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ABSTRACT

This paper examines whole language and mathematical concepts implemented to incorporate reading, writing and oral-language concepts into mathematical lessons in early childhood education. After discussing the theoretical background and anecdotal observations of the use of whole language to improve math skills, the paper describes a mini study in which whole language was used in kindergarten math lessons. One class used whole-language concepts while the other class did not. Observations showed that when literature was integrated into math lessons, the children became more active learners and the teacher did not need to constantly refocus and motivate them. By being allowed to discuss and relate the concepts to their own lives, the children were able to grasp and retain new information and incorporate it into existing schemas. The experimental group was far happier and gained more language and math vocabulary than the control group. Contains 14 references. (JPB)

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# The Integration of Whole Language and Mathematical Concepts

by

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**Abstract-** The purpose of this paper was to examine Whole Language and Mathematical concepts implemented to incorporate reading, writing and oral language into mathematical lessons as well as to report results of a mini study conducted in the kindergarten classroom.

**Introduction-** The scope of this paper will address the "Whole Language" approach to reading and how mathematical concepts can be incorporated to enrich and connect to children's everyday lives. As an early childhood teacher, I have seen and experienced how the various components of whole Language functions to incorporate math as well as other content areas. A mini study was conducted to evaluate how well children respond and grasp math concepts in contrast to teaching math in the "traditional" way.

### Emerging Literacy and Whole Language Learning

The theoretical perspective for whole language learning evolved from the idea that language is a complete entity; any attempt to fragment it into parts (i.e., grammatical patterns, vocabulary lists, phonics, "families") ultimately destroys it: "If language isn't kept whole, it isn't language anymore" (Rigg, 1991 p.522) Within this

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framework, the definition of literacy is expanded to include writing as well as reading. The way in which children learn oral language is recognized as a vital element of the whole language process, rather than a mechanism apart. According to Reutzel and Cooter (1992), whole language teachers are those who believe in reading literature in the classroom and who attempt to integrate listening, speaking, reading and writing across the curriculum. Literature and language skills, however, are often neglected in the mathematics area of the curriculum. Educators are now discovering ways to incorporate reading into mathematics through the use of children's literature.

### The Importance of Literature

In addressing the issue of choosing instructional materials for early literacy, Cullinan (1992) refers to a study conducted by De Ford in 1981 comparing a number of reading programs, she observed that children in phonics- and skills-based classrooms wrote imitations of texts they used. By contrast, children in whole language classrooms produced richer and more imaginative texts using invented spellings to

represent words they had not yet formally learned. Their writing, too, reflected their classroom texts--which included trade books, newspapers and a wide variety of printed materials. Two years later, Eckhoff examined the writing of second graders in relation to their basic reading text. Similarly, she found that children who read from texts "written with the style and complexity of literary prose" (Cullinan, 1992, p.xiv) used more linguistic intricacies in their own writing than did children who read from more traditional, simplistic grade- level text.

The influence of reading materials is not only stylistic. Hearn (1993) states that :

Through reading stories children become involved in the text, learning about the characters in the story and following their actions, constantly page turning to see what

happens next. There is an emotional engagement

which enables the readers to possess a text, and make it their own. (p.p 138-139)

Books are advantageous because they help students explore

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mathematical ideas in natural, familiar, and meaningful contexts. (Griffiths and Clyne, 1991; Whitin, 1994). Literature can spark students' interest in a math lesson, if the story is first read and enjoyed for its literary content (Whitin and Gary, 1994). If students can relate to and enjoy the plot, setting, and characters of a story the new math skill will be associated with the meaningful contexts. Several educators have referred to the picture book, "The Doorbell Rang" by Pat Hutchins (1986) as a valuable resource for math teachers (Conaway and Midkiff, 1994). This story puts the mathematical concept of division into the familiar context of sharing. Two children are preparing to share a dozen cookies when the doorbell rings and two more children enter the house. As soon as the four children decide how many cookies each person will get, the doorbell rings once more, and the cookies have to be divided again. The pattern continues until the book's surprise ending. Thus, the book introduces students to the mathematical concept of division in the familiar context of sharing and eating cookies. After hearing the story, students can practice division

in similar situations.

Clyne and Griffiths (1991) suggested that children can take math ideas from stories and use them in their own situations, and that stories pose problems that children are intrinsically interested in solving. One example given by Conaway and Midkiff (1994) demonstrates how picture books can be effective in modeling fractional concepts.

Children are attracted to the pictures in the book "Eating Fractions" by Bruce McMillan (1991), because there are photographs eating fractional parts of foods, such as halves of a banana and fourths of a pizza. Simple recipes for the foods shown in the pictures are located in the back of the book.. Therefore teachers can help students model fractions in a fun and enjoyable way using the same portions of foods mentioned by the children in the book. Stories can provide a literature link to math by modeling concepts in ways that can be recreated using objects or manipulatives shown in books. In addition to modeling math ideas, "Eating Fractions" also puts the fraction concept into a meaningful context which children can relate to. Stories can challenge

students. Ohanian (1989) asserted that "A Grain of Rice" by Helena Clare (1992) is a story that develops a meaningful concept. In this tale, a farmer saves the life of the emperor's daughter. He asks that his reward be one grain of rice on the first day, and for the amount to be doubled each succeeding day. After predicting how many grains of rice the farmer would have received by the twenty fifth day, students might feel challenged to solve the problem for themselves. They would be quite surprised to learn that on the twenty fifth day, the emperor would pay the farmer 16,777,216 grains of rice (Ohanian). A similar story is that of King Kaid of India, in which the king wishes to reward the man who invented the game of chess. The inventor asks for one grain of corn on the first square on the chess board, double that on the second square, double that on the third square, and so on. While students are attempting to solve the problem of how much corn will be needed to pay the reward, they are involved in a number of mathematical processes, such as developing and testing hypotheses, searching for patterns, utilizing various methods of recording,

multiplying, adding, and using calculators (Griffiths and Clyne).

In keeping in line with the whole language approach one must not forget the writing component. Writing serves many purposes when used in conjunction with math. Writing enables students to communicate about math and help clarify their understanding of various math concepts( Wood, 1992). By requiring reflection, analysis, and synthesis of information, writing involves many of the thought processes utilized in mathematics. (Davison and Pierce, 1988). Educators have been successfully incorporating different types of writing into the math curriculum. Writing is often a useful tool because it helps students organize and record information in useful ways. Writing can be integrated into the math curriculum in three ways: (a) By creating word webs, (b) by organizing notes in a notebook, and (c) by categorizing concepts on the basis of common elements. A word web is a thought organization and clarification strategy that can be utilized with students across the curriculum (McGehe, 1991). The importance of webbing occurs when students

begin to associate words and phrases with key mathematical information. Students can brainstorm terms and concepts studied in a previous unit by classifying them by the elements they have in common. After classifying the information, students can choose a category on which to write a paragraph in their notebooks. Writing can also be used by students to explain to others how something is done or to help them further understand a concept or a process. This writing requires students to be very specific and critical in their thinking processes. Students and their teacher learn more about how they think and about how well they understand mathematical processes when they write about them. Explaining how to do something, describing processes in a journal, or explaining mistakes made during problem solving help students clarify their understanding of various mathematics concepts.

### Mini Research Project

I conducted a mini research project integrating Whole Language with the teaching of mathematical concepts. I elicited the help of another

kindergarten teacher to serve as a control group using the "traditional" approach to teaching math. My kindergarten class served as the experimental group that was used to incorporate Whole Language to teach math. For a period of three months the same mathematical concepts were taught by both groups using the aforementioned approaches. The children were introduced to the concepts of position and classification. With regard to position, there were five lesson objectives. In the first lesson the children had to identify the concepts of top, middle, and bottom. In the first lesson the children explored the mathematical concepts of position through literature. As a warm up exercise to help the children explore the concept of position, they played a version of the game "Follow the Leader". Simple commands using words such as in, on, under and above were given. For example, "Put your hands in your pockets". This was followed by a discussion where children were asked if any of them owned a cat. Those that did were asked to describe their cat's behavior. Part of the discussion included descriptions of places where they have seen cats sleeping.

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This was followed by a reading of the poem "Cats" by Eleanor Farjeon. Once the poem was read a discussion followed where the teacher elicited responses from the class as to the literal interpretation of the poem as well as asking them to make comparisons between where cats sleep and people sleep. The children in my class were very excited and actively engaged in the discussions and activities that ensued. They were able to attend to the tasks assigned for a longer period than the children in the control group where the literature and discussion that connected the concepts to childrens prior experiences. Even though the children in the experimental group did not do better on the actual hands on activity of placing cat stickers in various positions on an activity page, they appeared to be more motivated and involved in the activity per se than the control group. As a teacher I feel that to instill a love of learning is just as important if not more important than the immediate concept at hand. When the concept of classification was introduced there was a warm up period to prepare the children to explore classification. A pile of yellow and green crayons were placed

on a table. The crayons were not the same size or the same brand. Children identified the colors and explained their reasons for the sets. Some children classified by size and others classified by color. This gave the teacher the opportunity to view and listen to childrens reasoning abilities. The children were read a copy of "Caps for Sale" by Esyphyr Slobodokina. Before the literature was introduced the teacher of the experimental group explained that many years ago peddlers went from house to house selling many different things. As stated in the previous lesson mentioned above a discussion followed to check for understanding . This was followed by a guided practice where the children point to the position of where the monkeys were on the tree. The children then put a hat sticker on each monkey as the teacher instructed such as "Put the blue hat on the monkey at the top". The children were not read the story and were not able to complete the task as successfully as the experimental group. They required follow up lessons to grasp the concept . These were just two sample lessons of many lessons using the technique of "Whole Language" to integrate

the math concepts. My colleague and I learned that when literature was integrated in to math lessons children become more active learners and the teacher does not need to constantly refocus and externally motivate children to learn. By allowing them to discuss and relate the concepts to their own lives, children were able to grasp and retain new information and incorporate it in their existing schemas. The experimental group were far happier and gained more language and math vocabulary than the control group. Research on including reading, writing and oral language in math instruction is very positive. Not only do students benefit as mathematicians, they develop as readers, writers and speakers from the additional opportunities to practice these skills. Practicing language arts skills across the curriculum is in line with the whole language movement, as well as with the integrated curriculum approach. The benefits of including literature and reading experiences throughout the curriculum have been expanded upon by whole language researchers. Research supports the benefits of incorporating reading writing and oral language into

mathematics instruction to help students convey mathematical information in familiar words and to assist them with their thinking processes as they work through math calculations and problem solving. Another reason writing is a valuable tool in mathematics instruction is that the teacher is better able to evaluate students understanding of math concepts and processes based upon what children have written. A teacher can also evaluate students by what they say. By including oral language activities in math lessons students abilities to communicate mathematically will improve. Thus the teacher will be better able to evaluate and clarify student thought processes while building their confidence in their own abilities to discuss mathematics. The basis for language art activity must be literature but there must be a wider range of math topics added .

## References

- Clyne, M. & Griffiths, R. (1991), The Power of Story: Its Role in Learning Mathematics. Math Teaching, 135, 42-45.
- Conaway, B., & Midkiff, R.B (1994). Connecting Literature, Language and Fractions. Arithmetic Teacher, 41,430-434.
- Cullinan, B. E. (1992). Leading with literature. In B.E. Cullinan (E.d.). Invitation to read: More children's literature in the reading program(pp.x-xxii). Newark, DE: International Reading Association
- Davison, D.M., & Pierce, D.L. (1988). Using Writing Activities to Reinforce Mathematics Instruction. Arithmetic Teacher, 36, 42-45
- Hearn, B. (1993). Literacy and Reading Development: A Review of Theories and approaches. Early Child Development and Care, 86,131-146.
- Hutchins, P.(1986) The Doorbell Rang. New York: Green Willow Books
- McGhee, C.A. (1991). Mathematics the Write Way. Instructor, 100,36-38.
- McMillan, B. (1991) Eating Fractions. New York: Scholastic
- Ohanian,S. (1989). Readin', 'rithmetic- Using Children's Literature to Teach Math. Learning, 18, 32-35
- Reutzel,D.R. & Cooter, R.B. (1992). Teaching Children to Read: From Basals to Books. New York: MacMillan.

Rigg, P. (1991). Whole Language In TESOL. TESOL Quarterly, 25, 521-541

Whitin, D.J. (1994). Exploring Estimation Through Children's Literature. Arithmetic Teacher, 41, 436-441

Whitin, D.J., & Gary, C.C. (1994). Promoting Mathematical Explorations Through Children's Literature. Arithmetic Teacher, 41, 394-399

Wood, K.D. (1992). Fostering Collaborative Reading and Writing Experiences in Mathematics. Journal of Reading, 36, 96-103



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