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Mathematics in Early Childhood: Research-Based Rationale and Practical Strategies

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Abstract Mathematics education is a critical part of the curriculum for students worldwide. The foundation for understanding mathematical concepts related to number sense begins early in life, and early childhood classrooms can provide the seeds for mathematical skills that will be needed later in life. In this article, the authors make a case for meaningful and developmentally appropriate mathematics experiences for young children in diverse early learning settings. Instructional and curricular methods inspired by the Reggio Emilia Approach are described as effective ways to teach number concepts to young children from preschool through primary age. Strategies for teachers of young learners are presented in order to strengthen the mathematics curriculum in contemporary early learning settings. The authors' analysis and recommendations are informed by their extensive experiences including studies in Reggio Emilia early childhood settings (infant toddler, preschool, and primary schools) and their work in early childhood teacher education at their respective universities.

Keywords Reggio Emilia · Mathematics · Number sense

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Introduction

Young children are natural learners, and they observe and explore mathematical dimensions in their own environments on a daily basis (NAEYC & NCTM 2002; Clements 2001). Early education historically emphasizes the language development and pre-reading skills of young children, often at the expense of mathematics education. In this article, the authors make the case for rich and meaningful mathematical experiences and affirm the need for high-quality and challenging learning experiences that promote mathematics education for preschool children (NAEYC & NCTM 2002). While the call for high-quality experiences in early childhood mathematics is not new, this article provides strategies for practitioners to implement best practices in early childhood mathematics education by examining connections between the Reggio Emilia Approach and current literature on mathematics education in the United States. The authors focus on one aspect of mathematics education for early childhood, developing number sense, in an effort to provide specific examples of meaningful experiences. However, the practices described from the Reggio Emilia Approach to early childhood education can extend to all content areas in mathematics.

The Importance of Mathematics in Early Childhood Settings

Early childhood settings should provide research-based curriculum and instructional practices that begin to build a foundation for the understanding of mathematical concepts. According to Clements (2001), there are four reasons for intentionally teaching mathematics to preschool children: (1) current early childhood curriculum is very limited in

mathematics content; (2) children from low-income homes often struggle with mathematics in later schooling and early success with mathematics can narrow the gap for these children; (3) young children possess natural curiosity and informal mathematical abilities that should be nurtured; and (4) preschoolers' brains are undergoing significant developmental change and are stimulated by more complex and engaging learning activities rather than rote counting or drilling (p. 2). Young children are capable of learning mathematics because many of these relationships and concepts are directly observable in the natural learning environment. They instinctively compare quantities, observe and make patterns, navigate through different kinds of spaces, and problem-solve in their play interactions with objects and with peers in the classroom. The early childhood educator acts as a facilitator to make the child's informal connections to mathematics more explicit.

The rationale for increasing the emphasis on mathematics education in early childhood settings such as child care, Head Start, and school-based pre-kindergarten programs is compelling. Mathematics is an essential requirement for negotiating life's demands, and we readily acknowledge the importance of mathematics in elementary and secondary education. If young children engage in meaningful and enjoyable mathematical learning experiences at the preschool level, they are much more likely to appreciate and continue to engage in mathematical learning experiences at the elementary, middle, secondary, and post secondary levels (Seefeldt and Galper 2008; Van de Walle and Lovin 2006; NRC 2001). Early learning experiences that foster positive attitudes and dispositions toward mathematics are needed in American education in order to sustain children's interest in mathematics. Young children in preschool and primary settings today are our future mathematicians, engineers, and scientists.

Strategies for Teaching Mathematics to Young Learners

Traditional mathematics instruction begins with rules and procedures and progresses to applications of those rules and procedures (Battista 1999). Developmentally appropriate practice in early childhood calls for a more constructive approach for teaching mathematics to young learners (Van de Walle and Lovin 2006). This inquiry-based approach to early childhood mathematics engages students in the discovery of rules and procedures through mathematical investigations. Pedagogical practices in early childhood mathematics education include the need for teachers to act as facilitators, asking open-ended questions and scaffolding for students as they work collaboratively to make sense of mathematics through meaningful tasks (Hiebert et al. 1997; Baroody and Wilkins 1999). An emphasis is placed on moving from concrete to abstract representations of concepts (Van de Walle and Lovin 2006); developing classroom discourse in mathematics through whole group and small group discussions (NCTM 2000; Hiebert et al. 1997); and creating a shared sense of community through the establishment of sociomathematical norms that enable all students to approach mathematical tasks in a confident manner (NRC 2001). Mathematics for young children should involve helping them make meaningful connections through play, discovery, and exploration in natural environments. Thus, the mathematics curriculum is embedded within natural learning environments both indoors and outdoors. Likewise, the excitement and love of mathematics comes from facilitating children's unfolding of these natural and simple connections. "High-quality teaching in mathematics is about challenge and joy, not imposition and pressure" (Clements 2001, p. 1), and quality early childhood mathematics is more than drills and practice in counting and adding.

In order to make meaningful connections to mathematical concepts, the early childhood classroom should embed learning experiences in the daily routine that engage young children in real-life activities: *estimating and finding out how many steps it is to the playground; gathering enough cups for each child for snack time; building towers and buildings with blocks that represent structures in the real world; and sorting the snack food into categories by self-selected rules.* Young children need concrete objects to explore and opportunities to represent their own thinking. The skilled teacher will be able to articulate the connections that children are naturally interested in and discovering. *"Look, you have one cup for each child. Let's count them together…1, 2, 3, 4……10. You have 10 cups for 10 children!" "Tim, how many steps do you think it is from the classroom door to the playground gate? Why don't you make a guess and then we'll count the steps and see how many steps it is! How do you think your estimate will change if someone else is counting their steps? How did your estimate compare to the actual number of steps?" "Susan, how can you sort our snack for today into groups? Tell me how you would label your sort. What else can you tell me about your sort? How do the items in each category differ? How are they the same?"*

Standards and Guidelines for Developing Number Sense in Young Learners

The National Council for Teachers of Mathematics (NCTM) outline standards for early childhood math from Pre-kindergarten through second grade (NCTM 2000). Content and processes for early childhood mathematics

include the need for young children to develop understanding in algebraic thinking, geometric logic, data analysis, measurement benchmarks, and number concepts (Diaz et al. 2009). This article focuses on connections between the Reggio Emilia approach and building early number concepts and number sense in early childhood mathematics. Number sense in young learners encompasses counting skills in addition to more advanced concepts such as composing and decomposing sets (seven can be decomposed into five and two, nine and four can be composed into ten and three more), identifying relationships between numbers (six is one more than five or four less than ten), and examining patterns in numbers (comparing odd and even numbers, comparing sets when one or two is added or taken away, and identifying doubles such as $6 + 6$ or benchmarks of five or ten such as $8 + 2$ or $9 + 1$). Many early childhood educators view counting skills as the ability to count forwards and backwards from one to a certain benchmark such as ten, twenty, or one hundred. While this skill is important, it does not encompass the entire concept of counting in early childhood. Prairie (2005) identifies five principles of counting that should be developed in young children: (1) the one-to-one rule, (2) the stable order rule, (3) the cardinal principle, (4) the abstraction rule, and (5) the order irrelevant principle. One-to-one correspondence indicates the ability to count objects individually by connecting one counting word to each object. For example, a student might be counting a collection of three-dimensional shapes. If the child is able to point to a shape or pull it away from the collection and then name the shape by a number in the sequence, that child is demonstrating one-to-one correspondence. The stable order rule establishes the need for counting words to be memorized in an unchanging order (Fuson and Hall 1983). Most children progress towards this rule in stages where they can present numbers in a stable order (1, 2, 3, 4, 5, and 6) and then continue with unstable counting (11, 20, 9). Cardinality indicates the ability to name a set of objects by the total value rather than by counting each item individually (Kamii 1982). Children who demonstrate cardinality have a more sophisticated understanding of numbers than those who can only count a set using one-to-one correspondence. Teachers can assess cardinality by presenting a set to students and asking them to tell the total amount. When students accomplish this task, the teacher can reorganize the same set in a different way and ask students to tell the total amount. If the students have to recount the set, they are not demonstrating cardinality. The abstraction rule allows dissimilar objects to be counted as a part of a whole group. For example, a blue triangle pattern block can be counted as part of a set of triangles, as part of a set of blue items, or as part of a set of shapes in general. The item can be abstracted to a variety of groups and not all items in a group have to be identical. Finally, the order irrelevant principle indicates that objects can be counted in any order. Many times young children will view numbers as labels, meaning that the number will belong to a certain object. For example, a teacher may be conducting a lunch count by grouping all of the students who want pizza. She may call these students by a number, Gianna is one, Sophia is two, Lucas is three, Mike is four. Mike may say to her, but I am five, indicating that he is 5 years old. This child does not yet have a concrete understanding of the order irrelevant principle or the abstraction rule. These principles of counting along with advanced concepts in number sense encompass the majority of standards related to numbers and operations in early childhood. Building number sense in early childhood can seem like an easy topic to cover, but in reality, students require in-depth, meaningful tasks over a long period of time to establish a sophisticated understanding of numbers. Counting as a group is not enough to foster these concepts in our students. Strategies inspired from the Reggio Emilia Approach to early childhood education can be helpful when developing these mathematical concepts in young children.

Reggio Inspired Strategies and Mathematics Education

In this section we present applications of the Reggio Emilia Approach to mathematics education for young children from preschool through primary grades. Key components of the Reggio Emilia Approach that are presented within the context of developing number sense in mathematics education include (1) project work; (2) documentation; (3) recycled materials; (4) integration of the arts and mathematics education; and (5) integration of play and mathematics education. Also presented are examples of developmentally appropriate, Reggio-inspired tasks for developing number sense in children at the Pre-Kindergarten, Kindergarten, and Primary levels.

Project work

A noted dimension of Reggio-inspired schools is the use of in-depth and focused projects as an avenue for learning. Project work does not represent the whole curriculum. Rather, project work complements and extends the classroom curriculum (Katz and Chard 1989). The Reggio Emilia Approach encourages the establishment of natural learning environments that provoke young children to explore, ask questions, and pursue answers. By exploring familiar concepts, places, and objects; children unpack or deconstruct everyday objects, which creates deeper meaning and understanding of those objects. Learning is accomplished in a highly integrated curricular approach

Fig. 1 Project work and mathematics: photograph of community vegetable market

(Katz 1994), and mathematical concepts are embedded, studied and articulated within a holistic perspective, as are concepts related to science, language arts, movement, and creative expression. In-depth exploration of a topic selected by the children evolves into the creative construction of a learning process known as project work. Project work in the Reggio schools is a collective and collaborative effort to make sense of the children's most salient questions.

Project Work requires time, materials, exploration, and a great deal of constructing and recording of ideas. Through the exploration process, teachers and children engage in dialogue that focuses on patterns, similarities and differences, sequential processes, and representation. For example, in a project on *Vegetable Gardens,* the children may select books to read about gardens; look at and draw pictures of vegetable gardens; visit a nearby farm and ask questions of the farmer about the large vegetable garden on the farm; create drawings, paintings, murals and other representations of different kinds of vegetable gardens, complete with varied colors, sizes, and kinds of vegetables; construct a book about vegetable gardens; and paint, draw, or in other ways represent different kinds of vegetable gardens growing in different environments.

Project Work within the context of mathematics provides the time and opportunity for deeper study and questioning and encourages children to represent their ideas in a variety of ways. Below is an example of representation from Project Work related to vegetable gardens made by a group of 4 year olds. The children created a large mural of some vegetables from their own school garden for their classroom wall. They visited a farmer's vegetable garden, read books and listened to stories about different kinds of vegetable gardens, and practiced drawing and painting vegetable gardens. Figure 1 contains a photo that their teacher took of a nearby vegetable market and community garden. The children are using this picture to create a classroom mural, and the teachers and parents are making connections between the study of the community vegetable garden and market and number sense concepts. From the photograph and the classroom mural, the children can practice one to one correspondence, sequencing, size comparison, direction, predicting, and other mathematical processes. The following sample questions enable the teacher to elicit open-ended information about student thinking related to the project.

Questioning strategies to promote number sense

1. What is a garden? What are different kinds of gardens?
2. What can you tell me about the vegetables in this picture?
3. Where do vegetable gardens grow? (different places: city, farms, schools, churches, other community sites)
4. How are these vegetables sorted or categorized?
5. How many green vegetables are there? (Name different green vegetables and count)
6. How do the number of green vegetables compare to the other groups of vegetables?
7. How many different shapes/colors of vegetables do you count?
8. What prices are listed for the vegetables? Which one costs the most? How do you know?
9. How are these vegetables similar or different?

This is an example of how Project Work can provide in-depth study of familiar objects in the natural environment and how connections can be made to fundamental math concepts for young children. The Vegetable Project could take place over a period of time of a month or longer. Through Project Work, children are able to immerse

themselves in an integrated learning experience and they learn counting skills and more advanced number concepts in a natural and hands-on learning environment typified by the Reggio-Inspired classroom approach.

Documentation

The Reggio Emilia Approach is known for the use of multiple forms of representation and documentation. While American schools frequently do not have the financial resources to complete the level and detail of documentation observed in the Reggio schools, teachers can utilize documentation strategies and adapt them to their own settings, resources, and budgets. Common forms of documentation in the Reggio schools include digital photography that captures the details of the learning process in the classroom; child-and teacher-constructed books complete with drawings, photographs, other forms of representation; narratives and stories to support and describe the learning process; large pictures and murals that are painted, drawn, or constructed by the collective group of children that represent a significant project, in-depth study of a topic, or meaningful event in the community. Children in a Reggio-Inspired preschool in southeastern United States studied and constructed structures of their church-based site and made a large painting to keep in their classroom. This project took many months to complete and involved multiple forms of documentation including photographs by the children, teachers, parents, and community members; paintings by individual children; clay moldings of the church structure; writing stories about the church; and making a large collective mural of the church steeple as a permanent artifact in their school.

Documentation takes many forms and promotes children's attention to detail; careful representation of ideas, places, or people; drawing and writing; and an appreciation of the symbolic value of documentation. Children who engage in multiple forms of documentation processes sharpen their skills in observation, comparing and contrasting, fine-motor and eye-hand coordination, and sequencing of events. They develop an understanding of before and after, recognize patterns and repetition, and establish an appreciation of time for reflection, analysis, and changing one's perspective. In the example above, the children carefully observed and replicated the number of windows on the side of the church, measured and drew a tall angular steeple on the church, and made decisions about how to represent the church on the large mural for their own classroom. All of these activities involved thinking about mathematical concepts and involved the children in measuring, counting, sequencing, and replicating.

Recycled Materials

The ReMida Center in Reggio Emilia, Italy is a wonderful repository of recycled and second-hand materials that support mathematics education. This center accepts donations from industrial production and then provides workshops for teachers to demonstrate how such materials can be used to work with children. We can learn a great deal from these educators who see and teach the value of using materials in innovative ways. The authors have visited the ReMida Center several times, and each time we were impressed by the changing landscape of materials and ideas. Once again, American teachers can garner many useful ideas from the use of recycled materials. Examples of materials that we have observed and worked with at the ReMida Center are included in Table 1 below.

Integration of the Arts and Mathematics Education

The Reggio approach encourages children to express themselves and learn through multiple ways knowing (Gardner 2006). Symbolic languages are used as tools in the context of project-oriented curriculum. These include drawing, sculpture, painting, play, as well as written

Table 1 Recycled materials suitable for building number sense in mathematics education

Recycled material	Use in mathematics education	Appropriate age levels
Small dark blue cosmetic bottles in 2 or 3 sizes	Counting and sorting; composing and decomposing sets; symbolic representation	Preschool; kindergarten primary
Stacks of folded newspapers bound together, about 24″ tall	Counting the number in each bundle; sorting the bundles by self-selected rules; examining sets for patterns; decomposing and reorganizing stacks	Kindergarten; primary
Strips of fabrics in 4 different lengths and many different colors	Classify and sort the fabrics by self-selected rules; Chart the different ways the fabric strips can be used; create a 4-step dance using the fabric strips as scarves	Preschool; kindergarten; primary
A display of eyeglass frames on a circular cylinder that turns like a mobile in the room	Organize the eyeglasses into a graphical display; Sort or categorize the eyeglasses by a self-selected rule; classify and compare the eyeglass for children, men, and women; sequence and count the eyeglasses by size	Preschool; kindergarten; primary

language and symbols. Graphic arts are used to foster cognitive, social emotional, linguistic, and mathematical development. The arts can foster mathematical concepts and number sense in particular in a number of ways. One key way is through playing with objects and working with media. Building on the work of Piaget, Clements and Sarama (2005) assert that for young children "playing with objects before using them to solve a problem leads to greater success" (p. 42).

Reggio pedagogy has specific guidelines for supporting children to explore media. First children explore what a medium is and what they can do with a material. These materials should be presented in an inviting and aesthetically pleasing manner and should have variation in color, texture, and tones so that children can understand similarities and differences. Likewise these materials should be revisited throughout the school year so that children can explore the many possibilities for that medium (Edwards et al. 1993). For example, drawing is a medium that encourages number sense for young children. Drawing, a form of graphic symbolism, develops prior to writing (Woleck 2001; Dyson 1983; Vygotsky 1978). Pictures typically are used in multiple ways by children. Pictures are used by children to support problem solving. They can be used like manipulatives to count and sort objects. They can be used to represent mathematical functions such as addition and subtraction or they can be used to represent mathematical symbols. Moreover, drawing can facilitate children's discussion of mathematical concepts through self-talk, conversations with peers, and discussions with adults (Woleck 2001). In one example, a child in a Reggio preschool was drawing his family on a large piece of paper. He explained to his teacher that there were four people in his family but that his mother, who was expecting, would soon bring a new member to the family. "That would make five" he proclaimed as he added a new person to the drawing. Another child was working out how many blocks he and his friends could have if they were to have equal amounts for their play session.

Integration of Play and Mathematics Education

Play, a central part of Reggio curriculum, encourages several mathematical concepts. Clements and Sarama (2005) cite six categories of math that emerge through play: "classification (grouping and sorting), magnitude (describing or comparing the size of objects), dynamics (putting things together and taking them apart), pattern and shape (identifying or creating patterns or shapes, exploring geometry concepts), spatial relations (describing or drawing a location or direction), and enumeration (saying number words, counting, recognizing a number of objects, or reading and writing numbers" (pp. 38–39). The authors observed these categories in action through a play episode in a mixed age preschool class in Reggio. The children created a store where they were grouping and sorting wooden fruit by size and color (classification and magnitude); they had created a price list and were calling out prices to customers (enumeration). Likewise children counted out numbers of objects to sell or buy and counted wooden tokens to buy and sell food items (enumeration).

Mathematics Tasks for Pre-K, Kindergarten, and Primary Age Children

Using the pedagogical frameworks described above, we present examples of Reggio-inspired mathematics tasks for children at the preschool, kindergarten, and primary levels. These tasks have been selected for their capacity to promote children's observing and thinking; making meaningful connections from real-life experiences to number concepts; and the potential for representation in creative and integrated ways.

Preschool Task #1

Document students as they engage in free play outdoors. Do students collect items from the outdoor space? Capitalize on their inquisitive nature and take them on a hike around the property. Ask them to collect items that they find interesting. Once they have established a collection of objects, ask them to sort the objects with a rule of their choosing and to describe their sort to a partner. Question each pair about their sorts: "*What can you tell me about your sorts? How does each set compare to each other? What is the total amount of objects in your collection? How did you find the total? Can you count the objects in a different way?*"

These questions will enable you to assess principles of counting and the overall task will encourage student to decompose collections into sets and identify number patterns and relationships. Once students have completed this task, ask them to represent their collections with a drawing or through another medium.

Preschool Task #2

Look for opportunities during center time or indoor free play time to explore number concepts with students. You may have a group of four students in the dramatic play center who are role playing with dress up clothes. As they play, begin to ask questions such as: "*What types of jobs do we have represented in our center (police, fireman, doctor, etc.)? How many types of jobs do we have represented in our dramatic play center? Can you point and count the types of jobs? What else can you tell me about the clothes*

in our center? As they continue to play, document their interactions and look for opportunities to insert questioning about numbers. "*You are cooking dinner for your family? How many people will be at dinner? Show me how you can set the table for that many people. Do you think you will need to use all of the pots in the center to cook your dinner? How many pots do we have in our center? What will you make in each pot?"* These interactions will give you an opportunity to assess student understanding of counting skills in the context of a meaningful activity.

Kindergarten Task #1

As students gather for snack time or meal time bring out a treat that is easy to count such as popcorn or pretzels. Put a collection of pretzels in the middle of the table and ask each student to tell the total amount. By allowing each student to count the same set, you are able to assess many of the principles of counting. Do they use one to one correspondence as they count? Do they always need to count the set if they have already heard the total? Can they count the set in a different way?

After you have assessed this understanding, ask questions such as the following: **"***How would the set change if you added another pretzel? How would it change if you had taken away a pretzel?"* You can model these actions as you ask the questions. Repeat this process a couple of times with a different number of pretzels each time. When students gather for math time, connect to this experience by have students work in pairs to add one more to a set of objects and create a T-chart representing the results up to ten. Once students have made their representations, ask them to work together to identify patterns in the numbers. Create a chart of the patterns that students identify as a form of documentation to revisit at a later date.

This task builds awareness of patterns and relationships in numbers and allows students to develop strategies for basic facts in addition. This task could be extended by having students analyze a third column on their chart labeled Two More for patterns when a set is increased by two. These explorations can also be done with subtraction and can be extended at the primary level by increasing the numbers and examining place value.

Kindergarten Task #2

Create a center with an assortment of recycled materials such as buttons or wallpaper tiles. Allow students to interact with the materials and document these interactions. If they are working with a small item, like buttons, put the whole collection in a pile and ask students to guess or estimate how many buttons are in the pile. Be sure to always follow up these questions with a question that assesses their strategy for finding the answer: *"How did you decide on your estimate? Can you describe what you were thinking when you chose that number?"* These follow-up questions will enable you to build an understanding of student thinking and will promote student discourse in mathematics.

Ask students to find a way to organize the set of materials in a way that is easy to count. Document their strategies for organizing the material. Do they put the buttons in separate piles? In rows or columns? Do they sort the set into groups that are easy to count such as 2, 5, or 10? Ask students to count the set and then ask them to compare the total to their original estimate. If more than one student is working on this task, they can work together to sort a collection or they can work individually and then compare each other's method for counting the buttons. This task assesses students' understanding of cardinality and their ability to decompose and compose sets. It also enables them to examine relationships within numbers.

Primary Task #1

Gather your students as a group and teach them a song with a growing pattern such as The Deep Blue Sea. It would also be beneficial to include a literature selection that relates to the song such as *The Deep Blue Sea: A Book of Colors* by Audrey Wood (2005). After reading and singing the song, ask students if they notice any patterns in the book or in the song. After this discussion, ask students to define a growing pattern and write their definitions on a chart as a form of documentation. Display a growing pattern using numbers such as 5, 10, 15, 20…. Ask students to find relationships within the pattern and list their ideas on the chart. After this process, allow students to work in small groups or pairs to create their own growing patterns with numbers. Have them choose a number between 2 and 10 to create their skip counting growing pattern. Once they have completed their pattern, allow them to represent the pattern on a hundreds chart. Ask each group to identify and write about any patterns or relationships that they can find on their hundreds chart.

Once each group has completed this task, have the groups share their charts and findings with the group. Ask the class to find another pattern on each group's hundreds chart. These types of algebraic tasks continue to build student understanding of patterns and relationships within numbers. Continuous experiences such as these will help students as they explore number properties and operations.

Primary Task #2

Consider the work students have accomplished as part of a current project your class has begun, such as the garden

project described previously. Document students as they engage in activities and look for opportunities to create number-focused word problems around their tasks.

During math time, present one of these word problems and ask students to work in pairs to solve the problem and represent their strategies for solving in numbers, pictures, and in words. Multiple forms of representation will encourage students to metacognitively examine their steps for solving and will provide more documentation for you to assess understanding. Discuss each group's strategy for solving the word problem: "*How are the strategies similar? How are they different? Are there any strategies that are confusing to you? Do you have any questions for each other?"*

Following this discussion, present a second word problem to students and ask them to work in their groups to solve the problem using a different strategy than what they had used previously. Have a discussion with each group about the strategy they used: *"How was it different or similar to what you did before? Which strategy did you find most useful? Why? Tell me about your representations. Is there anything you want to add to your representations?"*

These explorations will encourage students to find patterns in numbers as they look for different ways to solve a problem. Students need exposure to multiple strategies for solving problems. The teacher's role in this type of lesson is to facilitate as students develop and refine strategies rather than teaching them a variety of ways to solve a problem.

Summary

In summary, the goal of developing positive dispositions toward mathematics in child care, Head Start, and preschool settings is significant. In the US, the early care and educational community for the 3–5 year old child population represents a patchwork system that varies greatly in curricular and instructional approaches. As the academic demands in mathematics become greater at the kindergarten and primary levels, the need to develop more systematic and developmentally appropriate strategies to introduce young children to mathematics concepts within natural environments, relationships and settings becomes even more important. Children who love to explore numbers and number relationships are better prepared for their future academic experiences. In this article the authors present simple, effective, yet developmentally sensitive strategies for promoting one aspect of mathematics: developing a sense of number. The Reggio Emilia Approach provides especially engaging and meaningful strategies to involve children in project work that is enhanced through varied means of documentation, use of natural and recycled materials, and integration of the arts. By applying these strategies to mathematics instruction in early childhood settings, teachers can foster higher levels of student motivation and understanding of concepts related to number sense.

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