The Power and Potential of Art in Literature to Teach Mathematics

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Abstract

Much professional literature indicates that developing and implementing interdisciplinary curricula is linked to high levels of student achievement. Text sets, defined as a collection of conceptually related pieces of literature, is a curricular resource and instructional tool that can be used to support interdisciplinary curricula. This presentation shares an overview of research conducted in the United States on the effectiveness of interdisciplinary curricula, and a text set of high-quality and award-winning literature that illustrates the power and potential of art to teach important concepts in mathematics.

Educational Objective

The objective of this presentation is three-fold: 1) describe an increasing body of research conducted in the United States that indicates that the conceptualization, development, and implementation of interdisciplinary curricula are linked to high levels of student achievement, as measured by standardized tests as well as reported by teachers conducting classroom-based research, 2) share a *text set* of high-quality and award-winning literature published in the United States of America (USA), the United Kingdom (UK), Australia (AUS) and other countries, which can be used to teach substantive concepts in mathematics, and 3) highlight the artistic elements within and across literature in this text set that supports and extends the teaching and learning of mathematics.

1. Introduction

An increasing body of research conducted in the United States continues to indicate that the conceptualization, development, and implementation of interdisciplinary curricula are linked to high levels of student achievement (Whitin, Mills, O'Keefe, 1991; O'Keefe, Mills, and Whitin, 1996; Wilde and Whitin, 1995; Whitin and Whitin, 2000; 2004; Whitin, 1992; Karp, et al., 1998). Much of this research indicates that interdisciplinary curriculum is particularly effective in the teaching and learning of mathematics. Increasing numbers of teachers in the United States use collections of high-quality and award-winning literature to integrate not only language arts, but also art, history, and science into the study of mathematics. This research indicates that incorporating literature into the teaching and learning of mathematics is a means to capture and engage students' attention and interest because they see mathematics in a different context, e.g. story vs. word problems. For example, a word problem that requires students to calculate the circumference of a circle has much less context for understanding this concept than does an engaging and informative narrative like *Sir Cumference and the First Round Table* (Neuschwander, 1997). This narrative has important story elements like relevant characters (Sir Cumference, Lady Di of Ameter, Raduis, and Geo of Metry), a historical setting (Medieval England), a problem (designing an alternative to a rectangular table), a resolution (a round table), and ending (names of characters became mathematical concepts).

2. Text Sets

Using literature, especially picture books, to integrate literacy and mathematics has been, and continues to be popular in the United States. In fact, the National Council of Teachers of

Mathematics (NCTM) advocates using literature, especially through *text sets*, to integrate literacy and mathematics. Simply stated, a *text set* is a curricular resource for developing and implementing interdisciplinary curriculum. This resource is a collection of texts that are conceptually related in some way, e.g. theme, topic, genre, artistic element, etc. Text sets help students: 1) learn content area material like mathematics, 2) develop awareness of and appreciation for artistic elements in high-quality and award-winning literature, and 3) enhance important reading skills, e.g. making connections within and across texts, reading broadly and deeply, and seeing relationships across concepts. Text sets have been developed to address important concepts in geometry and measurement: circles, polygons, area and perimeter, and measurement (Bintz & Moore, 2002), as well as reasoning, topology and dimensionality (Moore and Bintz, 2002; 2003). They have also been used to integrate mathematics, science, and literacy to teach experimental design; the scientific method; collecting, analyzing, and calculating data, measures of central tendency; graphing (Bintz, Moore, Hayhurst, Jones, and Tuttle, 2006).

3. Activities

In this presentation we will offer three activities. Specifically, we will: 1) provide a brief overview of recent research that indicates a link between interdisciplinary curricula and student achievement, 2) share a text set that is designed to illustrate the power and potential of art in literature to teach math, and 3) highlight and discuss the artistic elements of individual pieces of literature in this text set, specifically highlighting the use of illustration, collage, montage, and paper engineering (pop-up books) to teach important mathematical concepts.

4. Conclusion

Literature illustrates that art and mathematics are closely tied. Text sets are an excellent tool for demonstrating this connection in a form friendly to students. They learn through these connections and contexts with literature, and that is powerful.

References

Bintz, W.P. and Moore, S.D. (2002). Using literature to support mathematical thinking in middle school, *Middle School Journal*, 34(2), 25-32.

Bintz, W.P., Moore, S.D., Hayhurst, E., Jones, R., and Tuttle, S. (2006). Integrating literacy, math, and science to make learning come alive, *Middle School Journal*, 37(3), 30-37.

Karp, K., Brown, E.T., Allen, L. & Allen, C. (1998). *Feisty females: Inspiring girls to think mathematically*. Portsmouth, NH: Heinemann.

Moore, S.D. and Bintz, W.P. (2002). Teaching geometry and measurement through literature, *Mathematics Teaching in the Middle School*, 8(2), 78-84.

Moore, S.D. and Bintz, W.P. (2003). Teaching geometry and measurement through literature, *Delta-k*, 40(2), 14-19.

Neuschwander, C. (1997). *Sir cumference and the first round table*. Watertown, MA: Charlesbridge.

O'Keefe, T., Mills, H., and Whitin, D. (1996). *Mathematics in the making: Authoring ideas in primary classrooms*. Portsmouth, NH: Heinemann.

Whitin, D., Mills, H. and O'Keefe, T. (1991). *Living and learning mathematics: Stories and strategies for supporting mathematical learning*. Portsmouth, NH: Heinemann.

Whitin, D. (1992). *Read any good math lately?* Portsmouth, NH: Heinemann.

Whitin, P. and Whitin, D. (2000). *Math is language too: Talking and writing in the mathematics classroom*. Urbana, Ill: National Council of Teachers of English.

Whitin, D. and Whitin, P. (2004). *New visions for linking literature and mathematics*. Urbana, Ill: National Council of Teachers of English.

Wilde, S. and Whitin, D. (1995). *It's the story that counts: More children's books for mathematical learning, K-6*. Portsmouth, NH: Heinemann.