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How Picture Books Can Be Effectively Used in Middle School Mathematics Classes to Enhance
Learning and Instruction

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Abstract

This study looks at the issue of how picture books can be effectively used in middle school mathematics classes to enhance both the learning that should be occurring and also the instruction that is taking place. Participants involved in the study were several different students ranging from sixth to eighth grade. These students included regular education and special education students as well as regular and special education teachers. Analysis of the data along with evidence from the research says that picture books are in fact motivating for middle school students. Middle school teachers should aim to incorporate the use of picture books in the mathematics classrooms whenever possible in alignment with the current curriculum.

Introduction

The purpose of this study was to investigate the use of picture books in middle school mathematics classrooms. The major goal was to explore and see if there was any positive or negative correlation to the use of picture books in middle school classrooms. It was evident from the literature as well as the research conducted that reading picture books to middle school students has many positive attributes. It was discovered that the use of picture books increases motivation greatly for students of this age.

Theoretical Framework

Literacy is ways of talking, valuing, thinking, believing, acting, and interacting. Gee defined literacy in terms of discourses; ways of behaving, interacting, valuing, and writing that are accepted in society depending on the role or group to which people belong (Gee, 1989, 2001). “Discourses are ways of being in the world; they are forms of life which integrate words, acts, beliefs, attitudes, and social identities as well as gestures, glances, body positions, and clothes” (Gee, 1989, 2001, p. 526). Discourse with a capital D is the way in which we use language in our social settings. Gee believes that people are considered to be literate when they have the ability to use both primary and secondary discourses in their daily lives. Primary discourse is considered the discourse in which one acquires through family and community. Secondary discourses are often learned through contacts with other social groups or institutions (Gee, 1996, 2001). Our discourse is how we behave within the different groups that we belong.

Barbra Rogoff’s sociocultural theory of literacy also supports the definition of literacy as multiple discourses that were introduced by Gee. Her theory presents all individuals as an active member of a constantly changing community of learners and educators. Children often develop their literacy knowledge and understanding through participation in society (Larson & Marsh,

2005). As individuals in a constantly changing society, we are constantly working toward “becoming literate rather than being literate” (Kucer, 2005, p. 250).

“Sociocultural-historical theory challenges traditional definitions of learning as the transmission of knowledge” (Larson & Marsh, 2005, p. 4). We are members of a society in which our literacy knowledge is constantly changing and evolving based on the demands of different societies in which we belong. Literacy is an ever changing part of an individual that can be influenced in all of the different content areas.

The New Literacy perspective also defines literacy in terms of discourses. Many principles of the New Literacy Studies are that literacy events and practices are most always found in social, cultural, historical, and political relationships; that being literate often includes being competent across multiple discourses; that social inequalities based on race, class, gender, ability, sexual orientation, and so on, structure access to participation in literacy events and practices; and that literacy practices change, and new ones are frequently acquired through processes of informal learning and sense-making (Larson & Marsh, 2005, p. 23). “New Literacy Studies emphasize literacy as a more complex social practice rather than traditional pedagogy, curricula, and assessments address” (Larson & Marsh, 2005, p. 38).

Literacy instruction should not be taught to all students in only one way. There is not one way of teaching reading that is appropriate for all students (Ness, 2005, p. 3). There are many different practices that a teacher can use to teach literacy skills. One of the most beneficial learning styles for students is teacher modeling. A great number of students benefit greatly from simply watching the teacher do a behavior that he/she expects the students to do. Inquiry based learning is also another strategy that can be found useful in the instruction of literacy in the classroom. It is important for the teacher to have a classroom where students participate in

authentic activities (Larson & Marsh, 2005, p. 28). It is also apparent that students learn well from interacting with each other through collaborative learning. If this strategy is one that is being used regularly it is important that the students learn to work with many other students and not only those in which they consider to be their friends. It is also important when using collaboration as a technique that everyone in the group is responsible for a piece of the learning, this can easily be accomplished by each member in the group having a defined role. Ultimately, there are many effective ways to teach literacy in the classroom; the most important thing is that there is a balance of the many different types of literacy instruction. There are multiple learning styles within the classroom and to effectively teach all students literacy we must teach literacy in multiple ways, not just one way each and every day.

Teachers need to make the different texts being used engaging for all students. If we choose books that range in diversity, we can relate too many of our children's lives and make the fiction seem like real life experiences for them. If bilingual children and/or children of color are the majority of the class, the books that are used in the classroom should reflect that (Meier, 2003, p. 247). Teachers need to teach the students the behaviors that they want the students doing while they read. As teachers, we need to realize that often times our students do not do what we expect them to do because they do not know how to do what we are expecting of them.

In the sociocultural approach to literacy the use of cultural tools is viewed as important. These items that are part of the culture may be computers, picture books, books, and traditions taught. By being exposed to the different items that are part of the culture the child will learn the importance of the different items available. The use of picture books for literacy acquisition is viewed as a sociocultural tool that enhances the instruction.

Synthesis of Research

Content Area Literacy

Content area literacy is the use of reading, writing, and study strategies to learn content across the different curriculums (Loranger, 1999). Literacy is not only a part of reading and writing classes, it now should be a part of all content area teachers' instruction; Draper claims that content-area literacy education should encourage mastery of the discourse within a specific content (2008). Every teacher in today's schools should be viewed as a reading teacher as well as a teacher of their specific content. Many current faculty and staff feel that they do not have adequate education to teach reading and writing. There has been controversy over the term content-area literacy and whether it should be referred to as adolescent literacy. Draper (2008) believes that it should be viewed as content-area literacy because it should not be directed toward just one particular age group. Literacy should rather be addressed throughout the educational career of all children.

Literacy instruction should be viewed in terms of texts, rather than attempting to use traditional print materials in all content classrooms. The term text refers to anything that is used to create, convey, and negotiate meaning (Siebert & Draper, 2008). As an example, in a mathematics classroom, text may include, but are not limited to, the following: diagrams, pictures, calculator readouts, manipulatives, equations, small group and whole class discussions, and conceptually oriented explanations and justifications (Siebert & Draper, 2008). It is not reasonable to think that all content area instruction will be taught through the use of traditional print materials. Content-area literacy appears of more value to content-area teachers when it makes room for non-print, non-language based texts, and also when the teacher uses print texts in ways appropriate for the particular discipline (Draper, 2008). Literacy instruction may look

very different depending on the content in which it is being used. Students often benefit when teachers broaden the materials that are available for their use in the classroom (Costello & Kolodziej, 2006).

Content area teachers should include several different types of literacy instruction as a part of their daily content instruction (Siebert & Draper, 2008). The use of children's literature in mathematics curriculum encourages students to use mathematics language, skills, and concepts in other content areas (Jennings, Jennings, Richey, & Dixon-Kraus, 1992). Some different strategies and approaches that should be used in the different content area classes are: anticipatory activities, graphic organizers, structured note taking, read alouds/shared reading, reciprocal teaching, vocabulary instruction, and writing to learn. Content area teachers need to understand the strategy but also understand how to apply it efficiently to the different content areas (Fisher & Frey, 2008).

Connecting Literature and Mathematics

The National Council of Teachers of Mathematics (NCTM) includes four broad standards that should be part of all mathematics learning. These standards include problem solving, reasoning, communication, and connections. The communication standard addressed by the National Council of Teachers of Mathematics emphasizes that students must communicate their understanding of and skill in mathematics in many ways: writing, talking, acting, building, and demonstration (Greenlaw & Tipps, 1997). Overall mathematics educators have been concerned about mathematical communications in general (Siebert & Draper, 2008). Mathematics instruction continues to be controlled by paper and pencil drill, memorization, teacher explanations, and teacher presentations rather than on reasoning and problem solving (Jennings, Jennings, Richey, & Dixon-Krauss, 1992). Some ways suggested that mathematics could use

print materials in their classrooms include, but are not limited to, picture books, chapter books, poems, newspapers, and reference materials (Greenlaw & Tipps, 1997).

The connection between children's literature and mathematics is encouraged. Making connections between literature and mathematics motivates the students to learn mathematics, but also demonstrates to the students, that mathematics does not need to be learned separately from other content areas (Raymond, 1995). Literature also provides a meaningful context for mathematics, shows the students that mathematics is a language, and integrates mathematics into many other content area curriculums (Shatzer, 2008). Through the use of books in daily mathematics instruction, learners see mathematics as an everyday activity rather than an isolated discipline. As a result of making connections between literature and mathematics, students start to view mathematics as a part of daily life (Raymond, 1995). Using literature as a bridge to teach mathematics also provides the students and teachers with an opportunity for creativity which is thought to increase interest as well as achievement (Jennings, Jennings, Richey, & Dixon-Kraus, 1992).

Raymond (1995) asserts that stories often provide a context where children can explore different content areas in a more meaningful way. For example, the story *The Rajah's Rice* deals with an exponential concept. Through the use of this story, the students are introduced to some mathematics that challenges them to solve problems, reason, communicate, and make connections. The content of the story includes number operations, patterns and functions, and algebra (Greenlaw & Tipps, 1997). It is also suggested that we not only focus on integrating literature into mathematics class, but also bringing mathematics into a literature class. Mathematic concepts should be investigated as they are come upon in literature. (Kribs Zaleta & Ruebel, 2008).

Children's literature can provide an important framework for learning in mathematics, it can also support learners to be mathematical problem solvers, provide a meaningful context for children to correspond mathematically, and investigate many different mathematical topics. Research also suggests that when children's literature and numeracy are associated in a meaningful way, students will understand the concepts and will also sustain the knowledge (Shatzer, 2008). After connecting literature and mathematics, students' interest in mathematics increased and allowed them to make connections between mathematics concepts beyond the connections made by the teacher, communicate about mathematics to others, begin to see mathematics as relevant, and also to see the logic behind mathematics (Jennings, Jennings, Richey, & Dixon-Kraus, 1992).

Use of Picture Books

A picture book, by definition refers to a book whose story can be understood only with the illustrations used to supplement the written text (Miller, 1998). The use of picture books as supplemental material for middle school classrooms is becoming more common (Costello & Kolodziej, 2006). Picture books can be a very powerful tool used by a content area teacher at the secondary level of instruction.

Picture books should be used in middle school classrooms for various reasons including: enjoyment, independent reading options, diversity, vocabulary development, abstract topics, and research sources. The arrangement of stimulating artwork, accessible language, and shortness of text can be very appealing to the adolescent age group. Picture books can often be used to incorporate multicultural content in all subject areas. Vocabulary rich picture books can provide a source of contact to more complicated language (Miller, 1998). Many picture books contain humor that is beyond the understanding of a younger audience (Giorgis & Hartman, 2000).

Picture books can also be used to introduce an abstract concept in mathematics, science, technology, history, etc. Activating background knowledge can also be stimulated through the use of diverse picture books (Miller, 1998).

Content area teachers should use picture books in their classrooms to illustrate different concepts (Miletta, 1992). Not only does the use of picture books provide motivation and interest for adolescents, it also allows teachers the capability of differentiating instruction by giving students the opportunity to select their own texts, based on interest as well as reading abilities (Costello & Kolodziej, 2006). The illustrations that are found in the picture books often helped students understand the text that they were given. Middle school students often dislike the length of what they are given to read, the succinctness of the text in picture books can be very appealing to middle school students.

Selecting Picture Books

It can be very difficult to select an appropriate picture book to use in a middle school classroom. When selecting picture books the teacher should consider several factors including the purpose for using the book, the book itself, the ability of the book to achieve the objectives for a particular lesson, and the teacher's personal enthusiasm for the book (Costello & Kolodziej, 2006). When selecting a picture book to use in a middle school classroom, one of the main criteria should be that it tells a good story (Giorgis, & Hartman, 2000). Some other criteria to consider when selecting picture books for use in middle school classrooms are the illustrations, the prospective dialogue, as well as titles recommended by other teachers and/or book lists (Dickinson, 1995). Many picture books can and should be used in more than one content area. A teacher should select a book that not only serves an instructional purpose but can also be integrated into the other content area classrooms (Costello & Kolodziej, 2006). If the teacher

makes a connection between different content areas by using picture books, the students will begin to see that the different disciplines do not stand alone.

Methods

Researcher Stance

I began researching the effect of picture books in the middle school classrooms, particularly mathematics. When beginning the research my belief was that using picture books in middle school classrooms was very beneficial to the students. I began to look at the many different reasons that picture books enhanced learning at this level.

After reading several articles related to the topic and looking around the building that I currently teach in, I realized that this is a practice that is talked very highly of, but not put to use very often. I began to look at the different ways that picture books could be used in the classroom as well as some of the reasons that they are not used often in the classroom.

Design

Given the research question and the time frame allowed, I looked at the ways different teachers use picture books in their classrooms over the course of a semester. I used field notes, observations, teacher interviews, and student interviews as well as artifacts. During the course of the research I hope to discover more reasons why picture books are not used and what it is about picture books that students thrive from.

Setting

Freeman Middle School is a rural school in western New York. The population was about 5,219 in the 2000 census. There were approximately 495 students student's at the middle school level. There are about 1900 students in the entire district including pre-kindergarten. About 32% of the students are eligible for free or reduced lunch. Approximately 98% of the

students at this level are white. There are also currently 51 teachers at this level of which approximately 99% are white also. According to the New York State report card, Freeman Middle School is meeting the adequate yearly progress (AYP) in the content areas of English Language Arts, Mathematics, and Science. For the English Language Arts state test given the percentage of students that scored at or above a Level 3 in grade six was seventy-three percent, in grade seven was fifty-one percent, and in grade eight was seventy-two percent.

Participants

Teachers. Different types of teachers were observed and interviewed. Special education teachers were observed as well as regular education teachers. An observation also occurred in an Academic Intervention Service setting with a mathematics teacher. Mrs. Swarts, a special education teacher as well as a literacy provider, with seven years teaching experience was both observed as well as interviewed. Mrs. Swarts uses differentiation in her instruction to accommodate the many needs of her students. Mrs. Sherman, an Academic Intervention Service provider, has over twenty years of teaching experience and is certified in both mathematics and science. Mrs. Sherman's philosophy with her students is to help the students to understand the reasons why they are doing what they are doing. She believes that if the students can look deeper and truly understand the concept then they will better understand the content. Mrs. Adam, a regular education teacher with seven years of teaching experience holds a certification in mathematics. Mrs. Adam tries an approach that is a balance of direct instruction, student investigation, and group work. She believes that students need some direct instruction before they are set free to work through their problems.

Students. Students in grades six through eight were observed during the period of data collection. Students from all abilities will be observed during the observation period. The

majority of all students observed will be Caucasian. Approximately thirty students will be observed at different times throughout the research. Eleven sixth grade students, eighteen seventh grade students, and one eighth grade student are among the students that are included in the classes that were observed. There were thirteen boys observed and seventeen girls observed.

Data Collection

Data was collected over the course of three months. Several different types of data were collected. Observations were completed in middle school mathematics classrooms. The middle school mathematics teacher was interviewed. Artifacts from the school were collected.

Observations. Observations were the primary method of research. The topic is analyzed best by watching several different classrooms while the teacher is reading a picture book to the students. Observations will occur four times over the course of the semester.

Interviews. Mrs. Swarts and Mrs. Adam were interviewed about their feeling and use of picture books in middle school mathematics classes. This data was very valuable in the overall research process. This data gave more insight into how the teachers feel about what the student has learned.

Artifacts. Basic demographic data was gathered by looking at the New York State report card.

Findings

Data were analyzed using several different approaches. I began to look for themes that arose across the several different types of data that were collected. I found the most useful data for this topic was either teacher interview or classroom observations. The combination of these two types of data collection gave the most overall insight into the topic of using picture books in middle school mathematics classrooms.

Engagement

After observing classroom ranging from AIS classes, Special Education classes, and Regular Education classes I found that overall the students were much more engaged in class while the teacher was reading a picture book. A sixth grade boy in the special class mathematics class that is generally found out of his seat or playing with his pencil was leaned over his desk trying to get a closer view of what the teacher was reading. The students were generally very quiet during the time that the teacher was reading the story. One regular education student asked “are we going to finger paint net, this is like being back in kindergarten”? I found in all the observations that in the beginning the students were very enthusiastic and excited about the book that was being read. As time went on during the class, the level of enthusiasm decreased, but the students were still very engaged. In three out of the four observations that were completed the teacher asked questions while they were reading the book. The teacher asked questions relating to the story that would make the students think beyond what was written on the page and being read to them. When reading a book in special class mathematics related to shopping some questions asked were, What is bartering?, What are some differences between borrowing and bartering?, What is money called from different countries – US, Mexico, Europe?, Where would we see bargaining in our society?, Does anyone ever see anyone using the internet as a shopping tool?, and What are some of your favorite ways to shop?. Also, in the same three observations the students also asked questions and made connections while they were listening to the picture book that was being read. After observing several lessons using picture books and several lessons not using picture books, I concluded that the students are definitely far more engaged with the use of a picture book in the classroom.

Student Questioning

In the same lesson observations I also found that overall the student's desire to question increased when they were being read a picture book. The student's seemed to feel more comfortable commenting, questioning, and connecting to what was being read in the book. I think that part of the reason for this is that they are seeing some of the mathematical concepts in the context of a story rather than the context of a mathematics text. Students often do not know what questions to ask about mathematical concepts because they do not have enough understanding to know what question to ask. The students who were asking question and making connections as the story was being read had a solid understanding of the topic that was presented.

Limitations and Implications for Future Research

After the data that was collected I am confident that the use of picture books in the middle school increases engagement and interest, however, I would be interested in seeing if it truly increased the student's comprehension of the topic that was presented. The use of picture books is good to give the students background information and context for the mathematical concept that is going to be investigated.

It is very important for teachers to realize that picture books are not only designed for the use of young children. Often the message that is found within the picture book is actually meant for a much older child or even adult. Many picture books that are designed around a mathematical concept are in fact written for a much older audience that will be able to apply the concept being discussed. As a mathematics teacher currently teaching seventh grade, I hope to use what has been discovered and increase the amount of picture books that are used in my classroom.

There are many mathematics picture books that are available for the use in middle school mathematics classrooms. As an eighth grade mathematics teacher, next year I plan to explore some of the many different books for use in my classroom. My goal is to find picture books that are centered on a mathematical concept that can be read to the students and used to enhance their understanding of the concept being taught.

When using picture books in the classroom, depending on the general make up of the class I would like to try having the students read aloud to each other as well as the teacher reading aloud. In my accelerated Algebra class, I would like to present the idea of the students reading picture books in small groups rather than a large group setting. I would need to model the activity to the whole class in the beginning of the year so that all students are on task and doing what is expected of them, but with scaffolding I would hope to release the task to the students.

It is a great observation that students are more motivated while they are being read to, but the important piece that is missing, is whether or not there is any sort of increase in understanding or application. It may not necessarily be relevant at this level of research about the given topic; however, I feel that it is very important to look at the level of understanding that is gained from the use of picture books in the classroom. I feel that it would be very interesting to look at that piece and continue my research to include the level of understanding after reading a picture book versus “regular” instruction. Students can be motivated and engaged, but they also need to understand the content. Since literacy is a social practice using picture books as a portion of mathematical instruction tends to encourage students to ask questions which lead them to greater understanding of the concept.

Conclusion

The literature supports that literacy should not only be found in reading and writing classes, but in all content area classrooms. The literature also suggests that the use of children's literature in middle school mathematics classroom encourages the students to use language, skills, and concepts from mathematics in other content areas. Often times children's literature can give a framework for the learning that will occur in the mathematics classroom. Picture books can be used at secondary education levels for various reasons, such as, enjoyment, independent reading, diversity, vocabulary development, abstract topics, and research sources.

Overall, it was discovered in the literature and in the research that the use of picture books in the middle school classroom is a good form of motivation. From the research conducted it was found that engagement was increased a great deal as well as the student's desire to question. The question that still has not been answered is whether or not students retain the content or concept being taught better after the use of a tool such as a picture book.

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