solving contributions and share rewards. During Case 35 (p.296), for example, the children
decided to build one large structure to solve the practical problem of not enough space for many individual structures. Children were able to combine problem solving contributions and shared the rewards for their work because they shared the same goals and play interests. Cooperative work during pretend play may cause interpersonal problems. Division of tasks during sociodramatic play means assigning roles. In Case 34 (p.295), for example, children shared the same goals and interests and expressed willingness to work together but the nature of their play theme caused interpersonal and conceptual problems. Cooperative work leads to problem finding and solving interpersonal problems when children have developed peer culture and the required social skills to participate in group work and consider peers’ ideas and feelings.

Peer collaboration, in contrast, occurs when novices work together on tasks that neither can do separately. Collaboration involves the mutual engagement of participants in a coordinated effort to solve a problem together (Roschelle and Teasley, 1995). In Case 30 (p. 293) both children had limited knowledge on reading. They both combined their efforts and in a step-by-step process, they managed to find out what the writing on the envelope said and solve the problem. The Lab School children use peer collaboration as a problem solving strategy. In Case 47 (p.302), for example, two children wanted to write the number “3” on the classroom’s new monthly calendar but there was only one left. After they were asked by the teacher to make a plan, they decided to collaborate so that one of the children could write half of the number and the other child, the other half. Children playing together on a daily
basis at the Lab School preschool, are observed saying and doing what the other is, engaging in the same activities, sharing objects, hence developing peer culture. Peer culture can be the source of problems, such as the practical problem of unavailability or enough resources in Case 47, but it can also be the source of finding solutions to problems. Children within friendship groups express compassion and support towards other members of their group and become open minded, flexible and inventive for successful collaborative problem solving.

Modeling refers to information or behavior transferred by imitation. The Lab School children imitate their peers during group play, when they try to develop peer culture. They would, for example, imitate their friends’ ideas of jumping from the climber without their shirts on, wearing coats, hats and gloves in the classroom, or “silly-dancing” to music. Development of peer culture facilitates interpersonal problem solving, however, through my observations, I found out that teacher modeling had a more direct effect on problem solving. Lab School teachers were observed using phrases, such as “Do you want to make a plan?”, “You have to make a plan” (Case 25), “What’s your idea?” (Case 19, 21, 30), “Say some words”, “Listen to their words” (Case 23), encouraging the children to express ideas, interests, likes and dislikes, and to follow the classroom rules. In Cases 17, 22, 25, 27 and 35 children were observed using phrases, such as “I want to make a plan”, “You can’t make choices for us”, “They make their own choices”, “You have to listen to my words”, “I have an idea!”, “We have a plan!”. By modeling the teachers’ behavior, the children were communicating with their peers to solve problems.
Summary

In learning communities, new members watch masters and try to acquire knowledge and skills, and later they try to refine and perfect the use of the acquired knowledge and skills. Children's play at the Lab School is a social function. It is highly interactive, planned by small groups of children and is based on investigating common interests and questions while respecting the rules of the group and the classroom community. Peer observation may be initiated by the children and lead to voluntary participation in peer problem solving when the observant discovers and follows his/her peer's goals. Peer observation is also suggested by the teacher as a problem solving strategy when children ask for help in performing a task.

Educational contexts such as the Lab School, that value the development of peer culture, allow it to develop through peer tutoring, cooperative learning, peer collaboration and peer modeling. Peer tutoring can be both teacher- and children-generated and lead to problem solving if the children have developed communication skills to be able to clearly transmit information to their peers and be flexible enough to consider other people's suggestions and ideas for solutions to problems. Cooperative work leads to problem finding and solving interpersonal problems when children are socially developed and able to consider peers' ideas and feeling. Children within friendship groups express compassion and support towards other members of their group and become open-minded, flexible and inventive for successful collaborative problem solving. Teacher modeling has a direct effect on problem solving. By
modeling teachers' behaviors, children use key phrases as strategies to communicate with their peers and solve problems.

Conclusions

According to the Reggio Emilia philosophy, children are communicators, naturally responsive to others and can easily learn procedures for interactive learning. The context of communication and interaction is facilitated by specific teachers' strategies, which include responding to children's questions, providing opportunities for the children to interact with each other, with them and with other community members, helping children clarify their shared goals and facilitating purposeful communication through modeling, eliciting, probing, restating, clarifying and questioning. Verbal communication and interaction at the Lab School played an important role during children's problem finding and problem solving. It involved expressing ideas, choices and reasoning, reminding other children what the classroom rules were, having meaningful conflicts and discussions, dispositions that led to successful problem solving.

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Implications for art education

Descriptive educational research, in general, allows both art teachers and art educators to develop images about what actually takes place in the classrooms and also allows for a common language about classrooms to emerge. It is vitally important for teachers to gain knowledge of the different teaching methods and strategies in
order to reflect on their own thought processes, gain a strong knowledge of self, and facilitate student achievement. As educators, we can never be entirely certain what ideas will crop up in the art classroom and when. When considering how to help children plan investigations and expressive representations, we need to know which directions are likely to lead to inspiration and cognitive conflicts and which are likely to lead them into dead-ends. Educational research can not provide "recipes" or prescribed strategies for confronting the challenges of teaching, but it can offer examples from teachers' practice and analysis that could serve as guidelines for turning theories, such as the Reggio Emilia approach, into practice.

One of the outcomes of educational research is that it satisfies the desire of teachers to increase the predictability of what happens in their classrooms - in particular, to increase the likelihood that a given curriculum or instructional strategy will positively affect student outcomes. The findings of my study contributed to the predictability of specific teaching environments with outcomes that emerge from the implementation of situated art-related problem solving activities. These findings describe learner outcomes or goals and structure or context of learning environments. Both of these factors affect problem solving in socioconstructivist educational approaches from Reggio Emilia and the Lab School. In order to define the implications of the findings to art education, the goals and structure of Reggio-inspired environments were compared with those of traditional art classrooms with emphasis on the effects on problem solving.
Goals of art education

Traditionally, art education recognizes the importance of developing children's cognitive abilities and dispositions. However, the primary focus of traditional art education is on children's specific knowledge acquisition geared towards the product of art making, such as development of technical skills in using tools and materials, creativity and originality. The fact that the Reggio approach has a process orientation rather than product, leads to more general curriculum goals, with the development of cognitive abilities and dispositions as the primary focus. The Reggio outcomes are not as tangible as the traditional goals of art education. Facilitating cognitive conflicts as an educational goal is not concrete because it refers to functions of the mind which may have different results for each individual. Reggio goals are primarily focused on dispositions and secondarily on art products. Intangible goals may lead to dead-ends in the classroom but they also lead to personally meaningful problem solving for the children.

When we think of traditional problem solving, images of individual children sitting at their desks usually in the context of mathematics, listening to teachers dictating problems, may come to mind. The Lab School educational approach, influenced by Reggio Emilia, promotes situated problem solving. Children are encouraged to play, express and explore their needs and interests, interact and communicate. These educational strategies create facilitative contextual factors for children's decision making, self expression, questioning, explorations, investigations and negotiations, thinking qualities that lead to spontaneous and voluntary problem solving.
finding and committed problem solving. Problem solving is not part of a specific subject area. It is valued as a skill of the mind that can be used in everyday situations and in all aspects of children's lives.

The physical structure of traditional classrooms and the focus of the teachers on specific outcomes for the art-making process and the time constraints, make the art classroom a place for "work" and not for play and social interaction. Social interaction and playfulness at Reggio-inspired schools are not viewed as disruptive behaviors in the classroom but as learning processes that offer students opportunities for developing autonomy and responsibility for their own learning. Children at the Lab School are encouraged to freely explore play themes that interest them. Play is not considered solely natural playground behavior but part of children's everyday lives. When art instruction is planned around play, children can draw ideas from their own experiences instead of following the teacher's lead. They learn how to discover and plan for themselves. In artistic play the process of art production is constructed as a part of children's culture and offers opportunities of absorbing, examining, altering, restating or even rejecting ideas. Artistic play in educational contexts can be expanded into problem solving possibilities when children are provided with open-ended materials and are encouraged to plan, predict possible outcomes, make decisions and observe the results of their actions. Planning of and decision making about play themes, making choices, self expression, spontaneous manipulation of objects, interaction and negotiating meaning cause problem finding and problem solving.
The globalism anticipated in the future stresses the importance of educating young children towards problem solving. According to Britz and Richard (1992), to survive in the new American society, children must be able to hold onto their values and yet be flexible to adapt to the new traditions and cultures of which they are becoming a part. Situated problem solving encourages learners to become aware of a variety of viewpoints, look for diversity in solutions, and negotiate to reach a common solution. Individuals can become competent not by acquiring knowledge by rote, but rather by learning to solve problems creatively. My study provided evidence that the skills and techniques needed to meet this challenge can be introduced early, practiced often, and expanded throughout the curriculum.

Context of art education

Throughout the history of art education, different educational approaches were based on different views on young children's abilities and the role of context in their learning. Children were either let free to explore the environment and learn from it on their own, without any teacher intervention or the teachers had every aspect of each lesson planned and every possible student outcome thought out and controlled. The Reggio approach values children as full of potential and capable to plan and make choices about what is meaningful for their learning, but the role of the teacher is not diminished. General goals are defined and possible ideas of children are predicted in order to have the required resources available to them. The teachers know when to intervene in children's problem solving and any other activity and have an important
role in providing the children with resources for enhancing and enriching their own choices.

Attempts to organize contexts for art making and creative expression based on theories of situated learning, can be grounded in the teaching method of emergent curriculum. Art teachers observe students' activities, interactions and conversations, to find out what their interests and questions are. Art activities that are based on children's interests lead to relevant, meaningful, focused and committed problem solving. A successful way to situate art-related problem solving and make it meaningful to children, especially of young age, is allowing children to play with tools and materials. This study provides early childhood teachers with evidence that the playful nature of educational programs can benefit children's cognitive development, particularly if teachers are aware of how the process works.

The process of learning does not have to be denaturalized in the name of education. Even young children are able to solve problems when they are presented in a concrete, interesting, flexible, and playful context. Purposeful play makes problem solving part of everyday life. Play is a natural and pleasant part of children's lives. Playful explorations are spontaneous and voluntary and lead to self-motivated problem solving. Guilford (1968) identified and investigated cognitive processes related to creativity, based on several principles which, according to Russ (1993), continue to be the basis for creativity research today. One of Guilford's principles is that creativity is a form of problem solving. The ability to generate a variety of solutions to a problem and to be flexible enough to transform or revise what you know into new patterns or
configurations, are important cognitive processes in the creative process. One of the findings of this study was that Reggio-inspired learning environments are respectful of all children's ideas, encourage children to deal with problems in a variety of ways, motivate interactions and negotiated problem solving, and facilitate continuous explorations and revisiting of ideas. It was also found that children that are used to these environments, develop imaginative and flexible thinking. These dispositions are considered important for developing creativity. Playfulness in general and during problem solving, is usually associated with children of young age. It is, however, important for any individual's art making process, even adults (Walker, 2001). Art teachers who try to facilitate creative problem solving, can create playful environments for art-making which would allow children to make choices, plan their activities, interact and negotiate understandings.

The results from this study stress the importance of the child-centered nature of art-related activities, in terms of allowing children to make choices and plan their activities according to their need and interests. However, as Burton (2000) points out, criticism of the child-centered approach to art education has swung back and forth throughout the 20th century and there is no doubt that child-centeredness, linked to the romantic notion of the young person as natural artist, has too frequently given rise to poor pedagogical practice. Today art educators have other ways of understanding children's artistic expression, its psychological, cognitive and social origins, and its outcomes in the ways in which young people in schools construct ideas and re-present their understandings (Gardner, 1990). Studies of Reggio Emilia - inspired
environments offer insights for a deeper understanding of child-centeredness than free self expression, through beginning to understand art making in light of the symbolic, cognitive and social processes involved in the construction of meaning in and through visual materials.

The physical context of traditional classrooms is goal directed and time driven. Learning is separated for each subject area. All students are asked to work on the same task and follow the teacher's instructions. Reggio contexts offer open-ended possibilities for learning by allowing children to make choices and plan their goals. Time is not an issue in Reggio schools. Children are allowed to work on a task for as long as it takes for their questions to be answered and for as long as the task keeps them involved and satisfied. Children are not forced to work together but they are encouraged to work in small groups rather than individually. Art-related problem solving is not separated from other subject areas. Problem solving is integrated in all learning experiences and art-making is considered a means of making thinking visible. Children are encouraged to use the art area any time of the day when they want to document their ideas or send the classroom community a message.

In the process of offering children opportunities for creative expression and meaning making, the important role of the art teachers and the environment should not be diminished. It is the teachers who would have to set up the art room's settings and atmosphere to create facilitative environments for playful learning and problem solving. During playful activities of self-expression, creative representation and communication, children solve practical, interpersonal and conceptual problems.
Knowing what each type of children's problems is about, helps the art teacher recognize more easily what the children's challenges are in the classroom and try to make informed decisions about his/her interventions. Problem solving situations can become frustrating or unsafe for children and the teacher will be required to give guidance. Knowing what the type of the children's problem is, would make the teacher's efforts more successful, especially if he/she knows which specific thinking qualities or strategies lead to successful solving of each type of problems.
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275


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APPENDIX A

OBSERVED CASES FROM PILOT STUDY

Case 1:
Space: playground
Objects: dry leaves
Actors: Maria, Walden
Actions:
As soon as they enter the playground, the children notice that a lot of dry leaves have fallen from the trees and formed big piles. Some children respond to that negatively, saying that they are dirty and others have a neutral response by almost ignoring the leaves and moving to another area. Maria and Walden run towards the area with the leaves, fall on them and then start throwing them in the air and at each other. Walden covers himself completely with them. Maria pretends that she did not see him and asks, "Hey, where is Walden?" He jumps up and says, "Wake-up time!"

Case 2:
Space: playground, sand area
Objects: plastic molds, shovel
Actors: Walden
Actions:
Walden takes a plastic castle-shaped mold and a shovel from the sand area and starts walking around the playground. He stops at a spot where no grass is growing. He picks dirt with his shovel and fills the mold, turns it upside down and lifts it up. Seeing that this process did not result to creating a castle with dirt, he flattens the dirt with his shovel and walks back to the sand box.
Case 3:
Space: playground, sand area
Objects: plastic bucket, shovel
Actors: Carly
Actions:
Carly is filling a bucket with sand using a shovel, after carefully removing grass or leaves from the sand in the shovel. She then turns the bucket upside down and pulls it up creating sandcastles. She moves a little and repeats the process. After finishing each castle, she counts them all out loud. Sara approaches Carly and asks her how did she make the castles.
Carly: I just fill the bucket and tip it over. I want to make twelve.
Nebyat runs and kicks one of the castles. Carly asks him to stop and he leaves. She looks at the destroyed castle and tries to fix it by placing the bucket over the sand and pushing it down. The first attempt doesn't work so she tries two more times again with no result. She then starts the process from the beginning.

Case 4:
Space: playground, sand area
Objects: plastic bucket, shovel
Actors: Hugh
Actions:
Maria and Aitana are playing with the sand but move to a different area of the playground with their shovels. After digging the grass, they find worms. They get really excited and start running around the playground, shouting: Worms, worms! That draws the attention of other children, including Hugh, who join the digging process.
Hugh spends the whole playground time digging at first to find worms, then to find anything that is buried in the ground, e.g. rocks. Other children adopt the digging choice but incorporate fire trucks into it. Hugh continues to use only a shovel and a bucket. He keeps counting his findings and informing the teachers and other children about how many things he found. He looks for a "safe" place to leave his bucket before going home and continues this activity the next day.

Case 5:
Space: classroom
Objects: marbles, vase, box
Actors: Ellie, Carly, Nebyat
Actions:
Ellie is walking around the classroom and she sees a clear plastic vase with some marbles in it. She goes and gets a basket, returns to the vase and empties it in the basket. She holds the basket and skips around the classroom. She finds a small empty box, picks it up, puts the basket on a table and starts putting the marbles in the box, slowly, one at a time. Carly and Nebyat approach her.
Carly: Marbles! Can we play too?
Ellie: These are not marbles, they are rats. We need to put them in their house.
Carly smiles and puts the marbles in the box. One of them falls on the floor.
Ellie: Get that rat! Put that rat back in the house.
Carly: I'll get it, I'll get it.

Case 6:
Space: block area
Objects: blocks, plastic animals
Actors: Hugh, Walden, Ike
Actions:
A group of children are playing at the block area. Hugh starts shouting to Ike, saying "No, stop". The teacher asks what is wrong. Ike and Walden say that Hugh won't let them play with the structure that they had all built. The teacher says that Ike and Walden can play there too.
Hugh: But this is my computer, they can't put animals on the computer.
Teacher: You are going to have to make a plan.
They all stay quite, staring at each other for a few seconds.
Hugh: I have an idea: this can be my computer (pointing to the upper part of the structure) and this can be for the animals (pointing to the lower part of the structure). The other children accept Hugh's solution and continue to play.

Case 7:
Space: sand area
Objects: bicycle
Actors: Amanda, Carly
Actions:
Amanda is playing in the sandbox, she hears the noise of a bicycle, turns and looks at Carly riding Ellie's bicycle.
Amanda: Hey Carly, come here.
Carly says no and continues riding the bike. Amanda stands up and keeps looking at Carly. Carly makes a circle and returns to the sand box area.
Amanda: Carly you have to come.
Carly: Why?
Amanda: Because my dog won't get up.
Carly: Amanda, it's OK. He made a choice. He is just taking a nap.
Amanda (in an angry and disappointed tone): No, he is not taking a nap. He is dying.
Amanda goes back to the sand box.
Case 8:
Space: playground, by the tree trunk
Objects: plexiglas box with stocking lid
Actors: Maria, Ellie

Actions:
Maria is holding a plexiglas insect box and she is walking around the playground looking for Lady Bags. Ellie is riding a bicycle with Carly seating at the double back seat. They approach Maria.

Ellie: Are you collecting Lady Bags?
Maria: Yes, flying bags.
Ellie: Come on, sit at the back with Carly. I can give you both a ride.
Carly: Come on Maria.
Maria seemed reluctant at first but then sat at the back seat for a ride with Ellie and Carly but was still holding the box and kept looking around. Whenever she saw a flying insect, she would ask Ellie to "drop her off", pick the insect and return.

Case 9:
Space: sand area
Objects: fire-truck
Actors: Peter, Max, Amanda (Max's older sister)

Actions:
Peter is playing at the sand box. He uses a fire track and a big plastic bulldozer. He puts sand on the bulldozer and then pulls it, making the sand fall off. Max, a child from the toddler classroom, approaches, watches the process for a few seconds and tries to imitate Peter by pulling the toy.
Peter (shouting): No, stop. No.
Amanda (Max's older sister): Peter, Max is just a baby. He needs to touch things. He is not a bad boy; he is my good brother. Stop.
Peter moves to a different spot ignoring both Amanda and Max.

Case 10:
Space: art area
Objects: styrofoam balls, pipe cleaners, paper, glue
Actors: Walden, Aitana

Actions:
The children expressed high interest in space play and Walden suggested to the teacher that they could make planets and hang them from the ceiling, the way they did with the snowflakes they created. The teacher asks him to talk about his idea during circle time. The children made plans about the necessary materials and the teachers had them all ready in the art area. Walden decided that he was going to make a dog planet (a planet for dogs) and Maria thought that it would be a good idea to make a cat planet (a planet that looked like a cat). Aitana asked the teacher assistant to show her
how to spell M. The teacher assumed that her planet would be Mars but Aitana informed her that her planet was going to be a "mom planet".

**Case 11:**
**Space:** writing desk  
**Objects:** markers, paper  
**Actors:** Walden  
**Actions:**  
Walden takes a box with markers and brings it to the writing desk. The teacher gives him some paper, assuming that Walden was going to use the markers to draw. He takes a marker, takes the lid off and puts it on the opposite side of the marker. He draws a circle, takes another marker and connects it to the first one and then connects two more. He takes the lid off of the first one and tries to write by keeping the markers connected at the same time. He tries holding them from different parts, using both his hands, one of the structure breaks, he puts the marker back and tries again. He changes the order of the connected markers and tries to write with the first one. When they all fall on the floor, he picks them up and tries again.

**Case 12:**
**Space:** oval  
**Objects:**  
**Actors:** Walden, Ike, Brian  
**Actions:**  
During circle time, the class is singing a song which requires from each child to add a phrase to the lyrics. When it's Walden's turn, he adds the phrase "frog legs". Ike and Brian express their dislike saying "liah, liah". As soon as the song is over, Walden raises his hand.  
Walden: I just wanted to say that frog legs taste like chicken, so it's probable not a good idea to say liah, liah, you guys.  
Ike: But they have spots...  
Walden: No, when they are cooked...Only the legs.  
Teacher: Walden is just saying that he has tried frog legs and they taste like chicken.  
Walden: No, I haven't. I asked Nikki and she told me.

**Case 13:**
**Space:** dramatic play area  
**Objects:** dolls, baby bottles  
**Actors:** Ike, Sophia, Ellie  
**Actions:**  
Ike and Bryan are playing with two dolls and bottles. Sophia approaches and is about to pick up the bottle from the floor, next to Ike.  
Ike: No, that's my bottle.
Sophia: But you didn't have your hand on it... I need a bottle. My baby is going to sleep. Hey you guys, may be you two can share a bottle since you are playing together. The teacher turns and looks their way.

Ike (to teacher): That's my bottle.

Teacher: Sophia, go ask Ellie. May be she has an idea where the bottles are.

Sophia asks Ellie and Ellie suggest that she looks for bottles on a specific shelf.

Sophia can not find one there and goes back to the teacher.

Teacher: Well, what do you think we should do?

Sophia: Well, may be we could borrow a bottle from the toddler's room.

Teacher: Do you think they have some?

Sophia: Yes, I know where they are. I saw them.

Teacher: OK. Let's go see if we can borrow one.

Case 14:
Space: Dramatic play area
Objects: Dolls, pic-nic baskets, chairs
Actors: Ellie, Lydia
Actions:
Ellie and Lydia wear the pic-nic baskets like bag-packs with the dolls inside. They are arranging two chairs and pretend that the set up is a car.

Ellie: I'm the mommy, so I'll sit in the front, right?

They are sitting on the chairs with the baskets on their backs, which makes them physically uncomfortable.

Ellie: My baby doesn't like sitting here, she needs her car-seat.

Lydia: Mine doesn't like it either.

They get up and start walking around the classroom.

Case 15:
Space: oval
Objects: brooms
Actors: Larry, Ike
Actions:
Larry and Ike are riding around the oval on brooms, pretending to be cowboys. Ike is wearing a cowboy hat. They are pretending to hold pistols and they are shooting at other children as they walk by their game. After they run for a few minutes they get tired and fall down.

Larry: It's time to sleep.

A few minutes later, Ike yells "It's morning!" and they pop up and ride around the oval again.
Case 16:
Space: drawing table
Objects: pencils, paper
Actors: Aitana
Actions: Aitana is writing a letter for her family. She has a troubled thinking expression on her face, looking at her paper and holding her pencil by her ear. She looks around but the teachers are not close. Then she gets up and walks over to the sign language poster board located near the kitchen. She looks at it for a few seconds, return to her letter and continues writing.
APPENDIX B

OBSERVED CASES AFTER PILOT STUDY

Case 17:
Space: classroom - oval
Objects: jump rope
Actors: Maria, Carly
Actions:
Maria arrived with her father, holding a jump rope and run to show it to the teacher. Maria's father tells the teacher that Maria has been practicing the jump-rope all afternoon the previous day. Maria moves at the center of the oval, looks at the teacher and gets ready to jump. The shirt she is wearing is wide at the waste and the rope is caught on it. She tries again, two to three times.
Maria: It gets stack on my shirt.
She takes her shirt off, hands it to her dad and tries the jump-rope again. Turns to her dad.
Maria: Dad, taking my shirt off is not really a good idea because now the rope hits my back and it hurts.
Her dad gives her the shirt back and when she puts it on, he tries to tack it in her pants.
Maria: I almost did it. It's hard... It's hard...
Carly: I want to try. Can I try? I want to make a plan.
Maria gives the rope to Carly. Carly's first attempts are not successful.
Carly : I can't really do it with boots. Here's how you do it: Over... and jump. Over...and jump.

Case 18:
Space: art area - easel for leaf painting
Objects: paper, red, yellow, orange and brown paints, leaves
Actors: Carly
Actions:
Carly goes to the art area, picks a brush and goes to the easel area where there are containers with different colors of paint. She picks some paint with her brush from one of the containers and starts painting. She then stops, looks at the containers, is about to
put her brush in a container of another color but she stops. She looks inside all the containers and puts her brush in one of them. She takes her brush out and looks at it.

Carly: Karen!
Karen (teacher): What happened?
Carly: There's no water! (sounds surprised)
Karen: No water? What was I thinking?
Carly: Somebody must have used it and forgot to put some more in the container.
Anneliese (teacher): I didn't know there was water in there. It's my fault Carly.
Carly used the water to wash her brush before using a different color, finished her painting, got a pencil, wrote her name, and called the teacher and asked for help to write the date on her painting.
Anneliese: Write a 10 then put a dash and then put another 10 after that.

Case 19:
Space: oval during oval-time
Objects: two framed Chinese paintings that were given to the school as a gift from Noah and Lydia.
Actors: all children and teachers
Actions:
The teachers asked the children where in their classroom they would like to see the pictures and they all had different ideas, so it was decided that voting was the best way to solve their problem fairly. The teacher asked the children to say what their ideas were and she was taking notes while the children talked. She explained that she was writing what the children were saying so that they could remember everybody's ideas when it would be time to vote.
Teacher: Here are the pictures from Noah and Lydia.
Carly: I remember the dragon but I didn't remember the other one.
Rachel: I don't remember them, I don't remember them.
Teacher: If you don't remember them, you don't have to say it. Think about it in your mind. Now think about something else in your mind: Where would you like them to be? If you have an idea, touch your chin.
Ike: (laughing) On the ceiling.
All children laugh.
Teacher: That may not work because it wouldn't be safe to hang them from the ceiling.
Not silly ideas, try a serious idea.
Carly: In the quite room, above the loft.
The teacher writes down the ideas.
Amanda: There.
Teacher: Where is there? Use some words.
Amanda: Between the windows at the observation deck.
Bryan: By the reading space.
Sophia: On the post by the desk.
Carly: Yeah, by the doctor. Like x-rays and staff.
After all ideas are written down, the teacher reads them to the children and asks each one to choose one. Each child says his/her choice but three ideas got the same number of votes and the teacher points out that the pictures are two so they would have to figure out something else to do.

Ike: Spencer and Raen are not here.
Teacher: That's right. We should ask the children who are not here what their idea is too.

Case 20:
Space: dramatic play
Objects: dress-up clothes
Actors: Mackenzie, Raen
Actions:
Kenzie: I am going to do ballet. Raen, you be the boy and I'll be the girl, OK?
Raen: Why do I get to be the boy?
Kenzie: Because I'm wearing the dress.
Raen: I don't want to.
Kenzie: I'm not talking to you Raen.
Mackenzie dances at the oval by herself and Raen continues playing at the dramatic play area.

Case 21:
Space: oval
Actors: Sophia
Actions:
During the morning oval time the children share their play ideas and make plans for the day.
Teacher: What's your play idea for today Sophia?
Sophia: Me (pause)... and Amanda (pause)... and Carly (pause)... we are playing at the dress-up area...
Carly: I'm not doing that.
Amanda: I'm not doing that.
Sophia stops and looks at the teacher.
Teacher: Just say what your idea was Sophia.
Sophia: Me and nobody and nobody (smiling) are playing by the dress-up area.
The children laugh.
Teacher: This is Sophia's plan. You are welcome to join her if you are interested in this idea.
Case 22:
Space: flubber table
Objects: flubber and carving tools
Actors: Rachel, Sophia, Mackenzie, Danah
Actions:
Rachel, Sophia and Mackenzie are playing at the flubber table. Danah finds a spot at the table and takes two of the tools from the center but there is no flubber for her because the three girls divided all of it among them. Danah looks at them.
Rachel: Let me tell you something guys. One of you should give some to her, if yours is more.
Sophia: You can't make choices for us Rachel. Come on Kenzie.
Sophia and Mackenzie leave the flubber table and go to a different activity.

Case 23:
Space: games table
Objects: card game
Actors: Maria, Sidney, teacher
Actions:
Maria is playing at the table with a card game. Sidney approaches and stands across the table from Maria. Maria starts explaining the rules of the game and gives instructions to Sidney. Sidney wants to keep a specific card but Maria tries to explain that she should take it, based on the rules of the game. Sidney lets the card on the table, Maria takes it and Sidney starts crying.
Maria (to the teacher): She wants this card but that's the only one I want.
Teacher: Sidney, you need to take a deep breath and calm your body down so that we can help you.
Sidney tries to talk but she still cries.
Teacher: Your words need to come out like they always do.
Sidney goes to the fountain, drinks some water, tries to stop crying and goes to the teacher.
Sidney: Can you help me now?
Teacher: Yes, there are plenty of choices going on. What would you like to do?
Sidney points to the dress-up area and goes to find something to play with.

Case 24:
Space: flubber table
Objects: flubber, straws
Actors: Maria, Larry
Actions:
Maria is playing with flubber. She is using a straw and trying to blow bubbles but her attempts are not successful.
Maria: Anna-Lisa, I have trouble making "flubbles" (flubber bubbles).
Teacher: Do you know who's an expert in that? Larry.
Maria: Laaaryyy. I want to make flubbles and I don't know how.
Larry runs to the flubber area takes a straw and demonstrates how to blow the bubbles.
Maria is looking at Larry's hands and flubber. He then goes back to his previous activity. Maria takes a larger piece of flubber than the one she was using before and tries again, looking at her flubber while blowing. She then stops.
Maria: Oh, you have to hold it real tied at the sides.
She continues blowing but puts both hands around the straw, holding the flubber tied instead of holding the straw with one hand and the flubber with the other. After a few more attempts she creates a bubble.

Case 25:
Space: oval
Objects: Carly's toy from home
Actors: Carly, Sophia, Rachel, Maria, Amanda
Actions:
Carly brought a toy from home and was playing with it. During oval time, she put it on the floor behind her back, like they are suppose to do with anything that they are holding for oval time. After oval time, she went to a different classroom area and forgot to put the toy in her cabby. Later, Sophia found it and started playing with it. Rachel and Amanda joined her. Carly saw them and tried to pull the toy away from them, telling them that it was her's. Sophia was pulling it back telling Carly that she didn't have her hands on it.
Teacher: Carly, I know it's yours but you left it on the floor and now you can't just pull it from Sophia's hands. You have to make a plan with Sophia.
Sophia: I want to use it for six more minutes.
Carly: How about five.
Teacher: Is that OK with you Sophia?
Sophia: Yes.
After five minutes the teacher informs Carly that the five minutes have gone by and asks her if she would like to put it away now. Carly who was in the quiet room working on the computer, sees that the other girls are really into the toy.
Carly: After Maria, it's time for me to put it away.
Rachel: Nooo, I want a turn.
Carly: Well, after Rachel I'm gonna put it away.
Rachel: I'm Rachel.
Carly: Yes, after you I'll put it away.
Amanda: I want to play with it too.
Carly: You can play with it in the afternoon, OK?
Amanda: No.
Carly: You have to listen to my words Amanda. You are not listening to my words.
Carly goes back to the quiet room.
Case 26:
Space: restaurant area
Objects: restaurant tables and flower arrangements
Actors: Maria and Sterling
Actions:
Sterling: Hey, do you want to play lion? I'll be the bad lion and you would hurt me.
Maria shakes her head no as she is fixing the flower arrangements on the pretend restaurant tables. Sterling pushes them off the table when Maria is not looking. Maria fixes them when she notices that they had fallen. Sterling pushes the flowers again and this time Maria sees him.
Maria: Nooo. This is a restaurant. This is how the flowers are supposed to be.
Sterling is pulling the tablecloth and Maria pulls the other side.
Maria: Stop pulling the tablecloth.
Sterling: Well, tomorrow when I come and you are not here, I am going to mess it up.
Maria: Well, other kids want to play restaurant and if you mess it up they won't be able to.
Maria moves to the kitchen area and Sterling leaves the table and moves towards the oval pretending he is a lion.

Case 27:
Space: snack table
Actors: Rachel, Sidney, Mackenzie and Sophia
Actions:
The four girls are sitting at the snack table having breakfast and talking.
Rachel: Do you want to play that game we played yesterday, remember...?
Sidney and Mackenzie: Yes.
Rachel: But you guys, to join that game you have to let me have the purple Barbie and the horse.
Mackenzie: But we want to play with that too.
Rachel: Well, you can't.
Sophia: They make their own choices Rachel.

Case 28:
Space: circle and restaurant area
Actors: Raen and Sterling
Actions:
Raen, Sidney, Mackenzie, Jacob, and Quincey made a plan to play a tiger game at the dramatic play area, next to the kitchen. They are on their hands and knees, make tiger sounds and move from the oval to the dramatic play area, through the restaurant. Halfway they are stopped by Sterling who is wearing a McDonald's hat and apron. Sterling tells the children that they can't pass from the restaurant, so they all go around the restaurant, except Raen.
Sterling: What are you, a tiger?
Raen shakes her head "yes" and continues making tiger sounds.
Sterling: Do you have an owner?
Raen shakes her head "no".
Sterling: Tigers are not allowed in the restaurant, you can't go through.
Raen, still on the hands and knees, starts making dog sounds, looking at Sterling.
Sterling: Oh, you are a doggy? You can pass.

Case 29:
Space: classroom
Objects: measuring tape
Actors: Carly
Actions:
The classroom is going to have a new carpet and the carpeting company sent someone to the Lab School to measure the space. This person is using measuring tape and taking notes on a small notebook, while the children are engaged in their morning activities. The teacher informs a group of children, who seemed curious about the new person in their classroom, about their plans to have a new carpet. Carly seems to be following him around, watching what he is doing.
Carly: How do you know how long it is?
- Well, I lay my measuring tape on the floor and then I read the number on it.
Carly: Oh, the measuring tape has numbers on it. How far does it go?
- It goes all the way to 35.
Carly: I can count to 35.
- How old are you?
Carly: Four and a half.
- Wow! That's pretty good for a four and a half-year-old.
Carly smiles and joins one of the activities in the quiet room.

Case 30:
Space: classroom
Objects: Larry's birthday gift and card from Quincey
Actors: Larry and Carly
Actions:
The day after the class celebrated Larry's birthday, Quincey brought a gift for Larry. She gave it to him as soon as she came to school in the morning. Larry opens it and Carly is standing by him, watching.
Carly: Walky-Talkies? That's cool.
Larry continues to unwrap the gift with one hand because in the other hand he has a red envelope from Quincey with something written on it. Carly notices the writing on the envelope.
Larry: Hey Carly, look: trading cards!
Carly: Oh, cool. What's this? Is it a card? What does this say?
Larry: It's a name. See? Big letter.
Carly: Quincey? It says Quincey?
Larry: Hey, that’s my name.
Carly: Oh, Larry. It says Larry!
Carly looks at the envelope for a few seconds and points at each letter saying Larry’s name.

Case 31:
Space: dramatic play area
Objects: doll
Actors: Maria, Quincey and Mackenzie
Actions:
Maria has a nurse’s hat on and a surgeon’s mask, and is holding a doll, wrapped in a blanket. Quincey approaches Maria and asks if she could play with the doll too.
Maria: I’m sorry but she is going to die.
Quincey: But I want to hold her.
Maria: I’m sorry, you can’t when the doctor hold’s the baby.
Mackenzie: Can I hold her?
Maria: You can’t because if you hold her, you’ll catch fever and you’ll die too.
Quincey and Mackenzie continue to play with Maria but they stop asking for the doll.

Case 32:
Space: circle, during circle time
Objects: Halloween costumes
Actors: Amanda
Actions:
On Halloween some of the children came to school with their costumes on. Amanda was dressed-up as Magenta, the dog from Blue’s Clues. Amanda’s younger brother, a member of the infant-toddler community of the Lab School, was dressed-up as Blue from Blue’s Clues.
Teacher: What is your plan for today Amanda?
Amanda: I am playing dog and whoever wants to join has to be a dog that’s blue, like my brother.
Teacher: That’s tricky, because we don’t have blue costumes in our school.
Ike: I’m wearing blue (superman costume).
Teacher: Would that work Amanda?
Amanda shakes her head no.
Teacher: How about if they put leashes on. You know all about how to make those.
Amanda: No, I’m not playing family, I’m playing just dogs. Whoever wants to join in should have blue dots on their faces with the face paints.
Case 33:
Space: writing table
Objects: paper
Actors: Carly and Maria
Actions:
Carly has just finished a drawing for her mom and is folding it to put it in an envelope. One of the teachers asks Maria if she put the letter that she wrote to her dad, in her cabby. Maria runs to the writing table and starts going through the paper but can not find her letter.
Maria: Carly, let me see that.
Carly: No.
Maria: I need to see it.
Carly: Why?
Maria: Because I want to.
Carly: No, it’s for my mom.
Maria: Carly, I want to see it, it may be mine. I had a paper…
Carly allows Maria to look at her paper.
Maria: Oh, it’s not my paper.
Maria continues looking for her paper in the writing area and eventually finds it among other pieces of paper.

Case 34:
Space: block area
Actors: Ike, Sophia, Mackenzie, Rachel, Sterling
Actions:
A group of children at the block area are discussing who is going to go to Ike's wedding and who he is going to marry. Mackenzie is wearing a white dress and a veil from the dramatic play area.
Sophia: Ike are you going to marry me and Kenzie?
Ike: Yes, two girls.
Rachel: Oh, two girls.
Sophia: Yes, see he can marry you and me.
Ike: No, I can't be married to two girls. Only two people go to the wedding.
Sterling: I can do "eanie meanie minie mo".
Ike: Yeah, do "eanie meanie" to decide who is the littlest. Which one of you is the littlest? You have to come down here and stand next to each other.
Sophia: Down there?
Sterling: Yeah, and I do the "eanie meanie".
Ike: You do the " eanie meanie minie mo" and I'll say who's bigger. No, no... who is littler.
Sterling: Eanie meanie minie mo catch a tiger by its toe.
Ike: Whoever is little can marry me. Let's see, Sophia's 20 and 1/2 and you are 1 and 1/2.
Sophia: No, no.
Ike: So now Mackenzie is gonna marry me.
Sterling: OK.
Sophia starts to cry. A teacher explains that it is just for play, not for real, and suggests that she takes a deep breath. Ike is standing still, holding a lego piece by his mouth, looking at Sophia from a distance with a puzzled expression on his face.
Rachel: Now Sophia can go to New York with me.
Ike: No, no. I want to do "eanie meanie minie mo" again.
Sterling: We already did that plan.
Ike: Sterling, you say "eanie minie minie" again.
Sterling: "Eani meani minie mo".
Ike: I am seeing who is the littlest. Sophia, you gotta match, match together. Whoever gets 21 will marry me.
Sterling: Eani meani minie mo catch a tiger by its toes and Sophia is the best.
Ike: You are 26 and you are 26.
Sophia: Tie?
Sterling: Eani meani minie mo.
Ike: Ummm, 26 again and 26 again. Okay. Let me do it one more time. You are 21 and you are 21 too. I can marry two girls now.
Sophia (to Mackenzie): He can marry you and me.
Kenzie: OK.
Ike: Hey, guys look at my two wives.

Case 35:
Space: block area
Actors: Ike, Sterling, Larry, Peter
Actions:
Ike: You guys, lets make the bad guy robots.
Sterling: Yeah, and I can help too.
Peter: Hey, this is my bad guy robot.
Ike: No, this is a good guy robot.
Peter: Then this one will be my robot.
Sterling: And this one will be my robot.
Larry: That's my robot.
Ike: Peter, that's Larry's robot and this is my robot.
Peter: Fine. I will make my robot over here.
Ike: This is my robot.
Sterling: Could this be my robot too?
Ike: This could be our robot.
Sterling: Mine too. Both of ours.
All the boys start to talk at the same time.
Ike: I've got an idea. What if we took our robot and Larry's robot and Peter's robot and put them together to make one big vehicle.
Larry: Then whoever needs help, can just call me or you or you.
Peter: My robot's head turns into its own small robot.
Sterling: Hey, Ike. Can I ride with you?
Ike: OK
Sterling: We can make it a two vehicle.
Ike: Maybe I can go to the theatre and you can go to Dairy Queen.
Peter: My robot's head has to go over here Larry. OK? OK? I put the robot's head like this to protect us.
All the boys start to make shooting sounds pretending that they are protecting each other.

Case 36:
Space: writing table
Objects: coloring pictures, crayons
Actors: Brian, Sterling, Larry
Actions:
The boys are drawing coloring pictures that Larry brought from home. They talk about different things and laugh. Larry seems to be the most immersed into coloring. He selects each crayon carefully and draws slowly, trying to stay within the lines.
Sterling: Hey, Anna-Lisa is here.
Brian: Anna-Lisei?!
(laughing)
Sterling: No. Anna-crocodile.
(laughing)
Larry: We have a lot to do.
Sterling: Yes, do it faster Larry.
Larry: I am doing faster and faster and faster.
Brian gets a blue crayon and scribbles all over a fruit shape on his picture.
Brian: I am coloring faster too.
Larry: That's not suppose to be blue. Are you coloring everything blue? Those are apples.
Brian: Apples are red.
Sterling: Wet?
Larry: No, red. Red.
Brian stopped painting the area that was covered by the blue scribbles, picks an orange crayon and starts painting the other fruits on his picture.

Case 37:
Space: oval
Actors: Rachel, Amanda, Sidney, Quincey
Actions:
Rachel is standing in one edge of the oval holding a hula-hoop and across from her are Amanda, Sidney and Quincey pretending to be dogs.
Rachel: OK, doggies, when I say go, you have to run over here where I'm standing and touch the hula-hoop. OK? 1-2-3-Go... Amanda won. This idea was repeated three times and Amanda came first every time. Rachel stops and looks at the other two girls for a few seconds after saying that Amanda had won. Rachel: OK, you won the medal. Here (pretending she is putting a metal around Amanda's neck). Now go home. After Amanda was sent "home" two more races took place and Sidney was the winner both times. Quincey stops running and sits in the middle of the oval with her arms crossed, looking upset. Rachel: OK. OK. Sidney, now you win the medal. Go. Come on Quincey. Quincey runs to the hula-hoop smiling.

Case 38:
Space: writing table, pretend play area
Objects: markers and papers \ plastic dinnerware
Actors: Carly, Larry
Actions:
Larry sets the table at the dramatic play area and goes over to the writing desk. Carly has picked up some markers from the art area and has, for about five minutes, been immersed into writing a letter and drawing a picture for her mom at the writing desk. When Larry approaches the writing desk, Carly stops writing and looks at him and the set table at the dramatis play area.
Larry: Hey kids, it's dinner-time.
Carly: Oh, I haven't finished my studying dad. Can I finish my homework first?
Larry: Yes but make sure you don't miss dinner-time.
Carly: All right, I'm not going to miss dinner-time.
Carly stops writing, goes to the table and has "dinner" with Larry and then goes back to the writing table.

Case 39:
Space: dramatic play area
Actors: Maria, Carly, Sterling, Ike
Actions:
The children are standing at the dramatic play area, planning a "family" idea.
Carly: I am going to be the big sister.
Maria: I am a big sister, for real.
Carly: Me too. I am a big sister for real. I have a little brother.
Sterling: Ike has a bigger brother and he is even bigger than Maria's older brother.
Ike: No. My brother is the same as Walden because my brother is 7 and Walden is 6.
Maria: Nooo. my brother is not 7 yet.
Ike: My brother is 7.
Carly: Walden is 6 and is not even in our school.
Maria: No, he has finished our school.
Ike: My brother finished our school too but he is not 6, he is 7.
Carly: Well, Spencer is bigger than Walden.
Ike: Yeah, Walden is 6 and one more makes 7 (showing the numbers with his fingers).

Case 40:
Space: writing table
Actors: Carly
Actions:
Carly took a piece of paper and a marker and wrote the word "Dear".
Carly (to teacher): I want to write a letter to Matthew and Justin. How do you spell Matthew?
Teacher: You already wrote "Dear"! Leave some space and then write an "M".
Carly looks at her paper for a few seconds, then writes an M a few mm from the word Dear, looks at it, takes another piece of paper and writes Dear again. She then stops and looks at the new paper for a few seconds. She then puts her left index finger on the right side of Dear and then writes an M. Takes another look at it.
Carly: Anna-Lisa, what comes after M for Mathew?

Case 41:
Space: doctor's desk transformed into a store counter
Actors: Sterling, Quincey
Actions:
Quincey is standing behind the desk playing with a cash register and Sterling, who is wearing a Bad-Man costume and has been watching Sidney for a few seconds, approaches the desk.
Sterling: Can I buy something?
Quincey: Yes.
Sterling: What do you have?
Quincey: Ahhh...
Sterling: Bad-man stuff?
Quincey: Yes.
Sterling: Can I have a Bad-Man book?
Quincey: Yes, it's there on the shelf.
Sterling: OK
Sterling takes a book and walks away.
Quincey: Hey, over here.
Sterling: No, I got it.
Quincey: Sterling, you have to come back.
Sterling: I don't want to. I'm done.
Quincey: You have to pay.
Sterling: Oh, OK. Here you are!
Case 42:
Space: block area
Objects: Big wooden cylinder, sheets
Actors: Ike, Quincey
Actions:
Quincey got in the cylinder by the block area, covered herself with a sheet and was sitting there. Ike saw her, smiled and stepped in the cylinder too, but there was not enough room for both of them to be sitting. Ike stood up, still being inside the cylinder.
Quincey: It's my house.
Ike: Hey, I have an idea. Every house should have a guard. I need someone to guard this house. Why don't you be the guard Quincey?
Quincey agrees with the idea, gets out of the cylinder and Ike gets in. Quincey covers him with the sheet and joins other children at the dramatic play area.

Case 43:
Space: dramatic play area
Objects: Teddy-bear, doll's bath tab, baby-bottle, caps
Actors: Amanda, Sterling
Actions:
Amanda spent about 10 minutes pretending that her Teddy-bear was a baby, feeding and bathing it. The 10 minutes should be considered a long time because Amanda is a very active and energetic child who usually does not engage in the same activity, at the same space, for more than approximately five minutes. Sterling approaches with a cap.
Sterling: Here's some hot chocolate.
Amanda: I don't need any hot chocolate. Stop.
Sterling: I'll bring some water then.
Amanda: I hope this is hot water because she likes hot water.
Sterling: It's hot water (pretends he is pouring water on the baby's head).
Amanda: Nooo. Stop, Sterling.
Sterling: You are the mommy and I'm the daddy.
Amanda: Don't put that in her eyes because this is soap and it hurts her eyes if you pour it inside.
Sterling: I'm not.

Case 44:
Space: Writing area
Objects: Photographs of children's hands showing all the letters in sign language
Actors: Sophia, Amanda, Brian, Larry
Actions:
A group of children are standing in front of the posted photographs. Sophia points at one of the photographs.
Sophia: That’s my hand. I did the S. Where is yours Larry?
Amanda: That’s me and that’s Larry.
Brian: No, Larry starts with L. That’s not Larry.
Amanda: It is. Is that you Larry?
Larry: Yes, that’s mine. See? (places his hand next to its photograph).
Brian: Oh, then who did the L?

Case 45:
Space: Writing table
Objects: markers and paper
Actors: Jacob
Actions:
Jacob is at the art area picking as many markers as he can hold in both hands. He moves to the writing area and puts the markers at the table. Picks a sheet of paper and sits at the table with the paper and markers in front of him. He picks a marker, scribbles on the paper and puts it back on the table. This is repeated about five times and then he picks a marker and looks carefully at his paper. He looks at the point of the marker and then points at the scribble of the same color on his drawing, realizing that he has already used that color. He puts the marker down. He looks at the markers and then his paper and seems confused. He is about to pick another color but doesn’t, looks at the markers, looks at the paper, picks a marker, puts it down. Then he arranges the markers in a line, on his right side. He picks the first marker from the left, scribbles on the paper and puts it on the floor. He repeats this with every marker on the table.
A teacher who thought that the markers had fallen on the floor, gives Jacob one of the containers from the art area that are available when the children want to carry markers to another area.
Teacher: I’ve noticed that there are markers on the floor. Here is a container if you want to use it.
Jacob puts the markers that are on the floor in the container and puts the container on the floor. After using all the markers from the table, he picks a black marker, and writes all the letters of his name, each wherever there is space left in his picture.
Jacob: Look what I made, look what I made. I want to put it in my mailbox.

Case 46:
Space: Writing area
Objects: colored pencils, crayons, scissors
Actors: Larry
Actions:
• Larry is sitting at the writing desk drawing the outline of a rectangular form with two legs. He then colors the shape and starts cutting it following the outline. While cutting, he stops when he reaches the left leg of the shape and whispers: “It’s too long”.

301
• He then cuts the whole leg off, holds it in front of him, looks at it, and puts it on top of the other leg. While keeping it on the other leg, he cuts a small piece off of it. He puts the scissors on the desk.
• He picks the cut leg and looks at it, stands up, looks at the piece of paper in his hand again, sits down, leaves the paper on the desk and stands up again. He goes to the art area, picks some tape and returns to the writing desk. He attaches the leg to the shape, where it originally was.

Case 47:
Space: Writing area
Objects: new monthly class calendar
Actors: Carly, Maria, teacher
Actions:
Maria and Carly are sitting at a table with one of the teachers, to design the new monthly classroom calendar. They are writing numbers in squares for each day of the month. The last number left to write is 31.
Carly: I want to make the 3.
Maria: I want to make the 3 too.
Teacher: Well, what are we going to do? Do you have any ideas?
Carly: Well, I asked for it first.
Teacher: But Maria wants to do that too.
Maria: I have an idea: I can write half of it and Carly can write the other half.
Teacher: That sounds like a fair idea! Are you OK with it Carly?
Carly: Yeah (sounding excited).
Carly stands up and looks towards the kitchen, where another teacher is.
Carly: Anna-Lisa, we figured it out. Both Maria and I are going to write number three!
Maria: I know how to write the days too.
Teacher: Oh, we need someone to write December. Do you want to do it?
Carly: Yes. Maria can write a letter and then I can write a letter. Anna-Lisa, we have a plan for the calendar!

Case 48:
Space: circle time
Actors: Carly, Maria, teacher
Actions:
During the morning circle time the children are asked to say what their plans for the day are.
Carly: Can we have some paint?
Rachel: Yeah, we'd like some paint.
Teacher: Yes. What ideas are going to be thinking about so that I know what colors to bring out?
Carly: I will be thinking of flowers and plants and they have brown and green so I need brown, green and red paint.
Teacher: Are all ideas going to be about flowers and plants?
Maria: No, my ideas will be about tables.
Teacher: Well, do you think brown will work for tables?
Maria: Yes.
Teacher: OK. I will bring some paint and pictures of flowers and tables at the painting easel and if you need anything else, let us know.

Case 49:
Space: Snack table
Actors: Amanda, Carly
Actions:
Carly: I don’t like bubble gum.
Amanda: Why?
Carly: I just don’t.
Amanda: But why?
Carly: That’s how my body was made. It was made not to like bubble gum, so I don’t like bubble gum.

Case 50:
Space: Writing table
Objects: Children’s journals, markers
Actors: Maria
Actions:
- The teachers showed the children the individual folders—journals that they created for each child. Each folder has an enlarged picture of the child as a cover page and a lot of blank pages for children’s drawings/writing. The journals are hung on the wall.
- Maria finds her journal and decides to draw something in it. The first page cannot stay open because the plastic folder cannot stay folded. She tries to hold it open with her left hand but this seems uncomfortable when she is reaching for a marker and when she is drawing.
- She closes the file, walks to the sensory area, looks around for a few seconds, takes a big rock from the shelf, brings it to the writing table and puts it on her folder to keep it open.
- Later she decides to cut the page she was working on from her journal. The position of the rock does not keep the page completely open and that prevents her from cutting it close to the edge. She stops, keeps the page open with her elbow, picks the rock, look at it and turns it around. She places the rock back on the page in a different position. She lays the rock on a larger flat side and closer to the center of the folder, until the page stays completely open. Maria cuts the page and moves to a different activity.
Case 51:
Space: snack table
Objects: waffles
Actors: Amanda, Carly
Actions:
Carly is sitting at the snack table having breakfast and Amanda decides to join her so she goes to wash her hands. While washing her hands she is looking at the snack area and sees that Carly is about to have the last waffle from the tray.
Amanda: Carly, stop it. You are going to finish all the waffles.
Carly: I can eat as much as my body wants.
Amanda: But I want some.
Carly: Well, Anna-Lisa will bring some more.
Amanda: Are you going to eat all of them?
Carly: I can eat as many as my body needs but I promise that it’s not going to be all of them. We can take turns eating and you can go first.
Amanda: That’s OK because I like going first.
APPENDIX C

ANALYZED CASES
CASE #: 17

<table>
<thead>
<tr>
<th>Problem</th>
<th>Problem solving strategies</th>
<th>Problem context</th>
</tr>
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<td><strong>Practical</strong>&lt;br&gt;What prevents the rope from reaching over my head and turning in front of me? (physical properties of rope)&lt;br&gt;<strong>Conceptual</strong>&lt;br&gt;How could the obstacles throughout the jump-rope process be avoided/overcome? (expressive challenge)&lt;br&gt;<strong>Practical</strong>&lt;br&gt;How can I avoid the physical pain that the rope causes when it hits my back? (physical properties of rope)&lt;br&gt;• Taking the shirt off was the solution that Maria came up with for solving the problem of avoiding obstacles for the rope but that solution created a new problem: rope causing pain when hitting her back. Putting her shirt back on but tacking it in was a successful solution to the problem of the rope getting caught.&lt;br&gt;• Carly’s solution was to slow down the pace of her jump-rope attempts and break the process into steps.</td>
<td>• <strong>Problem finding</strong> - It was the girl’s own choice to engage in that activity. Both the teacher and the parent were just observers of the process because the child asked them to be. No comments were made by adults concerning the rope or the child’s shirt.&lt;br&gt;• <strong>Investigation</strong> - Maria was investigating if her shirt was the rope’s obstacle. She hypothesized that it was and took it off to check her hypothesis.&lt;br&gt;• <strong>Commitment</strong> - The process was repetitive and the attempts were lasting a long time and as the father informed the teacher, they had been taking place since the previous day.&lt;br&gt;• <strong>Flexibility</strong> - Maria demonstrated flexibility because when a new problem occur after she took her shirt off, she was willing to undo her original idea and think of another one.&lt;br&gt;• <strong>Reasoning</strong> - Maria verbally expressed why she thought taking her shirt off was not a good idea. Explaining why her first solution ~ to the problem was unsuccessful, was based on thinking about cause and effect, which is a thinking process that requires reasoning.&lt;br&gt;• <strong>Planning</strong> - Was evident in Carly’s analysis of the process into smaller steps. As a result, more attention was paid to the process rather than the product, and her attempts were slowed down and became more careful.</td>
<td>• <strong>Situationally appropriate behavior</strong> - The children’s behavior was situationally appropriate because it was taking place in a space which was safe for them and where the process would not interfere with other children’s work.&lt;br&gt;• <strong>Classroom rules</strong> - It is a school rule that any time during the classroom activities when the children feel they want to engage in any type of physical activity (running, jumping, chasing, etc.), that they do so in the circle area where there is enough space for their bodies and other children’s to be safe. The jumping-rope was taking place in the circle, therefore the process was not disturbed.&lt;br&gt;• The Reggio Emilia and the Lab School children are allowed and encouraged to bring objects / concerns from home to school. This makes the school experience a continuation of the experiences from the rest of the community and the school problem solving more meaningful to the children. Maria was engaged in the jump-rope process when she was at home and the school philosophy allowed her to continue her problem finding in the school environment as well.</td>
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CASE #: 18

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<tr>
<th>Problem solving strategies</th>
<th>Problem context</th>
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<tr>
<td>• Problem finding — It was not the teachers intention not to put water in the extra container to cause practical problems for the children. Carly was the one who discovered the problem for herself. Also, she was not asked to make assumptions about what could happen that caused the situation but she chose to turn the practical problem into a conceptual problem.</td>
<td>• Children's freedom of using the classroom resources. It is not a classroom rule that the paints don't get mixed. The children at the Lab School and the Reggio Emilia schools are allowed to use the materials in any way they want to as long as they are safe. In this case, the teachers did not state the problem. Children's freedom of using the classroom resources leads to problem finding.</td>
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<td>• Investigation — Carly was investigating if there was a way to solve her initial practical problem using the already existing tools and materials. She looked at all the containers carefully, checked the content and tried to find out if using the empty container could provide a solution.</td>
<td>• Teachers taking responsibility - problems as everyday situations. The Lab School teachers don’t hesitate to express that they are responsible for something that happens or doesn’t happen in the classroom and may create a problem. Instead of dealing with problems as mistakes, the teachers consider them and talk about them as normal everyday situations.</td>
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<tr>
<td>• Communication — Verbally stating the problem by asking the teacher for help.</td>
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<td>• Reasoning — Giving an explanation, making an assumption about cause-effect, trying to find the source of the problem.</td>
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<tr>
<td>• Recalling past experiences - Carly’s problem finding and problem solving were based on past experiences with using the same materials in the art area of the classroom. Usually when the teachers are setting up the paints at the easel, they put one brush in each container or they let each child to pick one brush and fill the container with water. Carly chose not to mix the colors and recalled previous experiences for how to achieve this.</td>
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• Practical 
(nature of the medium) How do I keep each color separate using only one brush? 
• Conceptual 
(materializing an idea) How do I get water? (trying to come up with an idea) Why isn’t there any water in the container? 

• Carly's solution to the practical problem was to clean the brush with water before using another color. After being unable to find water in any of the containers at the easel, she decided to ask the teacher to give her some.
## CASE #: 19

<table>
<thead>
<tr>
<th>Problem</th>
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| • Practical  
Where should the school’s new pictures be hanged?  
(problem related to physical properties of objects: framed pictures are usually hanged)  
The teachers stated it as a practical problem, related to the physical world, to the senses: Where would you like to see the pictures?  
The concrete nature of the problem related to the physical world was emphasized by the teachers because when the different ideas were expressed, one of the teachers was writing them down and the other was carrying the pictures and holding them where the children said they would like them to be.  
• Conceptual  
What do we do when more than one ideas get the same number of votes?  
(problem related to inventing /thinking of a process to materialize an initial goal)  
• The practical problem was not solved because the pictures were not hanged.  
• The solution for the conceptual problem was to ask for the opinions of the children who were absent when voting took place. | • Communication – Almost all children had ideas and were willing to verbally express them to contribute to the solution of the problem. Carly, however, chose to also verbally express and communicate her reasoning behind her idea and that made the idea more convincing for other children.  
• Reasoning – Explaining their choices. Giving more information about their thinking behind a choice that was made.  
• Recalling previous experiences – recalling how a doctor’s office looks like or where else she saw framed pictures on walls.  
• Making connections between contexts – associating the context of a doctor’s office with the context of the classroom (desk area).  
• Flexibility – Respecting the ideas of others, not being focused on own ideas. Not only being flexible enough to listen to and consider/accept the other children’s ideas, but suggesting that children who are absent need to be listened to as well to decide how their problem could be solved. | • Teachers’ reasoning and serious responses to all children’s ideas showed that all ideas are taken seriously. Encouraging children to take their own and each other’s ideas seriously and put more effort in their problem solving.  
• Communication.  
Teachers ask children to elaborate on their answers, explain their ideas verbally and communicate. According to the Reggio philosophy, children’s expression makes their thinking “visible” to the teachers and themselves. Communication clarifies problems and solutions.  
• Reggio philosophy – Children are considered responsible individuals. In the Lab School classroom the children are empowered by being considered responsible for what takes place in their environment. Even if it was a teacher who initially suggested voting for problem solving, later when the problem was not solved, the children were asked to come up with a different plan. Children were familiar with the process of voting for decision making. In this case, the children took the voting concept a step further by deciding to consider the ideas of the children who were absent. Allowing the children to assume responsibilities for situations that are concrete and that they can relate to, motivates them to expand their thinking and follow different paths for solving problems. |
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<tr>
<th>CASE #: 20</th>
<th>Problem solving strategies</th>
<th>Problem context</th>
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<tbody>
<tr>
<td>• Interpersonal Problem solving strategies Problem context</td>
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<tr>
<td>Planning a play theme. What role should be assigned to each child? Problem not solved, roles were not assigned within the group.</td>
<td>• Problem finding – group play was not assigned by teachers or other peers, children's decision to play together. • Reasoning – trying to explain how she came up with an idea, giving a reason for her choices.</td>
<td>• Situationally inappropriate behavior. Refusing to listen to peers or adults is not acceptable in the Lab School classroom. Problems among children are usually discussed and the children are encouraged to plan a solution with each other.</td>
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CASE #: 21

<table>
<thead>
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<tr>
<td>• Interpersonal Planning a play theme. How do I draw peer attention after my choice of play partners has been rejected? Sophia is a child that likes group play, she is rarely observed working by herself, and in more than one occasion she was observed crying when after a play conflict a peer told her that she couldn't be her friend or go to her birthday party. Sophia is sensitive in terms of social relationships. Problem solved – children responded positively to Sophia's words.</td>
<td>• Respect for all ideas, even individual. Sophia was encouraged to express her idea even if she didn't have a play partner. The play themes of individual children are discussed and are considered open to the participation of others. • Humor is a quality that is valued and developed at the Lab School. The teachers often tell funny stories and when they noticed that the children demonstrated interest in telling jokes, they motivated them to explore that by bringing funny books to the classroom or singing funny songs. The idea was to help the children develop humor without being insulting. Funny children were observed to be popular among the Lab School community. • Imagination – Humor.</td>
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### CASE #: 22

<table>
<thead>
<tr>
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| Practical / Interpersonal  
Not enough materials for everybody-practical. How do we get materials for another child who wants to participate? (sharing materials, making mutually agreed upon plans - interpersonal)  
• The problem was practically solved because after the two girls left, there were enough tools and materials for other children. Interpersonal aspect not solved - children unable to make a decision as a group, the group was divided and two of the three girls, who were previously playing as a group, left. | Reasoning – attempting to compare concepts: giving if you have a lot, keeping if you have less. However, excluding self from the process of sharing. Giving a solution based on what someone else should do rather than self. | Situationally inappropriate behavior  
Not considering peers' perspective before decision making. Making individual decisions rather than group decisions (being self-centered). The Lab School and the Reggio Emilia approach adopt a socioconstructivist perspective based on which, decision making should have a community / group focus. |

### CASE #: 23

<table>
<thead>
<tr>
<th>Problem</th>
<th>Problem solving strategies</th>
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| Interpersonal  
Joining a peer's game but not following the rules of that game – conflict of play rules within a group.  
• The problem was solved when the child who joined the game left. The child who was initially playing the game by herself, continued doing so. | Flexibility – The teacher helped Sidney to develop flexibility and consider other play possibilities rather than insisting on disrupting someone else's idea. | Producing situationally appropriate verbal and non-verbal behavior.  
-calm your body down, use regular voice.  
Communication / Social skills  
• Importance of group work. Ideal solution: both children flexible and both changed their initial goals to continue working together. It is the teacher's philosophy, however, to respect children's choices. Since Maria's game was initially individual, she had the right to follow her own rules and anybody who chose to join her should also respect those rules, unless they both agreed on changing them. Maria's choice was to maintain her initial idea and that was respected by both the teacher and Sidney. |
## CASE #: 24

<table>
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<tr>
<td>• Practical What I’m doing wrong while trying to make flubbles? (Related to physical properties of objects and lack of skills when using tools and materials)</td>
<td>• Problem finding Maria recalled other children’s play with flubber and decided to try it. The teachers were not suggesting to the children how to use the tools and materials. It was her own decision to attempt creating bubbles. She knew what the process was but couldn’t figure out why it wasn’t working. • Communication The problem was expressed verbally to the teacher and then a peer. Not hesitating to ask for help. • Investigation - Observing others and patterning behavior Maria was carefully observing what Larry was doing when he was demonstrating the process of making flubbles and she found out what the steps of the process were. She later used them repeatedly. • Commitment After Larry left the flubber table, Maria was observed trying the process over and over until she achieved her goal. Her initial attempts were not successful because she was not holding the flubber tied around the straw and the blown air was coming out through the holes instead of pressing the flubber to create bubbles. However, she continued repeating the process for a long time and then carefully observed Larry and tried it again until she finally learned how to do it.</td>
<td>• Children as experts Children are considered as knowledgeable individuals when they come to school and their abilities are valued (Reggio Emilia). According to the Lab School teachers, the children know a lot more than most educators give them credit for and than what they let us believe they know. The Lab School teachers empower the children by considering them experts in some fields and they often encourage them to demonstrate their abilities for guiding peers. The Lab School teachers do not pretend that they know everything about children’s interests and concerns and they motivate peer guidance and support during children’s problem solving.</td>
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<tr>
<td><strong>Problem</strong></td>
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<tr>
<td>• Interpersonal</td>
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<tr>
<td>Sharing – Using someone’s toy from home when it was found on the floor.</td>
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<td>• Problem solved – The school community already had a rule about situations like this. Children involved in this situation followed the classroom rule.</td>
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| **Problem solving strategies** |
| • Planning |
| Children involved made a plan, agreed on, how the toy should be used, by whom and for how long. |
| • Flexibility |
| Both Carly and Sophia demonstrated flexibility by being willing to change their initial focus for the sake of solving the problem. – Considering others’ suggestions. – Offering alternative solutions for other children’s problems |

| **Problem context** |
| • Teacher’s role was to remind the children about the classroom rule. Classroom rules did not provide solutions but understanding of what is fair and how problems should be solved. |

<table>
<thead>
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<th>CASE #: 26</th>
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</thead>
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<td><strong>Problem</strong></td>
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<td>• Interpersonal</td>
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<tr>
<td>After unsuccessful attempt to engage in group play, attempt to draw peer attention, having conflict of personal goals within the group.</td>
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<tr>
<td>• Problem not solved (?) – Personal goals continued to be different. Children played individually.</td>
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| **Problem solving strategies** |
| • Reasoning \ hypothesizing |
| Trying to explain and justify her request. |

| **Problem context** |
| • Choices – Context of free play that allows children to set their own goals and make choices about maintaining or changing them. |

<table>
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<th>CASE #: 27</th>
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<tr>
<td><strong>Problem</strong></td>
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<tr>
<td>• Interpersonal</td>
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<tr>
<td>What do we do when someone is asking us to do something that we don’t want to do? (Assigning roles within the group, assuming the role of the leader, limiting other group members’ resources).</td>
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<tr>
<td>• Problem not solved. Stopped making plans for group play.</td>
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| **Problem solving strategies** |
| • Analyzing information \ interpreting messages. |
| Sophia interpret Rachel’s messages as attempts to make choices for other members of the group and expressed he thoughts. |
| • Communication |
| Verbal expression of thoughts, likes/dislikes. |

| **Problem context** |
| • All aspects of daily classroom life at the Lab School and the Reggio Emilia schools, even having snack, are considered socializing opportunities. Situations where preschool children are asked not to talk at the table, observed in other schools, were never observed at the Lab School. |
**CASE #: 28**

<table>
<thead>
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<th>Problem</th>
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<tr>
<td><strong>Interpersonal \ Conceptual</strong>&lt;br&gt;Attempt to express personal interest and participate in other children's play too. Trying to make group play ideas compatible.&lt;br&gt;How can I engage in animal play and restaurant play at the same time?&lt;br&gt;• Problem solved – Raen continued pretending she was an animal but had a successful meaningful interaction with Sterling at the same time.</td>
<td><strong>Imagination</strong> – storytelling, creating a common ground for pretend play. Managed to combine both children’s interests.&lt;br&gt;<strong>Flexibility</strong> - willingness to modify initial idea according to peer play theme/rules to solve the problem.</td>
<td><strong>Play</strong> forms as active technique for solving conflicts and problems. Pretend play, change scenarios to make a situation pleasurable for everyone.</td>
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**CASE #: 29**

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<th>Problem</th>
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<tr>
<td><strong>Conceptual</strong>&lt;br&gt;What is this person doing in the classroom and how is he doing it?&lt;br&gt;• Problem solved. Carly’s questions were answered through her verbal interaction with the carpeting company representative and after asking a few questions she moved to a different activity.</td>
<td><strong>Problem finding</strong>&lt;br&gt;The teachers did not talk about the visitor of their classroom and his job. It was Carly’s own decision to follow his activity after noticing him in the room.&lt;br&gt;<strong>Investigation</strong> – <em>Observing the environment and asking questions.</em>&lt;br&gt;Related to problem finding. Formulating questions after making observations. Related to problem solving if attempt is made to find answers to the question. Carly used investigation for problem solving because she searched for answers for her questions.&lt;br&gt;<strong>Commitment</strong> – Relatively long time spent for the task of distant observing and questioning, without being distracted.</td>
<td><strong>This case offers support for Reggio Emilia philosophy concerning the power of the environment as the third teacher:</strong> When children come in contact with new materials and situations, they learn to ask questions and become self-motivated investigators. Being receptive to new situations, objects, materials etc. leads to problem finding. Carly has been a member of the Lab School community for a long time and looks for problems and investigation even in situations that are not planned by the teachers for problem solving.</td>
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**CASE #: 30**

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| • *Conceptual* Representational / expressive challenge.  
What does the writing on the envelope stand for?  
• Problem solved – Larry recognized his name and Carly verified that it was indeed his name by identifying each letter. | • *Problem finding*  
Being receptive / sensitive to environmental resources. Creating own problem solving situations.  
Carly and Larry decided to find out what the writing on the card was, on their own; were not asked to do so by the teachers/parents/children.  
• *Investigating* - Studying the visual qualities of representations and drawing conclusions.  
Noticed that the first letter of the word was capitalized, assumed that it was a name. After further study of the letters, Larry recognized his own name and Carly's study verified Larry's conclusion.  
• *Reasoning* – Analyzing information, making connections.  
Quincey brought the gift for Larry. The card that she also gave him may be saying her name. | • *Collaboration / communicating ideas* facilitates problem solving. It might have taken longer time for the individual children to find out what the card was saying, if they were working by themselves. By collaborating on solving the problem their discoveries and explanations were built upon each other's, step by step, until a satisfying solution for both children was achieved. |
### CASE #: 31

<table>
<thead>
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<th>Problem</th>
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<tr>
<td>• <strong>Conceptual problem</strong> - requiring interpersonal negotiation. How can I keep the doll and continue my own play idea, without causing a conflict?</td>
<td>• <strong>Imagination</strong> - Storytelling, play scenario. Story convincing to the other children. Quincey and Mackenzie seemed puzzled because even if they wanted to use the doll, Maria’s story made sense to them and proceeded to assuming alternative roles within the same play theme.</td>
<td>• The important role of play in problem solving. Fantasy play and storytelling as problem solving strategies are not mentioned in the Reggio Emilia literature. The Reggio approach seems to emphasize a more scientific method for investigating situations (studying real life resources, drawing from nature, taking notes). Lab School problem solving is often achieved through imaginative scenarios that children come up with.</td>
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<tr>
<td>• Problem solved – Maria keeps the doll and group play continues.</td>
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| - Conceptual problem - related to physical properties, choosing resources. How can the idea of role play as Blue's Clues characters be materialized? What dress-up ideas are practically possible in the classroom that would serve as a Blue's disguise, since an actual costume is not available? | - Flexibility  
Amanda's initial idea was to play Blue's Clues with a child that had a blue dog costume on. Other alternative ideas that were suggested by the teacher and other children were rejected but Amanda was flexible enough to compromise and seek for a more open idea for her play theme. Her idea and main goal remained the same but the resources were reconsidered. | - Teacher defining the boundaries for children's ideas - Encouraging them to consider the available resources.  
The teacher pointed out that Amanda's initial idea would not be possible because of the limitations that Amanda was creating. Children's ideas may become so imaginative that it may be impossible to materialize them. Usually, the Reggio and Lab School teachers allow children to choose what resources they would like to use to materialize their ideas, when the ideas are carefully planned and may lead to deeper investigation or project work, even if they know that it wouldn't be the "best" choice. Children would be allowed to try the materials and discover themselves if they can use something else instead. In this case, it was not possible for the teacher to provide what one child needed, so she clearly explained to the child why that idea would not be materialized and pointed out the need for a different plan which would involve a more concrete study of the available resources. |
| - Problem solved  
Anyone who wants to be Blue can use the blue face paints from the art area and mark his/her face. | | |
CASE #: 33

<table>
<thead>
<tr>
<th>Problem</th>
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<tr>
<td>Practical - Where is my paper?</td>
<td>• Reasoning</td>
<td>• Classroom rule: All children's work that should not be thrown away, should either be placed in the cubbies or mailboxes.</td>
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<tr>
<td>Conceptual - requiring interpersonal</td>
<td>• Explaining / justifying her actions.</td>
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<td>negotiation. How can I look at the paper</td>
<td>• Communication</td>
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<td>that Carly is holding?</td>
<td>• Verbally expressing the problem.</td>
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<tr>
<td>Problem solved</td>
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<tr>
<td>Maria was allowed to look at Carly's paper</td>
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<td>and realized it wasn't her own. Continued</td>
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<td>looking for it and found it elsewhere.</td>
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**Case #34**

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<th>Problem</th>
<th>Problem Solving Strategies</th>
<th>Problem Context</th>
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</table>
| • Conceptual  
How do I decide which girl I am going to marry?  
After drawing the conclusion that only two people can get married, Ike had to decide which of the two girls he was going to play with. He was searching for an idea to help him make his decision.  
• Problem solved by playing “Eanie, meanie” and choosing Mackenzie.  
• Interpersonal / Conceptual  
How can I play with both girls without upsetting neither of them? How can marrying two girls be justified? Sophia was upset after Ike chose Mackenzie. Both girls are Ike’s friends. These children were observed playing together every day and developed peer culture (shared routines, play themes, behaviors). Ike wanted to play with both girls, so the problem had an interpersonal aspect. He was also dealing with a conceptual problem because, like he verbally expressed, he knew that marriage involves only two people. He was searching for an idea that would conceptually make sense to the group and justify the fact that he wanted to play with (“marry”) both girls.  
• Interpersonal problem solved because all three children ended up playing together  
• Conceptual problem was, in a way, solved because the results of the game justified marrying both girls. | • Flexibility  
Even if Ike’s understanding of marriage was that there can only two people be involved, he prioritized between his conceptual and the new interpersonal problem and developed flexibility when he focused on the interpersonal problem rather than emphasizing his initial conceptual decision.  
• Imagination  
The “Eanie, minic” game was used in an unconventional way because after the poem would stop, Ike would add other words. Deciding to have tie in that game is also an unusual situation, which, however served Ike’s decision to play with both girls. | • The context of play facilitates imagination which is a problem solving strategy. When children play, and make their own rules for their games, they have to make decisions and fantasy justifies their decisions.  
• The Lab School teachers remind children that reality is different than their pretend situations. They don’t limit the development of children’s imagination, but they try to help the children distinguish between reality and pretend play. |
CASE #: 35

<table>
<thead>
<tr>
<th>Problem</th>
<th>Problem solving strategies</th>
<th>Problem context</th>
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| • Practical  
Problem caused by physical properties of tools and materials - not enough space for everybody's structures. The block area was filled with children's "saved" structures and the practical problem that some children were facing was that there was not enough space left for their structures. However, the children's focus was not on the physical properties of the materials but on the play theme/idea. Therefore, their problem required a conceptual solution. Where do I build my structure?  
• An interpersonal / conceptual solution was given to the problem by deciding to collaborate and share space and materials for a new play idea. | • Flexibility  
Even if each child had an individual construction idea (vehicle / robot / spaceship), they were willing to compromise and focus on similarities (action play) rather than detail differences of their individual goals. Flexibility expressed as tolerance, acceptance of others, sense of group, peer culture.  
• Imagination  
The conceptual solution to the problem was based on storytelling. A new play scenario was invented, which combined children's shared interests. | • Incidental problem solving - occurring during playful activities of manipulating objects with focus on play theme.  
• The rule that structures with a "save" sign can not be destroyed created the practical problem.  
• Development of peer culture contributes to the solution of the problem. This group of children share the same interest in action play (space, superheroes) and play together as a group every day. The fact that they had already developed routines and discovered their common interests, helped them deal with the limitations of the environment as a group. |
### CASE #: 36

<table>
<thead>
<tr>
<th>Problem</th>
<th>Problem solving strategies</th>
<th>Problem context</th>
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<td>• Conceptual problem rooted in differences of personal focus within a group. What is the group’s goal in this activity and how can it be materialized? Larry’s conceptual concern about Brian’s painting was that apples are red, therefore they shouldn’t have been painted blue. Larry verbally expressed his concern to Brian and that idea caused Brian a different conceptual problem. Brian’s problem was not related to the real color of fruits because he knew and had expressed that apples are red. The fact that he stopped his previous drawing process and was looking at his painting, shows that his goal was reconsidered and had changed from engaging in purely motor activity, to engaging in a more conceptual activity. • Problem solved. Mutual goal was reached, “wrong” area of drawing ignored.</td>
<td>• Problem finding&lt;br&gt;Situation which the children were voluntary involved in. Problem not imposed by teacher or peers. Brian’s focus on group work led to problem finding. • Investigation&lt;br&gt;Observing peer behavior and adopting goals and focus of activity. • Flexibility&lt;br&gt;Brian was able to change the focus of his activity easily, to parallel the ideas of the group’s verbal interactions.</td>
<td>• Children’s sense of developing peer culture and their personal differences lead to problem finding. • Children have different views on the nature of art making. Larry viewed drawing as an individual process. He was at the writing area first and the other boys joined him later. Larry’s goal was to paint the representations the way they are in nature. Brian viewed drawing as a social process and was changing his focus/goal to match that of the group (conversations). Brian’s initial focus was on the physical action of painting (not looking at the painting and not taking time to pick colors - was not paying too much attention on what was represented and how he would want to color it).</td>
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### CASE #: 37

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<thead>
<tr>
<th>Problem</th>
<th>Problem solving strategies</th>
<th>Problem context</th>
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<tbody>
<tr>
<td>• Interpersonal&lt;br&gt;How can all participants in the group play stay happy with the process? Rachel noticed that only one child was repeatedly winning and that the other children were getting disappointed and upset with the process. • Problem solved. All children given the opportunity to win and that kept them happy.</td>
<td>• Problem finding&lt;br&gt;Being receptive to other children’s emotions led to problem finding. • Imagination and flexibility&lt;br&gt;Storytelling, changing the sequence of events in the pretend play scenario to fit the needs of all participants.</td>
<td>• Pretend play allows for developing imagination and being flexible with possible stories, qualities that facilitate problem solving.</td>
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**CASE #: 38**

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<tr>
<th>Problem</th>
<th>Problem solving strategies</th>
<th>Problem context</th>
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</thead>
<tbody>
<tr>
<td><strong>Interpersonal / Conceptual problem</strong> How can I accept peer invitation to participate in group play and finish my previous activity at the same time?</td>
<td><strong>Imagination</strong> Telling a story which is supported by and supports peer's play idea. Adding a new dimension to the pretend role that was assigned to her by her peer.</td>
<td><em>Children’s freedom of choosing to stop an activity before they finish it and return to it later.</em></td>
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<tr>
<td>• Problem solved. Carly finished her own task first and then joined Larry’s game.</td>
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**CASE #: 39**

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<tr>
<th>Problem</th>
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<tbody>
<tr>
<td><strong>Conceptual (comparing ages - older, younger)</strong> Are our bigger brothers the same? Is there a difference between two big brothers' age?</td>
<td><strong>Flexibility</strong> Ike was open minded because he listened to the other children's ideas carefully. His initial understanding was: I have an older brother, Maria has an older brother, therefore our brother's are the same. His conversation with his peers helped him compare ages from a different perspective (compared the brothers' ages, excluding his and peers' ages from the comparison).</td>
<td><em>In the context of communication, discussion and constructive dialogue, even abstract concepts, such as age, can be understood by the children or start to develop. Knowledge is built step by step according to the children's own pace of understanding because they become in charge of their learning, whereas teaching them these concepts may be meaningless if they are not ready or interested.</em></td>
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<tr>
<td>• Problem solved. All children agreed that Spencer is older than Walden even if they are both bigger brothers.</td>
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**CASE #: 40**

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<tr>
<th>Problem</th>
<th>Problem solving strategies</th>
<th>Problem context</th>
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<tbody>
<tr>
<td><strong>Practical</strong> - related to the nature of the medium and lack of extensive experience in using it. What's a practical way to decide how much space to leave between words?</td>
<td><strong>Commitment</strong> Not giving up. Trying to do better.</td>
<td><em>Teacher gave basic guidelines by responding to the child's initial request for help but did not create any limitations for her process. Left the guidelines open, not too specific but not too abstract either and that allowed the child to have more questions and seek answers by herself.</em></td>
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<tr>
<td>• Problem solved - Carly was content with the length of space that she left between the words after her unsuccessful first attempt.</td>
<td><strong>Investigation</strong> In the form of experimenting with new resources. Incorporating new methods in the process to achieve wanted result (using her finger to leave space between the words).</td>
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<tr>
<td>Problem</td>
<td>Problem solving strategies</td>
<td>Problem context</td>
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</table>
| • Conceptual / Interpersonal  
What play idea could be suggested to support both our pretend roles? The idea / process can not be conceptually over yet. How can I convince Sterling to help me finish it?  
• Problem solved. Sterling’s interpersonal problem was solved because the children spent time playing together after he pretended that he was Bad-Man going shopping at Quincey’s store. Quincey’s problem was also solved because her and Sterling at the end continued their role play until the activity was conceptually finished. | • Imagination  
Creating a scenario for pretend play, assigning roles not verbally but by acting out a role himself. Sterling used his imagination to come up with a story which served both children’s interests.  
• Recalling past experiences not only was the source for Quincey’s conceptual problem, but also allowed Sterling to understand her point of view.  
• Communication  
Verbal expression and explanation of the conceptual problem was a strategy that helped Quincey convince Sterling that there was a problem that needed to be solved. | • Purposeful pretend play. |
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<tr>
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<tr>
<td><strong>Practical problem</strong> - related to physical properties of materials. Cylinder too small for both children. However, the child's focus was not on the physical properties of the materials but on the play theme/idea. (similar to Case 35). Therefore, the problem required a conceptual solution. Also required an interpersonal solution because another child was involved. - How can I use the cylinder by myself without upsetting Quincey? Need for a play idea that would relocate but not disrupt Quincey's pretend play.</td>
<td><strong>Problem finding</strong> Ike's problem came from his respect and caring for his friend. No matter how much he wanted the cylinder, he did not demand it from her. He respected the fact that she was using it first and tried to maintain her play theme while thinking of a different role for her.</td>
<td><strong>Incidental problem solving</strong> - occurring during <em>playful</em> activities of manipulating objects with focus on play theme.</td>
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<tr>
<td><strong>Problem solved</strong> Ike ended up with the cylinder and Quincey continued her play around the cylinder until she finally moved to a different activity.</td>
<td><strong>Imagination</strong> Inventiveness, storytelling, extending transforming someone else’s idea to align it with personal goals.</td>
<td><strong>Peer culture</strong> - Friendship among children affecting problem finding and problem solving.</td>
</tr>
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CASE #: 43

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<tr>
<th>Problem</th>
<th>Problem solving strategies</th>
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</table>
| • Interpersonal / conceptual for Sterling. How can I participate in Amanda's play? | • Problem finding  
Achieved through risk taking. Even if Amanda was observed playing by herself for a long time, Sterling did not hesitate to try to join her play. | • Sense of community life in the classroom  
It is a Lab School rule that spaces and objects of the classroom belong to everybody and it is not OK to ask other children to leave or tell them that a classroom object is yours and they can't use it.  
The tone of Amanda's voice and mood (rejecting Sterling's ideas) expressed that she didn't really want to engage in peer play. She didn't seem like having any problems playing by herself. Yet, she never asked Sterling to go somewhere else or leave her alone. |
| • Conceptual for Amanda. Sterling was a disruption to her game because at first he was not familiar with exactly what she was doing. | • Commitment  
Not giving up after his initial attempt to participate in Amanda's play was rejected. | |
| • Problem solved for Sterling because he managed to participate in Amanda's play. Problem also solved for Amanda because Sterling stopped being a disruption to her game. She had expressed no further dislikes about Sterling's decisions within the play context. | • Investigation  
Through peer observation, patterning behavior and adopting goals. Sterling observed what Amanda was doing and figured out that she was playing mommy. After his hot chocolate offer was rejected, he adopted Amanda's bathing baby idea and became the daddy bringing hot water. | |
| • Communication  
Amanda's strategy for solving her problem was telling Sterling what her ideas were. | | |
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</table>
| • Conceptual - "translation problem"  
  Which is the photograph of Larry's hand?  
  Trying to perceive/recognize something that was taken from reality (Larry's hand) and was represented in a different language (photograph). | • Problem finding  
  A child's question and the conflicting opinions of two other children caused the development of the problem and the attempt to solve it.  
  Also related to communication - The problem was further investigated because there were conflicting opinions about the initial question, which were openly expressed and respected.  
  • Investigation  
  In the form of constructive discussion among the children. Asking questions, seeking answers.  
  • Reasoning  
  In the form of explaining personal opinions and ideas. The problem continued to be investigated because Brian clearly explained his reasoning behind his idea that the picture in question was not representing Larry's hand. Problem solved when Lany also explained his reasoning, in a visual way. | • Meaningful, fruitful, healthy conflict.  
  Constructive discussion and negotiation of learning among children.  
  • Each child is a unique individual and that affects the strategies they use to solve problems. Brian focused on the conceptual characteristics of the photograph in question and the letter it represented, which was not Larry's initial. Amanda, on the other hand, focused on the visual characteristics of the photograph and the fact that the hand represented looked like Larry's hand. Encouraging and motivating children to collaborate and join their efforts and unique skills and abilities, helps them learn from each other solve problems successfully and in a simple way that may be hard to teach. |
**CASE #: 45**

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<tr>
<th>Problem</th>
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<th>Problem context</th>
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</table>
| • Practical  
Related to inability to organize the materials due to unfamiliarity with using them. Jacob is a new young child in the classroom community whose motor skills in holding writing tools are not developed yet and who is rarely engaged in any writing activity in the classroom. 
Task: Find a way to keep the already used markers separated from those not used yet. — requiring conceptual solution / an idea.  
• Problem solved.  
Finds a way to organize tools. | • Problem finding  
Seemed that he had an idea for what he wanted to achieve. His inability to organize the tools imposed a practical problem on him. It was not his goal to set a problematic situation, but it was his own choice to try to solve it.  
• Planning  
Thought of a practical process with specified steps. Putting used markers on the floor.  
• Flexibility  
Accepted the possibility of the container for improving his plan. | • Teacher not offering a definite solution to the problem but just a possibility for another choice.  
• Teachers’ help more evident during practical problem solving. It is a Reggio belief that the children are benefited when the teacher does not hesitate to give guidance during practical problem solving because that would save children valuable time for mastering skills and solving conceptual problems. |
**CASE #: 46**

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<thead>
<tr>
<th>Problem</th>
<th>Problem solving strategies</th>
<th>Problem context</th>
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</table>
| • Practical  
How can I make the second leg as short as the first leg?  
Preconceived idea: Need to have a shorter leg.  
Task: Cut as much off of the leg to make it look the same as the other one.  
How can I physically/practically compare the two legs?  
How do it attach the cut leg back to the form? | • Problem finding  
Compared visual properties of forms (legs), had a clear idea about how he wanted is drawing to look like and stayed focused on it.  
• Planning  
Small steps, not the whole process was planned ahead. Planned how to cut the second leg, then stopped and made another plan about how to attach it back to his drawing. Making immediate, short-term plans.  
• Recalling past experiences  
Use of tape to attach two pieces of paper. Was not experimenting with new resources because. Enormous use of tape daily. Most children are familiar with the physical properties of tape. | • Context of making choices and having a plan.  
• Was his original idea to make two legs of that specific size or just two legs of the same size?  
Later idea was to have the second leg looking like the first one. He chose to cut the long one instead of enlarging the small one. The problem of having two legs of unequal length was discovered when he was cutting the second leg. The first one was already cut and approved. The problem was defined while cutting the second leg, therefore, it can be assumed that it was the second one that caused the problem. He chose to cut the second leg either because conceptually he wanted both as long as the first one, or because practically it was easier to cut off parts than add to the already finished parts. |

He first compared them by putting one on top of the other and then used tape to attach the second one back to its original position.
CASE #: 47

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<tr>
<th>Problem</th>
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<tr>
<td>Practical - practical difficulty in materializing an idea, limitations derived from unavailability of enough resources. How can we both write the #3 when there is only one left? Interpersonal - Both children wanted to use what was available and neither would change their minds. Conceptual - The children were asked by the teacher to make a plan, come up with an idea.</td>
<td>Problem finding Developing peer culture as a source of problem finding and problem solving. Idea of sharing defined the problem. Flexibility Being willing to compromise</td>
<td>Teacher clarifying the need for a decision that would solve the problem, facilitators of decision making process, not offering solutions, asking the children to solve their own problem.</td>
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<tr>
<td>Problem solved. Both girls shared the task of writing a part of the #3. The idea was continued.</td>
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<td>Children playing together on a daily basis are observed saying and doing what the other is, engaging in the same activities, sharing objects, hence developing peer culture. Peer culture can be the source of problems but it can also be the source of finding solutions to problems. Children within friendship groups express compassion and support towards other members of their group and become open minded, flexible and inventive for successful problem solving.</td>
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CASE #: 48

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<thead>
<tr>
<th>Problem</th>
<th>Problem solving strategies</th>
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<tbody>
<tr>
<td>Conceptual What will I be painting and what colors would I need to materialize my idea?</td>
<td>Planning Making decisions about the goal, purpose, theme of activity. Reasoning Making connections between the object that will be represented and color.</td>
<td>Teacher stated the problem but explained it justified the need for solving it. The fact that the teachers emphasize the need for making plans for activities does not limit children's spontaneity. They encourage children to ask for new tools and materials any time they decide to do so even if they were not mentioned in their initial plans. Planning makes process focused, organized and purposeful.</td>
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<tr>
<td>Problem solved. All children who expressed interest in using the easel to paint, made plans about their painting themes and asked for specific colors that they were thinking of using.</td>
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**CASE #: 49**

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<tr>
<th>Problem</th>
<th>Problem solving strategies</th>
<th>Problem context</th>
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</table>
| • Conceptual  
  Why don't I like bubble gum? | • Reasoning  
  Carly gave a reason for what she was claiming. She gave an answer, which was stated as a fact that could not be doubted. | • Teachers always try to encourage children to control their bodies.  
  "When your bodies feel like running, come to the circle area", "Keep your body safe", "Calm your body down", "If your body is not in pain, you don't need to cry", "If your body tells you you are tired, then it may be a good idea to rest for a while during nap time".  
  They are trying to help children differentiate their physical needs from mental conditions and prioritize mental activity. |

- Problem solved. Carly gave a convincing explanation why she doesn't like bubble gum which "made sense" and Amanda stopped asking why.

**CASE #: 50**

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<tr>
<th>Problem</th>
<th>Problem solving strategies</th>
<th>Problem context</th>
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</table>
| • Practical  
  Related to the physical properties of media, plastic folder would not stay open.  
  How can I keep the plastic folder open? | • Problem finding  
  Maria's problem was caused by the media but she chose not to ignore it and seek a solution for it.  
  • Investigation  
  Experimenting with the rock. Trying different possibilities of using it to achieve a preconceived goal. Had the rock and tried to find the right position for it to keep the folder completely open.  
  • Imagination / Flexibility  
  Willingness to use a tool in an unconventional way. A rock that is not usually associated with the process of drawing. Left the art area and moved to the science area to look for a solution to her problem. | • The teachers created the folders after observing children's developing interest in using notebooks and notepads, so that the children can have an organized space for their drawings and writing. The fact that Maria was choosing to use the journals as a source for paper was not a problem for the teachers and her activities were not disrupted. If she used all the sheets from her journal and asked for some more to be added in it, she would also be encouraged to think about her choices and decide if there could be an easier source for paper and consider other ideas for her journal.  
  Children's ideas are not disrupted even if they don't align with teachers' goals but children are always encouraged to revisit question, reconsider and reevaluate decisions. |

- Problem solved. Maria found a way to keep the folder open.
CASE #: 51

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<tr>
<th>Problem</th>
<th>Problem solving strategies</th>
<th>Problem context</th>
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<tbody>
<tr>
<td>• Practical concern: I want to eat some waffles and Carly is having the last one. How do I save some for myself?</td>
<td>• Problem finding Practical difficulty in materializing an idea (having breakfast), limitations derived from unavailability of enough resources (Carly was having the last waffle).</td>
<td>• Carly's response affected by teacher behavior. Listening to teachers and common phrases that they are using and adopting their behavior.</td>
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<tr>
<td>• Problem solved. Amanda stopped worrying about the situation and changed the nature and topic of discussion.</td>
<td>• Communication Expressed concern initiated conversation / definition and exploration of the problem.</td>
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<td>• Reasoning Carly explained the reason why she could eat the waffles: because her body needed them and the teacher would bring more.</td>
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<td>• Planning Carly suggested a possible way to continue eating.</td>
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APPENDIX D

SECOND LEVEL OF ANALYSIS
SITUATED LEARNING AND THE REGGIO EMILIA PHILOSOPHY

<table>
<thead>
<tr>
<th>CONTEXTUAL FACTORS</th>
<th>CASES</th>
<th>EFFECT ON PROBLEM SOLVING</th>
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<tbody>
<tr>
<td>Activities grounded in the actions of everyday situations</td>
<td>20, 21, 23, 26, 28</td>
<td>• Play is part of children's everyday lives. Play, especially group play, becomes part of the Lab School classroom life as well. When children attempt to plan play themes, assign roles, join peer's game or manipulate objects, interpersonal as well as practical problems may occur. Children's play at the Lab School is an everyday situation because children are encouraged to freely explore play themes that interest them. Cases 20, 21, 23, 26 and 28 describe everyday, ordinary situations during morning activities at the Lab School, when children are free to make choices and express ideas. During these cases, children chose to plan play themes or participate in peer play. Their spontaneous attempts of finding play partners, led to interpersonal problem solving. Playful theme explorations are spontaneous and voluntary by the children because they are part of their everyday life. In the classroom context, they lead to problem finding and spontaneous, voluntary and self-motivated problem solving attempts.</td>
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<td>Play situations and interaction</td>
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<td>• An important aspect of everyday life, according to the Reggio Emilia and the Lab School philosophy is communication and interaction among the members of a community. During children's play, the teachers encourage small group work, communication and interaction to the point when children interact with peers on their own. Activities grounded in everyday interactive situations mainly cause interpersonal problem finding and problem solving.</td>
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<td>Holidays and celebrations</td>
<td>32</td>
<td>Holidays and celebrations, such as Halloween, Thanksgiving and birthdays, which are everyday situations in the broader community, are also brought in the Lab School classroom. During Case 32, for example, Amanda had a Blue's dog costume at home and expressed her choice to play Blue's Clues in the classroom as well. A problem was defined when the teacher pointed out that Amanda's idea would not be possible because the preschool did not have a Blue's costume. When situations that are taken for granted in the community or the children's home, are brought in the classroom, problems may occur for the children because of the classroom's physical limitations compared to the broader community, such as the unavailability of all resources for children's ideas and reproduction of the situations that they are familiar with outside the classroom.</td>
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<tr>
<td>Problem solving as everyday situations</td>
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<td>Problem solving itself is considered as an everyday occurrence in the Lab School classroom. Case 18 offers evidence of how the Lab School teachers do not hesitate to take responsibility for the creation of a problem. Instead of dealing with problems as mistakes, they discuss them with children as normal everyday situations. This attitude encourages problem finding.</td>
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<tr>
<th>Activities grounded in negotiating understanding</th>
<th>30, 39, 44, 47</th>
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<tr>
<td>• When children in small group activities have the same goals, focus, interests or questions, common problems are defined. In Cases 30, 39, 44 and 47 even if the problem was initially stated by one of the children, it was communicated to and accepted by the other child. Children’s interactions became focused on the defined problem, for example of what does the writing on the envelope mean? (Case 30) The group members may have different ideas for what the solution to the problem is but interaction and communication allow for solutions to be negotiated. Negotiated problem solving was observed as reaching a solution to a problem that is accepted by all group members, after presenting and trying to support individual solutions. When children develop the communication skills to be able to interact with each other and exchange ideas with an open-minded attitude, problem solving is negotiated and solutions are more likely to be successful.</td>
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<tr>
<td>• When children in small groups activities don’t share the same goals or focus, problems may be defined by one of the group members and expressed for negotiating a solution. In Case 36, for example, the children had different views on the nature of art making. Larry viewed drawing as an individual process. He was at the writing area first and the other boys joined him later. Larry’s goal was to paint the representations the way they are in nature. Brian viewed drawing as a social process and was changing his focus/goal to match that of the group (conversations). Brian’s initial focus was on the physical action of painting (not looking at the painting and not taking time to pick colors - was not paying too much attention on what was represented and how he would want to color it). Larry’s conceptual concern about Brian’s painting was that apples are red, therefore they shouldn’t have been painted blue. Larry verbally expressed his concern to Brian who acknowledged the problem and proceeded to solve it. If the definition and importance of the problem are convincing to the other group members, then the focus of all members may shift towards that problem and a solution could be achieved. Whether or not the children involved in an activity have the same goals or ideas, problems are solved when communication skills and interaction are developed.</td>
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Activities grounded in children's interests and concerns

- The community approach to problem solving through purposeful and focused interaction and communication is encouraged by what is considered situationally appropriate classroom behavior. The teachers constant reminders of listening to each others ideas (Case 21), taking each others ideas seriously (Case 19), and calmly and clearly expressing personal ideas (Case 23), make interaction and negotiating problem solving seem like part of the classroom rules (Case 25). Negotiating understanding leads to successful problem solving because it is a process that requires clarification and expression of personal goals/understandings and revisiting/reshaping understanding after listening to the ideas of others. The Lab School teachers provided children with organized opportunities for interacting with each other, with the teacher and with other community members. As demonstrated in Case 19, during early childhood, children often act first and discuss later (Tudge and Caruso, 2000). The Lab School teachers played a vital role in children's problem solving by helping them clarify their goals and the problem before they attempted to solve it and by even verbalize the children's objectives for further clarification.

- All the problem solving cases of this study were observed during activities based on children's interests. Activities are initiated either by teachers, who observe children's interactions and expressions of interests, questions or concerns (Reggio Emilia teaching strategy), or by the children themselves. The teachers respect child's ideas but don't force all children to participate in an activity that may seem beneficial or important to one of them. Children are free to organize or join activities that are based on their own interests.

- In an attempt to have continuity between the school context and the broader environment of the children, the teachers encourage them to bring objects of interest and concerns from home to school. Maria (Case 17), for example, was trying to accomplish the jump-rope technique at home, dealing with practical problems due to her undeveloped motor skills. The Lab School philosophy allowed her to continue trying to solve the same problem and made the classroom experience more meaningful to her. Teachers listen to children talk about familiar topics from home and the community. Individual and group activities that are based on children's interests and concerns develop committed problem solvers. Commitment is expressed through persistence in trying to solve a problem, and repetitive attempts focused on specific goals. Gandini and Golhaber (2001), however, emphasize that having respect for the children's interests does not mean that the teachers should blindly follow all their ideas but they should think about them to determine which ones should be pursued and how they might be supported. Maria's explorations of interests in Case 17 were encouraged in the classroom because they were based on situationally appropriate behavior which ensured children's safety and purposeful character of activities.
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<tr>
<th>Activities based on dilemma-driven action</th>
<th>34</th>
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<tr>
<td>The observed problem solving Case 34 was based on Ike's dilemma-driven actions. His dilemma was created by his previous knowledge that only two people get married, and by the fact that he wanted to play with both girls. His dilemma combined conceptual and interpersonal aspects and required conceptual and interpersonal problem solving. Dilemma-driven action as complex but playful, imaginative and flexible decision making can lead to a solution of all occurring problems.</td>
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EDUCATIONAL PLAYFULNESS AND THE REGGIO EMILIA PHILOSOPHY

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<tr>
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| Children responsible for their own learning, spontaneity, autonomy, stating ideas, making choices, defining play rules | 17, 20, 21, 22, 27, 32, 35, 45, 48, 51 | - The spontaneity and autonomy which characterize children’s actions when they are engaged in play activities, lead to spontaneous problem finding and spontaneous problem solving. In Case 17 it was the girl’s own choice to engage in the specific activity. The Lab School children are constantly ask children to plan their daily activities and express their ideas (Case 48). When children spontaneously express their ideas and make theme choices for daily activities, they may not consider the practical (Case 32, 35, 45) and interpersonal (Case 20, 21, 22, 27, 34) obstacles of the materials and the classroom environment. In their attempts to maintain their play ideas/themes, they have to solve practical and interpersonal problems.  
- Children's planning goes beyond thinking and decision making about activity themes and rules (Case 48). Planning was also observed as a strategy for solving problems on a personal and interpersonal level by analyzing processes in steps and following those steps (Case 17), and by making agreements on how an object should be used, by whom and for how long.  
- Teacher and parents choose to be observers of children's problem solving process, unless children's safety or children's questions require them to participate. During autonomous problem solving (Case 17), no comments are usually made by adults. The adults at the Reggio schools and the Lab School respect children's choices and don't interfere with them. Children's actions are spontaneous and under the control of children themselves. As a result, problem solving also becomes completely under the children's control. The Reggio Emilia educators, however, point out that they don't hesitate to give instructions to children on tool use because that saves them time for focusing their attention on solving more important conceptual problems. The Lab School teachers offer tool instruction only when the children ask and, in rare cases, when children's spontaneous choices and play ideas lead to unsafe situations or possible damaging of the classroom resources. For example, a group of children were playing at the light table, exploring color. Their plan was to put drops of diluted paint on the table and experiment with mixing different colors. At some point the children started emptying all the tubes of paint on the table, laughing, not realizing that too much paint might damage the light table, even after the teacher explained it. Instead of cleaning up the paint, they kept laughing until the teacher asked them to stop, listen and reconsider.  
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### Constructive Play (Manipulating Objects)

<table>
<thead>
<tr>
<th>Incidental problem finding / solving (focus on play theme)</th>
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<tbody>
<tr>
<td>17, 24, 45, 35, 42</td>
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<tr>
<td>Instrumental problem finding / solving (focus on objects)</td>
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<td>Intrinsic problem finding / solving (representing objects or situations)</td>
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Playing with and manipulating objects involve exploring and investigating the physical properties of tools, materials, and spaces. Children investigate and explore, for example, the properties of a jump rope (Case 17), of "flubber" and straws (Case 24), of big blocks in a small space (Case 35), and a cylindrical wood object (Case 42). Explorations and investigations lead to problem finding, such as: What prevents the rope from reaching over my head and turning in front of me? What am I doing wrong while trying to blow "flubbles"? Where can I build my block structure? How can I use the cylinder by myself? Problems rooted in manipulating objects are usually practical problems. Further manipulation of objects turns abstract troubling into specific investigations.

After a problem is defined during play with objects, the problem solving process involves continuous manipulation of objects, investigations, and hypothesis testing. In Case 17 the physical properties of objects were investigated to test if the child's shirt was the obstacle for the rope, and in Case 24 continuous attempts were made to adopt a peer's strategies for reaching a solution to the problem. When individual problem solving attempts of object investigations affect the play process of other children, the problem may require an interpersonal solution. Interpersonal solutions can be achieved through imaginative thinking (Case 35, 42). Problems rooted in the physical properties of materials during constructive play can be solved both through investigations and through imaginative thinking.

Manipulation of objects can lead to incidental, instrumental, and intrinsic problem finding and problem solving.

- During Cases 35 and 42, problem solving was incidental because the children's focus was on the theme of their play rather than the materials. Imagination is a commonly observed thinking quality during incidental problem solving.
- During Cases 17, 24, and 45 problem solving was instrumental: The children's focus was on the materials and the most commonly used problem solving strategy was investigation.
- Intrinsic problems can also be solved through manipulation of objects and utilizing all available resources. Intrinsic problem solving during children's play occurs when attempts are made by children to symbolize or represent objects and situations by using other objects or situations. An example of intrinsic problem solving in a play situation is Case 32 during which a child was trying to find out a way to represent a cartoon character by using the classroom's available resources.
<table>
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<tr>
<th><strong>Sociodramatic / symbolic / pretend play</strong></th>
<th>31, 32, 34, 35, 41, 43</th>
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- Sociodramatic, pretend or symbolic play refers to children's activities that are based on world construction, for example, pretending to be ballerinas (Case 20), restaurant owners and animals (Case 26, 28), doctors and patients (Case 31), cartoon characters (Case 32), participants in a wedding ceremony (Case 34), store owners and customers (Case 41), families (Case 43). Symbolic play can be even more fantasy-based and imaginative when themes are not rooted in children's physical reality but on their TV experiences, such as playing robots and superheroes (Case 35), which may be an important part of some children's world. Intrinsic problem solving may occur during sociodramatic play because the children are attempting to represent or enact situations by using the classroom resources.

- During symbolic play, children can have different personal goals or focus than their peers, disagreements when planning play themes or different ideas about the same tools and materials, situations that may cause interpersonal problems. Play is disrupted and problems are not solved when children are not flexible and don't communicate with their peers to negotiate a solution.

- The open-ended character of symbolic play situations allows for the thinking quality of imagination to be used as a problem solving strategy, especially in the form of storytelling. In Case 31, a group of girls wanted to play with the same doll. One of the girls who was dressed up as a doctor was holding the doll and came up with a play scenario of her being the doctor and the doll being a dying baby in need of a doctor's care. Even if the other children wanted to hold the doll themselves, the story was convincing to them and they proceeded to assume alternative roles within the same play theme. Through imaginative storytelling problems and conflicts were solved. An alternative strategy for solving this problem would have been planning, which is normally what is observed in similar problem situations at the Lab School classroom. If a teacher got involved, she would have asked the children to make a plan about how long each child should play with the doll and take turns. This strategy would have solved the problem as well. However, if children are allowed to solve problems by themselves during playful activities, they can develop imaginative thinking for successful problem solving. The Lab School teachers intervene in children's problem solving when it takes place in imaginative play situations that may be upsetting to some children. When, for example, during Case 34, a girl started crying because her friend said that he was going to marry another girl during their pretend play, the teacher reminded the girl that it was a pretend wedding and that the boy was still her friend. The Lab School teachers do not try to limit children's imagination but they try to help the children distinguish between reality and pretend play.
Flexible thinking

• Children's ideas during symbolic play may become so imaginative that it may be impossible to materialize them. Case 32 is an example of such situations. The teacher pointed out that Amanda's initial idea would not be possible because of the limitations that she was creating. Sometimes, the Reggio and Lab School teachers allow children to choose what resources they would like to use to materialize their ideas, even if they know that children's decision is not the "best" choice. When children's ideas are carefully planned and may lead to deeper investigation or project work, children would be allowed to try the materials and discover themselves if they can use something else instead. In Case 32, it was not possible for the teacher to provide what that one child needed, so she clearly explained to the child why that idea would not be materialized and pointed out the need for a different plan. Children's imagination may cause practical problems for the classroom community. The Lab School teachers ask children to reconsider their highly imaginative solutions to the initial conceptual problem to avoid new hard-to-solve practical problems.

• Children who are willing to consider other's points of view in order to solve a problem, develop flexible thinking. The disposition of flexibility is developed early on at the Lab School classroom through the teachers' encouragements and reinforcement of children's interactions and communication. The Lab School teachers encourage children to debate and talk about their differences because, according to their teaching philosophy related to the Reggio Emilia philosophy, the flexibility of thinking developed through healthy conflicts leads to problem solving and meaning making. In Case 28 flexibility was observed as willingness to modify initial idea according to peer play theme/rules to solve a personal problem. During Case 35, each child had an individual play idea but they were willing to compromise and focus on the similarities of their individual goals. Flexibility was expressed as tolerance and acceptance of others and their goals, and led to practical, interpersonal and conceptual problem solving in the context of playful activities. Flexibility is also developed through the teachers' strategy of encouraging children to consider the available resources when their initial choices are not feasible. In Case 32, for example, the child's problem would have not been defined and solved if the teacher did not encourage her to try to think of another possibility for materializing her idea.
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<tr>
<th>Reasoning</th>
<th>17, 26, 30, 33, 44, 48, 49, 51</th>
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- The playful character of the Lab School activities and the highly developed imaginative thinking observed during my study, do not imply that the children were incapable of developing more positivistic thinking strategies for solving problems. Through verbal communication, they were often observed expressing reasoning by thinking about cause and effect (Case 17) and explaining their actions, choices and ideas (Case 30). Reasoning was a strategy that contributed to successful solution of practical (Case 17, 33), interpersonal (Case 26) and conceptual problems (Case 44, 48). When conceptual or practical problems had interpersonal elements (Case 20, 22) and one child's reasoning was not convincing to the other children, the problems were not solved. The Lab School children knew that their ideas should be respected and that they had the right to make their own choices and decisions. If a child's reasoning does not express peer respect, the other children involved in the situation do not accept his/her solution to the problem. When, on the other hand, a child's reasoning is related to classroom rules about children's rights, it is accepted by peers and problems are solved (Case 49, 51).
# LEARNING COMMUNITY AND SOCIOCONSTRUCTIVIST PROBLEM SOLVING

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<th>CONTEXTUAL FACTORS</th>
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<th>EFFECT ON PROBLEM SOLVING</th>
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<tr>
<td>Communication and interaction</td>
<td>23, 33, 22, 27, 30</td>
<td>Communication at the Lab School is a multidimensional process of transmitting and receiving messages in an unobstructed channel of interaction through various means of expression. The Lab School classroom environment was a successful channel of communication among children, peers, and adults. The school's philosophy and practice concerning communication is derived from the Reggio Emilia philosophy, according to which the child is valued as sensitive and responsive to others. It is also believed that children easily learn procedures for interactive learning during which they are eager to ask questions and solve problems with others. They are communicators, and have a natural desire and deserve the right to use many materials in order to discover and communicate what they know, understand, wonder about, question, feel, and imagine. Verbal communication played an important role during children's problem finding and problem solving. It involved expressing ideas, choices and reasoning, reminding other children what the classroom rules were, having meaningful conflicts and discussions. In Cases 23 and 33, when children's problems were expressed and explained verbally, other children and teachers were able and willing to help solving them. Solution to problems becomes easier when children clearly communicate them to other community members. Support in problem solving is more likely when the problems are stated in a way that the importance of their solution is convincing to others. In Cases 22 and 27, the problems were solved when children reminded their peers what the classroom rules were, indirectly asking them at the same time to modify their actions to produce situationally appropriate behavior. Communication, in the form of meaningful, fruitful and healthy conflicts, constructive discussions and negotiations, was important especially during conceptual problem solving. In Case 30, for example, the children's task was to find out what the writing on an envelope stood for. It would have taken longer time for the individual children to find out what the card was saying, if they were working by themselves. By collaborating on solving the problem, their discoveries and explanations were built upon each other's, step by step, until a satisfying solution for both children was achieved.</td>
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<tr>
<td>Verbally expressing reasoning, ideas and choices</td>
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<tr>
<td>Expressing and enforcing classroom rules and routines</td>
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<tr>
<td>Meaningful, fruitful and healthy conflicts, constructive discussions and negotiations</td>
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The Lab School teachers provide children with resources and encourage communication through visual expression, dancing, writing, singing, storytelling etc. Sociohistorical theorists, such as Lave (1988), focus attention on structure that is constructed in social activities. Knowledge, in this view, depends primarily on a person's learning to participate in activities in socially constructed domains of situations (Greeno, Moore, Smith, 1993). Ecological theorists, such as McCabe and Balzano (1986), also focus their attention on structures outside the mind, but they are concerned mainly with structures in the physical environment. Ecological theorists conceive action as interaction with the environment, often involving direct perception rather than being mediated by mental representations. Based on my observations and informal interviews, the Lab School teachers share the orientation of both sociohistorical and ecological approaches to learning. They believe that their role in children's problem solving is to facilitate social interaction, purposeful discussions and constructive conflicts, as well as to offer environmental stimuli for provoking children's investigations. Specific teachers' practices that facilitate children's development of communication skills and affect problem solving, as observed at the Lab School are:

- Responding to children's questions. In Case 18, a child was wondering why there was no water in the water container at the easel. The teacher's response to children's questions expresses respect towards what the children are thinking about and encourages communication. The type of interaction demonstrated in Case 18 motivates problem finding and staying committed to solving it, not hesitating to ask for help.

- Providing opportunities for children to interact with each other, with the teacher, and with other community members. In Case 19 the teachers presented to the children two framed paintings that were donated to the school by two former classmates and asked the children to decide where they should be hanged. This case is an example of how the Lab School teachers see everyday situations as opportunities for problem solving and present them to the children in a way that requires interaction and communication.

- Helping children clarify their shared goals. During early childhood, children often act first and discuss later (Tudge and Caruso, 2000). Lab School teachers play a vital role in children's problem solving by helping them clarify their goals before they attempt to solve it and by even verbalize the children's objectives for further clarification. In Case 19, for example, the teachers listened to each child's ideas, asked them to explain and elaborate on their ideas and by holding the framed pictures where each child was pointing out, they helped children visualize their goals and be able to evaluate their own solutions to the problem before trying to materialize it.
Facilitating purposeful communication through modeling, eliciting, probing, restating, clarifying, and questioning. In Case 24 purposeful communication and problem solving was facilitated between a child who wanted to learn how to perform a task and a child who was presented as an expert in that task and could help his peer learn more about the tools and materials. In Case 25 a solution to the problem was achieved because the children were able to communicate with each other and make a plan. The teacher restated the problem. Even if the children were upset, they modeled the teacher's behavior of always following the classroom rules and a collective solution to the problem was reached.

According to Katz (1987), in early childhood, knowledge consists of facts, concepts, ideas, vocabulary, and stories and a child acquires knowledge from someone's answers to his questions, explanations, descriptions and accounts of events as well as through observation.

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<th>Observing others (peers and adults)</th>
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<td>Observing others and adopting their behavior or problem solving strategies is a commonly observed socioconstructivist problem finding and problem solving strategy at the Lab School preschool classroom. Case 17 provides evidence of the fact that observing peers engage in an activity may lead to develop interest in that activity. Participating in someone else's activity that involves problem solving, means that the problem is shared between the original and the new participants. The new participant may have new insights on the problem that may make its solution easier. Peer observation may be initiated by the children and can lead to voluntary participation in peer problem solving when the observant discovers and follows his/her peers' goals. Peer observation is also suggested by teachers as a problem solving strategy when children ask for help in performing a task. In Case 24, for example, a child stated that she wanted to create something but did not know how and the teacher asked another child to perform a demonstration. Observing her peer demonstrating helped the child discover the necessary techniques for achieving her goal and solving her problem.</td>
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<tr>
<td>Peer tutoring</td>
<td>17, 24</td>
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<td>Peer tutoring is a didactic transmission of information from one child to another, ordinarily from an expert to a novice. In Case 17 a child was observing her friend’s jump-rope problem solving attempts and spontaneously decided to demonstrate a technique. She analyzed the process, which was already familiar with, in steps and verbally explained each step with parallel practical demonstration. Peer tutoring can be children-generated and lead to problem solving if the children have developed communication skills to be able to clearly transmit information to their peers and to be flexible enough to consider other people’s suggestions and ideas for solutions to problems. Peer tutoring at the Lab School is also teacher-generated. At the Reggio Emilia schools and the Lab School, children are considered as knowledgeable individuals when they come to school and their abilities are valued. According to the Lab School teachers, the children know a lot more than most educators give them credit for and than what they let us believe they know. The Lab School teachers empower the children by considering them experts in some fields and they often encourage them to demonstrate their abilities for guiding peers. The Lab School teachers do not pretend that they know everything about children’s interests and concerns and they motivate peer guidance and support during children’s problem solving.</td>
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<th>Cooperative learning</th>
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<td>Cooperative work is accomplished by division of tasks among the participants in an activity. Each individual is responsible for a specific task. During cooperative problem solving, children share the same goals, combine problem-solving contributions and share rewards. During Case 35, for example, the children decided to build one large structure to solve the practical problem of not enough space for many individual structures. Children were able to combined problem solving contributions and shared the rewards for their work because they shared the same goals and play interests. Cooperative work during pretend play may cause interpersonal problems. Division of tasks during sociodramatic play means assigning roles. In Case 34, for example, children shared the same goals and interests and expressed willingness to work together but the nature of their play theme caused interpersonal and conceptual problems. Cooperative work does not lead to problem finding, or leads to solutions of interpersonal problems, when children have developed peer culture and the required social skills to participate in group work and consider peers’ ideas and feelings.</td>
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Peer collaboration occurs when novices work together on tasks that neither can do separately. Collaboration involves the mutual engagement of participants in a coordinated effort to solve a problem together. In Case 30 both children had limited knowledge on reading. They both combined their efforts and in a step-by-step process, they managed to find out what the writing on the envelope said and solve the problem. The Lab School children use peer collaboration as a problem solving strategy. In Case 47, for example, two children wanted to write the number “3” on the classroom’s new monthly calendar but there was only one left. After they were asked by the teacher to make a plan, they decided to collaborate so that one of the children could write half of the number and the other child, the other half. Children playing together on a daily basis at the Lab School preschool, are observed saying and doing what the other is, engaging in the same activities, sharing objects, hence developing peer culture. Peer culture can be the source of problems, such as the practical problem of unavailability or enough resources in Case 47, but it can also be the source of finding solutions to problems. Children within friendship groups express compassion and support towards other members of their group and become open minded, flexible and inventive for successful collaborative problem solving.

Peer modeling
Teacher modeling

Modeling refers to information or behavior transferred by imitation. The Lab School children imitate their peers during group play, when they try to develop peer culture. They would, for example, imitate their friends' ideas of jumping from the climber without their shirts on, wearing coats, hats and gloves in the classroom, or “silly-dancing” to music. Development of peer culture facilitates interpersonal problem solving, however, through my observations, I found out that teacher modeling had a more direct effect on problem solving. Lab School teachers were observed using phrases, such as “Do you want to make a plan?”, “You have to make a plan” (Case 25), “What’s your idea?” (Case 19, 21, 30), “Say some words”, “Listen to their words” (Case 23), encouraging the children to express ideas, interests, likes and dislikes, and to follow the classroom rules. In Cases 17, 22, 25, 27 and 35 children were observed using phrases, such as “I want to make a plan”, “You can’t make choices for us”, “They make their own choices”, “You have to listen to my words”, “I have an idea!” “We have a plan!”. By modeling the teachers' behavior, the children were communicating with their peers to solve problems.