Representation of Gender in Middle Grades Mathematics Textbooks Used in Southwest Georgia

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ABSTRACT

Empirical research has shown gender-related differences in educational materials contribute to females' and males' performance in mathematics. The purpose of this study was to investigate the degree of representation of females and males in middle grades mathematics textbooks used in southwest Georgia. The most frequently used sixth and seventh grade mathematics textbooks, identified by school system personnel in southwest Georgia, were selected for this study.

Content analysis methodologies used were illustration analysis and textual analysis. Chi square was used to test for significant differences between variables. Coding rules and instruments were developed to collect the data of interest systematically and consistently for illustrations and text of middle grades mathematics textbooks.

There were relatively even frequency counts of females and males represented in both illustrations and text of middle grades mathematics textbooks used in southwest Georgia. However, patterns emerged which indicated the use of more gender-neutral language and some stereotyping of females and males when analyzing the other gender roles. In both illustration analysis and textual analysis, females and males were portrayed in more gender-neutral roles than any other role. In illustrations and text, males were depicted in more traditional roles than females; and females were portrayed in more nontraditional roles than males.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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DEDICATION

I dedicate this study to my first child, Brystan Thomas Carthon, who was born on Monday, September 16, 2002, I love you.

Chapter 1

INTRODUCTION

Fair gender representation in instructional methods and materials is a significant issue for mathematics educators and researchers. Lubienski (2000) examined mathematics education research conducted between 1982 and 1998. She ascertained 10 percent of the 3,011 published articles considered the variable of gender equity. Empirical research has also shown gender bias and stereotyping in educational materials contribute to females' and males' performance differences in mathematics (Schau & Scott, 1984). Males dominate in the study and field of mathematics while females continue to lag behind. Educational materials including textbooks have been a major source of stereotypical gender roles (Schau & Scott, 1984). Intentional or unintentional gender bias in educational materials should not be tolerated in any school curriculum. The school curriculum should be designed to provide continuous progress for all students enrolled (George & Alexander, 1993).

Doll (1986) defined curriculum as "the formal and informal process by which learners gain knowledge and understanding, develop skills and alter attitudes, appreciations and values under the auspices of that school" (p. 8). His position was that curriculum could be improved in both realms. According to Doll, informal curricula, now called hidden curricula, were unofficial opinions and unexpressed feelings. These opinions and feelings were often conveyed through textbooks.

According to Northam (1982), values and assumptions which formed the hidden curriculum of mathematics textbooks could be improved. She found mathematical skills were defined more masculine as students progressed through middle school. Pictures and references to famous mathematicians such as Hipparcus, Napier, Pythagoras, and Pascal reinforced the impression of mathematics as a masculine activity. Northam reported a decline in females' involvement in mathematics and gradual disappearance of females in mathematics textbooks for students between seven and sixteen years of age. She concluded that the hidden curriculum of mathematics textbooks possibly influenced females' involvement in mathematics and could be improved.

Curriculum development has had direct effects on the success and failure of students taking mathematics in middle grades. Ryan and Cooper (1998) purported that the textbook has been a major influence on curriculum delivered to students, since school mathematics was mainly taught using textbooks (Clarkson, 1993; Foley & Boulware, 1996). Some researchers stated concerns about potential hidden messages conveyed to students about gender through educational materials such as textbooks (Clarkson, 1993, Denton & Muir, 1994; Goodman, 1993; Narahara, 1998; Parker, 1999; Purcell & Stewart, 1990). For instance, Goodman (1993) claimed mathematics problems involving females often showed them jumping rope, buying clothes, sewing, cooking, or calculating grocery bills. Ballantine (1997) indicated females' views of the uses of mathematics could be limited to potential hidden messages conveyed in problems. According to Ozmon and Craver (1999), a hidden curriculum has been embedded in the educational process, and students have been unconsciously molded into preexisting roles.

Researchers, such as Foxman and Easterling (1999), McCarthy (1990), and Pyszkowski (1993), concurred curriculum development and the textbook should not include hidden, biased messages. However, Doll (1986) stated the curriculum of a school included formal and informal content. Certain actions could be taken to improve both the formal and informal curricula.

Educators have generally agreed that gender bias in language arts, history, and social studies textbooks should be addressed, but they were less certain about the impact of gender bias in mathematics textbooks. For instance, Banks (1993) mentioned a mathematics teacher who felt the integration of multicultural education was fine and appropriate for language arts and social studies teachers, but had nothing to do with him. The teacher stated, "Mathematics was mathematics regardless of the color of the kid" (p. 112). Others who shared this narrow conception of multicultural education could have also believed mathematics was mathematics regardless of social content. Since social content was considered to be inconsequential to mathematics, the urgency to portray females and males in equitable roles may not be a priority (Northam, 1982). However, Northam contended social content in mathematics should not be considered insignificant simply because it has been presented in fragments through illustrations and text.

Students developed some concepts of gender roles from school (Witt, 1996). School was considered a social experience where social values and attitudes were transmitted and textbooks were agents of this transmission (Evans & Davies, 2000). The use of an unbiased curriculum and textbooks was important in mathematics education because students spent a vital part of their lives in school settings where they formulated social attitudes and behaviors which dictated their future (Foley & Boulware, 1996).

Ballantine (1997) claimed "curriculum content is influenced by certain concerns and trends in society" (p. 38). Stereotyping mathematics as a male domain was a concern and a pattern in today's society. According to Hyde, Fennema, Ryan, Frost, and Hopp (1990), stereotyping mathematics as a male domain could cause females to be perceived or perceive themselves as less feminine and choose not to achieve in mathematics or in math-related fields. Neither gender should be depicted in stereotypical roles in textbooks (Clarkson, 1993). The inequity of gender representation in illustrations and text in middle grades mathematical textbooks has been to some extent associated with students' perception, achievement, and career choices.

Statement of the Problem

Researchers demonstrated gender bias in educational materials influenced students' perception of who they were, how they should behave, and consequently, influenced achievement and career choices. Gender bias in illustrations and text of mathematics textbooks has been one main factor affecting females' views of the subject (Parker, 1999). Ballantine (1997) stated:

> Girls often surpass boys in elementary school in performance and achievement, and through high school in grades achieved. But, usually in middle school, changes caused by the onset of adolescence enter the picture; girls' perception of who they are and how they should behave begin to affect their career choices. By the time girls are seniors, their plans and values for future participation in the workforce closely parallel the actual sex differences in occupations. (p. 93)

Both females and males were more confident about things typed for their genders (Chipman, Marshall, & Scott, 1991). In addition, Chipman et al. contended students shy away from or have difficulty with subject matter stereotyped for the other gender. Students tended to be less familiar and spent less time with content typed for the other gender. Students reportedly spent the least amount of time and exhibited their worst performances when engaged in activities labeled gender inappropriate, while the reverse occurred when engaged in activities labeled gender appropriate (Block, 1976; Chipman et al., 1991; Schau & Scott, 1984).

Not only had students responded more to items typed for their gender, but reading gender typed instructional materials also influenced students' perception of themselves. Narahara (1998) stated the amount of time children spent reading educational material has been associated with students' perception of themselves as well as their perception of gender roles. According to Schau and Scott (1984), approximately 90 percent of students' learning time in schools involved the use of instructional materials including textbooks. Students also spent time reading the same instructional materials outside of school. Research by Purcell and Stewart (1990) indicated there were three assumptions which supported the idea of what students read affected the way they perceived themselves. The three assumptions were:

1. Sex roles are learned behavior and are not solely biologically defined.
2. Sex role definitions can be learned from role models including people presented in media such as picture books, storybooks and films.
3. Role definitions that are too narrow or rigid can be harmful to a child's development. (p. 178)

Various gender characteristics in instructional materials affected students (Schau & Scott, 1984). Gender biases, omissions, and stereotyping were clearly demonstrated in other textbooks such as social studies and children's literature. Progress has been made to improve the representation of females in those instructional materials (Sanchez, 1997). Schau and Scott conducted a meta-analysis on the impact of gender characteristics of instructional materials. They recommended expanding the research in the area of mathematics because of its importance in career development. Furthermore, the researchers also discovered fewer studies focused on the impact of gender characteristics of instructional materials on adolescents.

Purpose of the Study

This study examined the gender-related content of middle grades mathematics textbooks used in southwest Georgia by analyzing illustrations and text. This research supported the continuous need to examine gender bias in mathematics education and to reduce gender bias as a factor contributing to the achievement gap between females and males in mathematics. This study also developed descriptive analysis instruments to evaluate gender and its indicators in mathematics textbooks. The dependent variable of interest in this study was gender roles. Independent variables were gender and grade level. This study employed these instruments and investigated these variables in an examination of gender representation in middle grades mathematics textbooks.

Research Question

The study was designed to answer the following research question: To what degree do middle grades mathematics textbooks used in southwest Georgia represent females and males in both illustrations and text?

Subsidiary questions.

1. Are males more likely to appear in illustrations of middle grades mathematics textbooks than females?

2. Is there a difference between gender roles and gender in illustrations of middle grades mathematics textbooks?

3. Is there a difference between gender roles and grade levels in illustrations of middle grades mathematics textbooks?

4. Are males more likely to appear in the text of middle grades mathematics textbooks than females?

5. Is there a difference between gender roles and gender in the text of middle grades mathematics textbooks?

6. Is there a difference between gender roles and grade levels in the text of middle grades mathematics textbooks?

Significance of the Study

A major resource for middle grade students studying mathematics has been the textbook. Like others, mathematics textbooks may have had similar gender stereotypes and similar gender biases. This study provided information about mathematics textbooks used in southwest Georgia and has the potential to lead to an improvement of gender representation in middle grades mathematics textbooks elsewhere. Authors, publishers and textbook adopters could become more sensitive to the issue of gender inequality in mathematics textbooks. Educators may be encouraged to recognize gender inequity in mathematics textbooks and compensate for it through their instructional approach. Teachers could become catalysts in promoting the need to review mathematical textbooks adopted by the State of Georgia and used in southwest Georgia schools. Instruments developed for this study offer a practical guide for analyzing mathematics and other textbooks for gender representation.

<u>Definitions</u>

Ambiguous. Having more than one meaning or something which cannot be classified.

Coding. Exacting and classifying the data of interest according to recording rules and instrument.

Female. Refers to woman and girl (child/adolescent/adult).

Emergent Coding Process. Coding rules and classification items will be established as necessary during the data collection process. These rules and items will be the result of new circumstances or occurrences in illustrations or text in the textbooks.

Gender. The biological sex and social, cultural, and psychological aspects of a person.

Gender Biased or Sex Biased. When one gender appears in illustrations and text more frequently than the other does; and one gender portrayed in stereotypical roles more frequently than the other.

Gender Labeling. To identify or associate a gender with a particular social position, attitude, behavior, or action.

Gender Role. A particular social position, attitude, behavior, or action associated with females and males in American's society.

Illustration. A unit or a picture with any visual element of a person.

Nontraditional Role. Those expected social position, attitudes, and behaviors which are not commonly associated with each gender in our society; the text or illustrations show role reversals.

Male. Refers to man and boy (child/adolescent/adult).

Precoding. Coding a sample of data in the textbooks before coding the entire data set required for the study.

Stereotyped. A gender portrayed in images and text according to societal, traditional roles.

Text. Exercises, tests, examples, practice problems, or any text where students are actively engaged.

Traditional Role. Those expected social position, attitudes, and behaviors which are associated with each gender in American society.

Chapter 2

REVIEW OF LITERATURE

Previous research on textbooks was based on the assumption that textbooks were a vital tool in shaping students and their views of society during their most influential years (Evans & Davies, 2000). Their most influential years were in middle school (Milgram, 1992). Nationally, middle schools mainly consisted of a combination of fifth grade through ninth grade, a period spanning students' most influential years (Alexander & McEwin, 1989; Lounsbury, 1992). In Georgia, middle schools seemed to consist of a combination of six grade through eight grade (See Appendix A). For several decades, researchers were aware of the importance of examining mathematics textbooks, as well as other textbooks for gender representation (Lubienski, 2000). In this chapter, relevant literature is discussed. Major areas addressed are: (a) concerns of gender inequalities, (b) defining gender language forms, (c) Georgia textbook selection procedures, (d) instructional materials, (e) middle schools, (f) adolescence, (g) adolescents and identity, (h) mathematics achievement, (i) career choices, (j) stereotyping of mathematics, (k) gender bias in other educational materials, and (l) gender bias in mathematics textbooks.

Concerns of Gender Inequalities

Concerns for rectifying gender inequalities in our society have been reflected in federal laws. For example, the Civil Rights Act of 1964 prohibited sex discrimination in employment and Title IX of the Elementary Secondary Education Act of 1972 provided for equal educational treatment on the basis of gender (Mid-Atlantic Equity Consortium, 2000). According to McCarthy (1990), textbooks tended to reproduce inequalities existing in our society. Likewise, Ballantine (1997) indicated school curriculum content was influenced by trends in our society.

Concerns for rectifying gender inequalities in our society have been also reflected in guidelines for authors, editors, students, typists, and publishers on gender bias in language. For example, Publication Manual of the American Psychological Association [APA] (1994) provided guidelines to consider and suggested ways to avoid gender bias in language. Policy in APA required authors to "avoid perpetuating demeaning attitudes and biased assumptions about people in their writing" (p. 46). In addition, authors were advised to avoid writing that "might imply bias against persons on the basis of gender" (p. 46).

The National Council of Teachers of English [NCTE] (2003) provided Guidelines for Gender-Fair Use of Language. According to NCTE:

> The language that educators use provides an important model for students and the larger community. Word choices often reflect unconscious assmptions about gender roles. As professionals, we all need to examine our language to reduce or eliminate choices that silence, stereotype, or constrain others. (p. 1)

Gender language guidelines have been adopted by a variety of organizations, including textbook divisions, reflecting the need to avoid gender biased content (Frank & Treichler, 1989). Publishing houses emphasized the importance of ensuring equal representation of all people in their guidebooks (Evans & Davies, 2000). In addition, publishing houses' guidebooks emphasized the potential influence of textbooks on students (Evans & Davies). Professional associations developed guidelines based on consensus and research (Frank & Treichler). The authors stated, "While publishers' guidelines are often prescriptive, officially requiring nonsexist usage in their textbooks, professional guidelines are more likely to promote nonsexist usage without making it mandatory" (Frank & Treichler, p. 124). Since these guidelines may not be mandatory, state and local school systems must be diligent to avoid selecting textbooks with gender-biased content.

<u>Defining Gender Language Forms</u>

According to the APA (1994) manual, the term gender was used when referring to females and males as a social group and when referring to cultural aspects. Titus (1993) indicated, "Gender designates social, cultural and psychological aspects of females and males in particular social contexts or what is considered masculine or feminine by a cultural group" (p. 39). On the other hand, in the APA manual, sex was defined as biological. For example, sex designated biological aspects such as chromosomal, anatomical, reproductive, hormonal and other physiological characteristics to differentiate between females and males (Titus). He defined "role," another important term, as essentially:

> A sociological concept referring to prescriptions and proscriptions for behavior—the rights, obligations and shared expectations about attitudes and actions attached to a particular person occupying a particular social position and acting in a certain social context. (p. 39)

Other studies in the review of literature did not distinguish between "sex" and "gender," or "sex role" and "gender role" or other gender language forms (Titus).

Although some researchers did not define gender-related language, Schau and Scott (1984) defined several terms related to gender language forms before discussing the effects of gender characteristics within instructional materials on students in their study. According to Schau and Scott:

> *Male generic* language ("he," "man") refers to people in general or to an individual when the sex of the person is unknown or is irrelevant. *Gender-unspecified* language substitutes a term ("people" for "men"), changes to a plural ("they" instead of "he") or uses the first person pronoun ("I") without explicitly indicating the gender of the referent. *Gender-specified* language refers explicitly to both females and males ("women" and "men," "he" or "she") or to the specific single sex involved. *Sex biased* (or *sexist)* materials are those in which (a) females appear as main characters and in illustrations far less frequently than do males; (b) females and males usually are portrayed in sex-stereotypical roles; (c) females appear more often than do males in derogatory roles; and/or (d) male generic language is used. *Sex-equitable* materials reflect the reality of the presence of females in the world, their contributions and the changing roles of both females and males. *Sex-fair* materials include females and males in numbers proportional to reality and include both traditional and nontraditional sex roles. Male generic language forms are avoided. (pp. 183-184)

Several gender-related terms in this study were defined such as the term "gender" which was used to describe both female and male. Schau and Scott (1984) and Titus

(1993) similarly defined gender role as a particular social position, attitude, behavior, or action associated with a male or female. In this study, traditional gender roles were those expected social positions, behaviors, or actions associated with females and males. In contrast, nontraditional gender roles were those unexpected social positions, behaviors, or actions associated with females and males (Titus).

Georgia Textbook Selection

Selection of textbooks in Georgia has been a critical issue because textbooks have provided a content framework for both teachers and students. In the State Board of Education Rules 160-4-4-.10 and 160-4-4-.20, the Georgia Department of Education (2001) stated selection and recommendation guidelines for local school systems. According to these guidelines, the state committee identified and recommended textbooks and instructional materials to local school systems. The state committee consisted of individuals recommended by the State Board of Education and the State Superintendent of schools. A state committee identified and recommended textbooks and instructional materials to local school systems based on these guidelines upon approval from the State Board. According to the Rules160-4-4-.10 and 160-4-4-.20, each local school system should periodically update and have on file in the superintendent's office an implementation plan for the adoption of textbooks using the most recent state recommendation for a given subject (Georgia Department of Education). In this study, Appendix A contains a list of the most recent middle grades mathematics textbooks recommended by the State of Georgia. Appendix A was received from the Mathematics Supervisor for the Dougherty County School System in Albany, Georgia. These middle grades textbooks were only recommended by the State. School systems could use textbooks not recommended by the State.

Instructional Materials

According to Schau and Scott (1984), "… it is important to examine the influence of gender characteristics of instructional materials on students' gender associations and sex role attitudes" (p. 184). Gender characteristics included sex roles, sexes of characters, and language form used in instructional materials (Schau & Scott). Over the years, researchers have identified many variables contributing to gender differences in mathematics. One variable was gender representation in instructional materials. Students spent a great deal of their time learning in schools using instructional materials such as textbooks. These gender characteristics in instructional materials had the potential to influence students (Schau & Scott). Numerous gender associations were presented to students through instructional materials (Schau & Scott). In a meta-analysis, Schau and Scott investigated research findings from 1970 to 1982 linking gender-related characteristics of instructional materials on students' gender associations, sex role attitudes, preferences for materials, and comprehension of materials. Study samples included students from preschool through college.

After synthesizing over 40 studies, Schau and Scott (1984) found that of the four areas (gender associations, sex role attitudes, preferences for materials, and comprehension of materials), the two areas involving gender associations and sex role attitudes yielded consistent findings. Results of nine studies clearly revealed that gender-related language affected students' gender associations. When male generic language was used, students of all ages frequently thought of males. Likewise, the results of 21 studies consistently revealed sex-equitable materials contribute to more flexible sex role attitudes, whereas sex-biased materials may contribute to more sex-typed attitudes. For instance, exposing females and males between 5 and 17 years of age to sex-equitable materials, such as female firefighters or male nurses, resulted in more flexible sex role attitudes for both females and males. Only a few studies revealed little to no effects of instructional materials on sex role attitudes.

Schau and Scott (1984) concluded most instructional materials were still sex-biased at that time. According to the researchers, sex-biased instructional materials were those, whereas; females appeared more than males and vice versa, females and males appeared in stereotypical roles, and male generic language was used. These sex-biased instructional materials affected students (Schau & Scott). They claimed that instructional materials reinforced sex-biased expectations about society (Schau & Scott). "The roles that women and men occupy in society are not biologically given" (Titus, 1993, p. 41). Arbor, Sanders, and Peterson (1999) also agreed differences in mathematics achievement were not biological, but perhaps influenced by social factors and expectations. This implied that gender roles could be learned behaviors. Schau and Scott also reported:

> Flexible sex role attitudes and mixed-gender associations were needed to encourage female and male students to make educational, career, and family choices based on their own competencies and interests rather than on preconceived sex-stereotyped notions. (p. 184)

Students become what they have been taught to become (Lounsbury, 1992).

Middle School

According to Lounsbury (1992), the development of the middle school concept bridged the gap in the approach and methods between elementary school and high school. The advent of Sputnik led to middle school academic reform and to the movement to institute new math in middle grades. Moreover, the ninth grade was returned to the high school level where a full four-year sequence of technical and advanced courses could be completed. Middle school was an expansion of junior high school (Lounsbury).

Typical configurations for junior high were sixth grade through eighth grade, seventh grade through eighth grade and fifth grade through eighth grade (Lounsbury, 1992). Alexander and McEwin (1989) examined data from 1968 to 1988 which revealed that junior high schools consisting of grades seventh through ninth declined dramatically. Eventually, junior high school was separated from secondary education (Lounsbury).

Middle schools mainly consisted of combinations of fifth grades through ninth grades. Students were usually 10 to 15 years of age. The adoption list of middle grades mathematics textbooks for Georgia indicated grades for middle schools consisted of sixth grade through eighth grade (see Appendix A). However, in some school systems in southwest Georgia the eighth grade was high school level, not middle grades level. Therefore, only grades six and seven were examined in this study.

Adolescence

George and Alexander (1993) expressed the importance of understanding the characteristics of middle school learners and providing programs which focus on their rapid change from childhood to adolescence. Descriptors used to characterize 10 to 15-year-olds were transescents, junior high kids, middlers, teenagers, emerging adolescents, young adolescents, and early adolescents (Lounsbury, 1992; Stevenson, 1992). Milgram (1992) categorized the change and growth for young adolescents into four areas: physical, social, emotional, and intellectual. Two important areas related to gender role identification in learning were social and intellectual characteristics.

During the period of adolescence, students experienced change and growth both socially and intellectually. A need to develop socially has been particularly important for middle level students (Milgram, 1992) for both females and males. Gender has been crucial in defining role in socialization patterns (Milgram). According to Milgram, females and males saw themselves as being very different in interests, sports, and other activities. For adolescents, social validation was needed to build and maintain a positive self-concept (Milgram).

Intellectually, students began to develop abstract reasoning during early adolescence (Spear, 1992). Furthermore, “middle grades students enter a period in which they experience heightened intellectual capacities” (Spear, p. 263). According to Milgram (1992), there appeared to be gender differences in intellectual abilities during early adolescence although it was still not clear whether it was biologically based, socially based, or both. Adolescents began to think about the world around them and themselves in new ways (Spear). This was also a time when young adolescents seem to dwell on their inability to perform difficult tasks, their lack of understanding, and seemed to personalize feelings of inadequacy (Spear).

Human development specialists, Feldman and Elliott (1993), used the descriptor “early adolescence” to characterize 10 to 15-year-olds. They viewed “early adolescence” as a pivotal stage of life when the person was defined, by our society, as being neither adult nor child. Feldman and Elliot characterized early adolescents as students who were changing physically, maturing sexually, becoming increasingly able to engage in complex reasoning, and markedly expanding their knowledge of themselves and the world about them. During this turbulent time, a young adolescent searched for an identity (Eggen & Kauchak, 1999; Feldman & Elliot, 1993; Irvin, 1996).

Adolescents and Identity

Forming a self-identify has been a developmental task of young adolescents (Eggen & Kauchak, 1999; George & Alexander 1993; Irvin, 1996). Erikson's Theory of Identity and Identity Crisis was among the earliest research regarding adolescent identity formation (George & Alexander). Erikson's theory revealed eight stages of psychosocial development. Middle school students appeared most affected by Stage IV, Industry versus Inferiority and Stage V, Crisis of Identity versus Role Confusion (George & Alexander). In Stage IV, the early adolescent between the ages 6 and 12 attempted to develop a sense of competence and achievement. In Stage V, Crisis of Identity versus Role Confusion, early adolescents "look for role models and heroes and attempt to integrate those ideals into their own value system" (George & Alexander, p. 12).

According to Spear (1992), young adolescents tried different identities, changed their physical appearances, and tried new social roles. Researchers suggested these different identities could be learned from what students read as well as what they see (Macaulay & Brice, 1997; Narahara, 1998; Purcell & Stewart, 1990). Purcell and Stewart suggested what students saw and read possibly affected the way they perceived themselves. The researchers also claimed gender role definitions could be learned from role models including people presented in media such as picture books, storybooks and films. By exposing students to gender-biased materials, they were likely to imitate role behaviors contained in the materials (Schau & Scott, 1984) therefore forming different identities. Furthermore, the lack of females in textbooks limited the opportunity for females to develop their own identity (Singh, 1998).

Self-reference. According to George and Alexander (1993) and Irvin (1992), students in middle schools reflected on questions such as: Who am I? Who do you think I am? How competent am I and at what? Those self-referenced variables referred to perceptions individuals had of themselves, including their attitudes, feelings, and knowledge about their abilities and skills (Seegers & Boekaerts, 1996). Researchers reported gender-related differences in mathematics achievement and these self-referenced cognitive variables (Ethington, 1992; Seegers & Boekaerts, 1996).

Findings of studies denoted relationships between mathematics achievement and self-referenced cognitive variables. In their study, Seegers and Boekaerts (1996) investigated the academic self-concept of mathematics ability of female and male adolescents between the ages 11 and 12 in the Netherlands. They revealed gender differences in self-concept and mathematics ability. Males' estimation of their ability to do mathematics was higher than females' estimation. According to Seegers and Boekaerts, "boys experience learning situations where they are confronted with a mathematics test in a more positive way than girls do" (p. 215). They also reported there was no easy explanation for the result. However, many accounts for gender differences in mathematics achievement have been explored including the affects of cultural factors, student-teacher interaction, and gender-related differences in intellectual abilities (Seegers & Boekaerks, 1996).

In another study, Ethington (1992) investigated gender differences in a psychological model of mathematics achievement. Results from this study were based on 746 eighth grade students in the United States. Achievement data were collected from the Second International Mathematics Study (SIMS) survey administered at the beginning of the 1981 to 1982 academic year. According to Ethington, self-concept had the greatest influence on expectations for success in mathematics for both females and males.

Mathematics Achievement

Researchers agreed gender differences in mathematics achievement developed earlier, but were most apparent during secondary education (Catsambis, 1994; Vermeer, Boekaerts, & Seegers, 2000). Armstrong (1981) claimed 13-year-old females began their high school mathematics program with at least the same mathematical abilities as males, but by the end of high school mathematical abilities changed. Hyde, Fennema, and Lamon (1990) also reported no significant gender differences in the mathematical achievement in elementary through junior high school. They agreed gender differences in mathematics tests tended to increase with age. These gender ability differences in mathematics were indicated on standardized tests (Hyde et al., 1990; Jackson & Fleury, 1995). Hyde et al. conducted a meta-analysis of 100 studies and found gender differences in mathematics performance were small. According to the researchers, gender differences emerged in high school and no gender differences emerged in problems solving in elementary or middle school. Males performed better on standardized mathematics tests than females (Hyde et al., 1990). One account for males outperforming females on standardized tests was differences in mathematics course selections. According to Kimball (1989), differences in selecting mathematics courses appeared to account for some of the gender difference in performance on standardized tests. Additionally, the simple notion of females' inability to perform well on mathematics tests might have caused females to underachieve on tests (Hyde et al., 1990).

Other researchers agreed females typically score lower on mathematical problems on standardized tests than males from early adolescence and beyond (Jackson & Fleury, 1995; Walsh, Hickey, & Duffy, 1999). According to Jackson and Fleury, males outperformed females on standardized tests of mathematics from early adolescence and onward. They explained the difference could be due to the different experiences of females and males with numerical information. Researchers also stated males were more experienced with numerical information than females, because "typical" male interests such as sports and computer games were more likely to involve numerical information than "typical" female interests such as personal relationships and physical appearance. Neither personal relationships and physical appearance required numerical information. On the other hand, sports involved statistical information about players and teams. They examined females' and males' mathematical performance on numerical information presented in a male-related, female-related, and gender-neutral context. Jackson and Fleury predicted males would attend more to numerical information than females when the context was male-related or gender-neutral, and females would attend more than males when the context was female-related. Jackson and Fleury found modest support for their predictions and less attention was given to numerical information presented in female-related context than in any other context, especially by males. Walsh et al. found similar results. They examined whether there were differences in mathematical problem solving and gender labeling such as female character, male character, or gender neutral.

Seventh and eight graders were tested using the Canadian Test of Basic Skills (CTBS). Females scored lower than males on standardized tests requiring mathematical problem solving. According to Walsh et al. (1999), restrictive cultural orientations, low expectations of teachers and family, mathematics being viewed as a male domain and societal gender roles in which mathematics was seen as unfeminine affected females' performance in mathematics (Walsh et al, 1999; Hyde, Fennema, Ryan, et al., 1990; Steele, 1997; Whitehead, 1996).

In contrast, Kimball (1989) reported females outperformed males on classroom mathematics tests compared to mathematics problems on standardized achievement tests. Kimball reported although males had more mathematics experiences outside the classroom than females did, females were confident and performed better in familiar settings. In contrast, Seegers and Boekaerts (1996) claimed males outperformed females on tests reflecting classroom content. They also stated gender differences were more pronounced when the difficulty of test items increased. To explain differences in mathematics achievement during secondary education, Hyde, Fennema, and Lamon (1990) suggested females take fewer advanced mathematics courses than males.

Stereotyping of Mathematics

"Stereotypes are shared 'pictures in our heads' about other groups" (Tesser, 1995, p. 11). Stereotypes learned through socialization possibly affected academic performance (Steele, 1997; Walsh et al., 1999). Stereotypical illustrations and text of males in mathematics textbooks affected how young females perceived themselves. Students restricted their interests to those roles considered appropriate for their gender. According to Doll (1986), as stereotyping concerning females' alleged incompetence in mathematics began, females avoided mathematics courses. Stereotyping mathematics as a male domain was also considered a critical factor in explaining why fewer females have been in advanced mathematics courses and mathematics related careers (Hyde, Fennema, Ryan et al., 1990). Experiences females have had in middle school mathematics classes were critical to the success in math-related careers such as science, engineering, and technology (Arbor et al., 1999).

One stereotypical view was males were superior in mathematics (Eccles, Wigfield, Harold, & Blumenfeld, 1993). Males might choose subjects such as mathematics which were considered masculine in an attempt to bolster their gender identity (Whitehead, 1996). Another stereotyped attitude in western society was that females found mathematics to be threatening (Walsh et al., 1999). Mathematics has been stereotypically characterized as a male domain. Hyde, Fennema, and Lamon (1990) conducted a meta-analysis on gender differences in attitudes and affect specific to mathematics. They found gender differences in the attitude that mathematics was a male domain. Males considered mathematics more of a male domain than females (Duffy, Gunther, & Walters, 1997). When mathematical word problems involved the character "Mr. Mason" (male label), "Mrs. Mason" (female label), and "the Masons" (neutral label), both genders answered male-labeled problems with greater accuracy than female-labeled or gender neutral-labeled problems (Walsh et al., 1999). According to Duffy et al. gender differences in mathematics appeared to be more complicated than we might have assumed. Their finding regarding mathematics as a male domain and mathematical problems-solving performance was considered to be complex. They claimed, the less students viewed mathematics as a male domain and the less mathematics anxiety experienced, the better students' mathematical problem-solving performance. This outcome seemed to apply to both females and males. Duffy et al. used Fennema-Sherman Mathematics Attitudes Scales to measure students' attitudes toward mathematics. In their study, they found the more mathematics questions were oriented toward females the more likely students were to answer questions correctly. This suggested females should be given the opportunity to view mathematics as a female domain.

Male images in textbooks could be one of many factors affecting the way females view mathematics. Parker (1999) expressed it was important that females felt mathematics was a subject relevant to them. Changing the perception of mathematics from a male domain could perhaps reduce the number of male references, thus portraying females more equitably and making mathematics more interesting to females.

Researchers have recommended considering other social and political influences to help explain the complex issue of gender differences in mathematics. Duffy et al. (1997) indicated socialization was a major factor in explaining gender differences in mathematics performance. Moreover, other researchers suggested gender portrayals in educational materials influence students' socialization (Clarkson, 1993; Duffy et al., 1997; Parker, 1999; Purcell & Stewart, 1990).

Gender Bias in Other Educational Materials

Other researchers based their research on the premise that educational materials shape children's views of society during their impressionable years (Evans & Davies, 2000). For example, they investigated the portrayal of gender in elementary school reading textbooks by examining thirteen textbooks from the first, third and fifth grade. These grade levels were selected because national standardized testing takes place during these years (Evans & Davies, 2000). The authors focused on the portrayal of males in two publishers' textbooks read by children during the 1990s. The researchers focused on the text only and not illustrations. Findings revealed 54 percent of characters were males and 46 percent were females. After analyzing traits, researchers reported stereotypical roles of males within these texts.

In addition, chi square analyses indicated males were significantly more likely than females to be portrayed using traditionally masculine characteristics and to be described as aggressive, argumentative and competitive. According to the researchers, argumentative and aggressive behaviors were thought to be natural, unchangeable, and often excused with the rationale of "boys will be boys" (Evans & Davies, 2000). On the other hand, males were significantly less likely than females to be described as affectionate, emotional, expressive, passive, or tender. Both females and males recognized what were considered acceptable behaviors for their gender at early ages (Evans & Davies, 2000). They concluded females and males were still portrayed in stereotypical roles. In contrast to other studies, these authors suggested males were often more bound by traditional standards in textbooks than females.

Gender Bias in Mathematics Textbooks

There have been those who believe the social content contained in mathematics textbooks was secondary to the core mathematics content (Northam, 1982). Researchers proclaimed gender stereotypical roles and gender inequalities which existed in other educational materials also existed in mathematics textbooks. Northam stated:

> Mathematics books do not usually present information about the social world in coherent, narrative way that usually occurs in reading books.

> There is no story line, little characterization and experiences are explored for their mathematical properties rather than intrinsic interest. However, children's textbooks are often lavishly illustrated and glimpses of social life are found in the problems in the explanations of mathematical processes. (p. 11)

Northam claimed the lack of females in mathematics textbooks related to the decline of females' involvement and achievement in mathematics. To support this notion, she examined five series of mathematics textbooks for children 3 to 13 years of age. The researcher investigated the illustrations and text of mathematics textbooks published between 1970 and 1978. Textual analysis results revealed females were less skillful and competitive, less likely to teach mathematics skills to others, and displayed less initiative and inventiveness than males. Illustration analysis results indicated females were stereotypically shown with a handbag and necklace. Females were often shown unpacking shopping items, cooking, and buying children clothes, whereas males were shown actively using telescopes, making calculations, building houses, and mending roads. Moreover, females wore dresses and had elaborate hairstyles and males had short cut hair.

Another researcher also revealed gender stereotypical roles and gender inequalities in mathematics textbooks. Clarkson (1993) investigated mathematics textbooks published since the mid-eighties for children 4 to 12 years of age. He systematically examined every fifth page of a mathematics textbook until 30 pages had been analyzed. The researcher used the categories: males, females, and gender indeterminate. Furthermore, his subcategories included percentages of males, females, and gender indeterminate shown in active and passive roles. Clarkson found 45 percent of the people depicted in the text were males; 39 percent were females; and 16 percent were people whose genders were indeterminate. According to Clarkson, the gender gap depicted in mathematics seemed to be closing, authors and publishers appeared to be responding to the demand of gender balance, and females seemed to be portrayed in more active roles. Although there seemed to be some progress made, Clarkson still cautioned gender balance had not been reached and supported the need to continue monitoring gender balance in mathematics textbooks.

Other researchers also revealed gender stereotypical roles and gender inequalities in mathematics textbooks. Researchers examined mathematics textbooks to quantify gender and stereotypical images of females and males (Nibbelink, Stockdale, & Mangru, 1986; Parker, 1999). Nibbelink et al. and Clarkson (1993) both studied gender role assignments in elementary school mathematics textbooks. Researchers examined the number of times females and males were mentioned and the number of times females and males were portrayed in stereotypical images in mathematics textbooks. The number of male roles, female roles, males in female roles, and females in male roles were counted. Most of the time people were not present in the textual analysis and illustration analysis. Their findings revealed few males in female roles and few females in male roles, but a large number of both females and males in neutral roles. Nibbelink's et al. and Clarkson's findings suggested authors and publishers have attempted to use gender-neutral materials in mathematics textbooks.

Although the gender gap depicted in mathematics textbooks appeared to be closing, others cautioned the issue of males outperforming females during secondary education needed attention (Hyde, Fennema, & Lamon, 1990). Results of a meta-analysis of 100 studies on gender differences in mathematics performance conducted by Hyde et al. suggested gender differences in mathematics were small. However, Fennema and Hart (1994) expressed:

> ...in spite of some indications that achievement differences are becoming smaller, and they were never very large anyway, they still exist in those areas involving the most complex mathematical tasks, particularly as students progress to middle and secondary education. (p. 51)

Other researchers reported the largest gender gap appeared on some tests requiring mathematical problem solving and complex mathematical tasks (Duffy et al., 1997; Walsh et al., 1999).

For example, Duffy et al. (1997) examined gender differences in mathematical problem solving performance of 12-year-olds. Participants included 83 males and 76 females. Students' mathematical problem solving performance was tested using the Canadian Test of Basic Skills (CTBS). Students' mathematical problems solving performance was also tested using a test named after a German mathematician, Carl Fredrich Gauss (GAUSS). The researchers found 12-year-old males usually outperformed females when solving mathematical word problems. Gender differences were prevalent on the mathematical problem solving performance for CTBS but not on the GAUSS.

Researchers also suggested males outperform females when the difficulty of test questions increased (Seegers & Boekaerts, 1996). On the contrary, Duffy et al. (1997) stated the questions on the GAUSS were considered more abstract and difficult than the

CTBS. Yet, no gender differences were found on students' mathematical problem solving performance on the GAUSS.

Other researchers indicated a larger gender gap in the performance of mathematics when numerical information was presented in male-related context or gender-neutral context. Jackson and Fleury (1995) stated males exhibited higher recall of numerical information presented in male-related context (e.g., sports), whereas females exhibited higher recall of numerical information presented in a gender-neutral context. Furthermore, gender labeling and the threat of being stereotyped have had more of an effect on junior high school students whose ages ranged from 12 to 14 within complex mathematical tasks and word problems (Walsh et al., 1999). They conducted an experiment on the influence of labeling on gender differences in mathematical problem solving. In the experiment, Walsh et al. manipulated gender labeling within mathematics problems on the Canadian Test of Basic Skills (CTBS). A modified version of the CTBS was administered to 64 seventh and eight graders whose age ranged from 12 to 14. Twenty-four problems were used: eight problems featured a male character, eight problems featured a female character, and eight problems featured a gender-neutral character.

Results indicated females and males answered male-labeled items with greater accuracy than female-labeled or gender-neutral labeled mathematics problems. Walsh et al. (1999) explained this finding by suggesting research had shown information in a female-related context was viewed as less important than information presented in a male or neutral-related context. Walsh et al. suggested gender labeling and gender stereotype threat could be key factors in explaining gender differences in mathematical problem solving.

Career Choices

By taking fewer advanced mathematics courses, females limited their career opportunities. There were major gender differences in participation in mathematics related careers (Clarkson, 1993). Researchers agreed these gender differences in career interests may also be the result of societal stereotypes of appropriate careers for females and males, societal pressure on females to put family before career and the lack of role models for young females to follow (Armstrong & Price, 1982; Steele, 1997). Catsambis (1994) conducted a study to explore when females' participation in mathematics began to drop during adolescence. Catsambis examined eighth grade students' mathematics-related learning opportunities, attitudes, and achievement from middle school to early high school. According to Catsambis, gender differences in careers related to mathematics were apparent in the eighth grade. By eighth grade fewer females than males have decided to pursue mathematics careers (Catsambis).

Furthermore, Whitehead (1996) established an association between stereotypical view of subjects such as mathematics and students' attitudes towards occupations and roles. Spear (1992) reported middle grades students began to think they had a future, and they were ready to make a commitment to the future. In addition, adolescents sought to identify their own interests and abilities (Reynolds, 1991). According to Reys, Reys, Barnes, Beem, and Papick (1998), middle grades was the time when students made decisions about what mathematics they continued to study and, to a large extent, set limits on their future career choices based on their decisions. Reynolds stated middle school could reinforce and extend early learning experiences or limit learning experiences.

Summary

Researchers revealed gender-related differences in mathematics achievement. Gender differences appeared in complex mathematical tasks and word problems. Researchers found that gender differences existed when numerical information was presented in male-related context or gender-neutral context. These gender differences in mathematical performance were more prevalent as students progressed to middle and secondary education than in elementary education.

In addition, gender-neutral language forms tended to affect students' performance. While a few recent studies suggested mathematics textbooks were becoming more gender-neutral, other studies confirmed gender bias in educational materials, such as textbooks, remained a concern. A number of researchers reported inequality in gender representation in textbooks still existed despite the passing of Title IX, Education Amendments to the Civil Rights Act of 1972. Researchers' findings contrasted with expectations of publishing house guidelines in authors' efforts to produce nonsexist educational materials including textbooks.

Researchers agreed the issue of gender-related differences in mathematics textbooks for adolescents deserved attention. Researchers' studies indicated consistent progress has been made since the passing of Title IX in 1972, but gender stereotypical roles still existed and the appearance of males tended to outnumber females in the illustrations and text. In addition, females were often still portrayed in traditional, stereotypical roles.

This study expands the research on gender-related differences in mathematics textbooks by examining illustrations and text. The purpose of this study was to investigate the degree of representation of females and males in middle grades mathematics textbooks used in southwest Georgia. In the literature reviewed, researchers used various forms of content analysis to examine text and/or illustrations. This study employed a similar methodological approach.

Chapter 3

METHOD

This study focused on gender-related differences existing in illustrations and text of middle grades mathematics textbooks used in southwest Georgia. A random sample of chapters and lessons from middle grades mathematics textbooks was examined. The content analysis procedural models for illustrations and text were based on Krippendorff's (1980) content analysis procedural model (see Figure 1). Coding rules and instruments were developed to collect the data of interest systematically and consistently for illustrations and text of middle grades mathematics textbooks. Chi square was used to test for statistical differences among variables. The methodology section includes the scope of the study, research questions, description of study variables, sampling procedures, design and procedures, Krippendorff's procedures in content analysis, data collection, data analysis, and summary.

Scope of the Study

Southwest Georgia. No study was found on gender-related differences and mathematics textbooks used in Georgia. Hence, no study was found on gender-related differences and mathematics textbooks used in southwest Georgia. The scope of this study was limited to mathematics textbooks used in school systems located in southwest Georgia.

Krippendorff's Procedures for Content Analysis

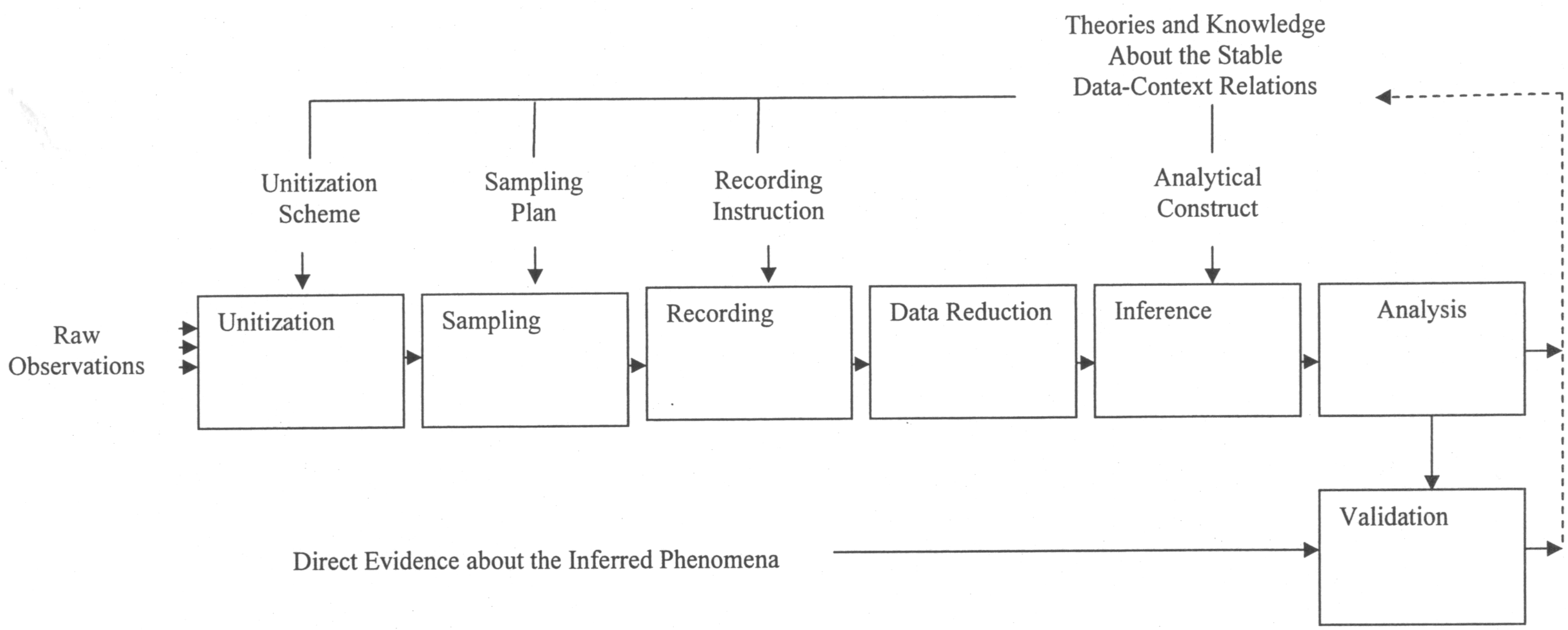

Figure 1. Content analysis procedures.

Note. From Content Analysis: An Introduction to Its Methodology (p. 54), by K. Krippendorff, 1980, London: Sage Publication.

There were 34 county school systems located within the “229” area code for southwest Georgia. For this study, each school system was asked by e-mail, Fax and/or telephone to provide the title, publisher, and publication date of mathematics textbooks being used in the sixth and seventh grades. After three attempts to contact school system personnel, twenty-five of the 34 school systems responded. The response rate from the school systems was approximately 74 percent.

Middle grades. A pivotal time in gender-related influences and choices in mathematics occurred during middle grades. Researchers found that gender-related differences in mathematics achievement were most apparent during secondary education, but had developed earlier (Catsambis, 1994; Vermeer et al., 2000). The National Assessment of Educational Progress (2000) reported no gender differences in mathematics performance in the fourth grade. According to Catsambis, gender-related differences in mathematics were most apparent in the eighth grade. Since students have had many mathematical experiences before eighth grade, this study focused on sixth and seventh grade. These were grades leading to the apparent gender-related differences in mathematics.

Research Questions

This study has been designed to answer the following research questions: (a) Are males more likely to appear in illustrations of middle grades mathematics textbooks than females? (b) Is there a difference between gender roles and gender in illustrations of middle grades mathematics textbooks? (c) Is there a difference between gender roles and grade levels in illustrations? (d) Are males more likely to appear in the text of middle grades mathematics textbooks than females? (e) Is there a difference between gender roles and gender in text of middle grades mathematics textbooks? (f) Is there a difference between gender roles and grade levels in text?

Description of Study Variables

Data were obtained from sixth and seventh middle grades mathematics textbooks. The variables were gender, gender role, and grade level. Gender was coded 1 for male, 2 for female and 3 for ambiguous. Ambiguous means gender of the person could not be determined; therefore, these cases were excluded from the analysis. Twenty-three (12 percent) ambiguous cases were excluded. The focus of this research was on the representation of females and males. Gender role was coded 1 for traditional, 2 for nontraditional and 3 for gender-neutral. The variable grade level was coded 6 for sixth grade and coded 7 for seventh grade. The dependent variable of interest in this study was gender roles. Independent variables were gender and grade level.

Sampling Procedures

Sampling procedures were guided by a plan (Krippendorff, 1980). For content analysis, the sampling plan depended on the population to be sampled and the kind of inferences to be made from the data (Weber, 1990). Sampling was defined as the process of selecting a number of items for a study so it represented the population from which items were selected (Gay & Airasian, 2000; Weber, 1990). This was required to reduce a large volume of potential data to a manageable size. The entire population has rarely been required for studies, and was generally not feasible or necessary (Gay & Airasian, 2000; Weber, 1990).

For content analysis, sampling was not suggested for short documents such as editorials, but was suggested for large texts such as textbooks (Weber, 1990). Since units of interest may appear unmanageable, sampling becomes necessary. Sampling units have been identified as smaller manageable parts of the population (Krippendorff, 1980). Weber argued most content analyses should not apply random sampling, but the sample should represent the population of interest. However, introductory and closing sections in text might be excluded. In this study, the sample included exercises, test items, examples, practice problems, or any text where students were actively engaged and excluded introductions, sidebars, and other descriptive information in the middle grades mathematics textbooks (Weber, 1990).

Textbooks. Middle grades mathematics textbooks recommended by the State of Georgia have been listed in Appendix A. There were 21 sixth and seventh grade mathematics textbooks on the Georgia adoption list received in 2001. Twelve were sixth grade mathematics textbooks, and nine were seventh grade mathematics textbooks.

The sample of mathematics textbooks used in this study was selected from the sixth and seventh grade textbooks identified by school systems in southwest Georgia. The three sixth grade textbooks most frequently used and identified in southwest Georgia school systems have been listed in Table 1. The three seventh grade textbooks most frequently used and identified by personnel in southwest Georgia school systems have been listed in Table 2. The publication dates of the mathematics textbooks were 1997, 1999, and 2001.

Table 1

Sixth Grade Mathematics Textbooks

Publisher	Title	Publication	Random Table	Quantity	20% of Chapters /Lessons	Random Chapters/ Lessons
Glencoe/ McGraw-Hill	Mathematics: Applications and Connections, Course 1	2001	00-04	13 Chapters	$2.6 \approx 3$	05, 06, 08
Prentice Hall	Middle Grades Math: Tools for Success, Course 1	2001	05-09	11 Chapters	$2.2 \approx 3$	01, 03, 09
Saxon Publishers, Inc.	Saxon Math 76, 3rd edition	1997	10-14 15-19 20-24 25-29	138 Lessons	$27.6 \approx 28$	005, 006, 014, 020, 022, 023, 032, 036, 037, 041, 048, 049, 064, 069, 072, 083, 093, 094, 099, 100, 101, 106, 108, 112, 116, 122, 127, 138

Table 2

Seventh Grade Mathematics Textbooks

Publisher	Title	Publication	Random Table	Quantity	20% of Chapters /Lessons	Random Chapters/ Lessons
Glencoe/ McGraw-Hill	Mathematics: Applications and Connections, Course 2	2001	15-19	13 Chapters	2.6≈3	002, 010, 009
Prentice Hall	Middle Grades Math: Tools for Success, Course 2	2001	20-24	11 Chapters	2.2≈3	006, 010, 011
Saxon Publishers, Inc.	*Saxon Math 87, 2nd edition*	1999	30-34 35-39 40-44 45-49 50-54 55-59	120 Lessons	24	011, 013, 024, 025, 031, 032, 038, 054, 056, 059, 071, 081, 084, 092, 096, 098, 103, 106, 107, 112, 115, 116, 117, 118

In a few instances, mathematics textbooks identified by personnel and used in the school systems were not on the Georgia state adoption list which was obtained from the Mathematics Supervisor of the Dougherty County School System in Albany, Georgia. Apparently, school systems may choose to adopt textbooks which were not on the Georgia state adoption list. The publishers and titles of the mathematics textbooks which were chosen by schools, but not on the Georgia state adoption list were italicized. For instance, *Saxon Math 87, 2nd edition* textbook for seventh grade was italicized. Ironically, *Saxon Math* textbook was listed on the State of Georgia adoption list for sixth grade, but was not listed for seventh grade (See Appendix A).

Chapters or lessons per textbook. McClelland (1974) recommended coding at least 10 percent of the words in a book when using content analysis method. Gay and Airasian (2000) suggested it was common to sample 10 to 20 percent of the population for descriptive research. Therefore in this study, 20 percent of the chapters and lessons in the middle grades mathematics textbooks were randomly selected. A random number table (Gay &Airasian) was used to select chapters or lessons in the textbooks. Table 1 and Table 2 contained publisher, title, publication date, column range (e.g. 00-04), number of chapters and lessons in the textbook, 20 percent of the chapters and lessons in the textbooks, and the randomly selected chapters and lessons in the textbooks examined in this study. Saxon publishers used lessons instead of chapters. The illustrations and text on each page of the selected chapters and lessons were examined.

Design and Procedures

Content analysis was one of the main research methods used for this study. Generally, this method was described as a scientific technique which yielded inference from essentially visual or verbal materials. It has been considered one of the most important methodologies in social sciences and communication research. The method has often been applied in both the academic and business arenas (Krippendorff, 1980). This research method was selected because it could be used to examine words, concepts, themes, phrases, characters, and illustrations within a wide range of texts (Palmquist, 2001). The presence or repetition of certain visual or verbal materials allowed researchers to make inferences about authors, textbooks or the targeted audience (Palmquist). There were many advantages to using content analysis techniques in this study. One advantage was data in textbooks was broken down into manageable and analyzable form (Weber, 1990).

Content analysis techniques helped to quantify and sort the data into categories in an objective manner (Palmquist, 2001). In this study, categories were referred to as classification items. Content analysis was designed to be sequential in nature which was another advantage in its use (Krippendorff, 1980). Several sequential components of content analysis have been identified by Krippendorff which could be tailored to a content analyst's needs (Figure 1). The procedural model components consisted of unitization, sampling, recording, data reduction, inference, analysis, and validation. Each component has been described in the following paragraphs.

Raw observations, unitization, sampling, and recording were the initial components identified in Krippendorff's content analysis procedures. First, raw observations were broken down into units. Breaking down an unmanageable body of data into units of interest was called unitization. These were recording units the researchers want to categorize (Popping, 2000). Moreover, recording units were parts of the sampling units which were analyzable. For example, in this study, recording units for textual analysis included practice problems, examples and test items in mathematics textbooks. Popping used the terms “coding units” to describe manageable data, but noted the terms “recording units” were also known as “coding units.”

Other sequential components of content analysis were data reduction, inference, and analysis. Data reduction, which occurred throughout the data collection process, referred to the process of selecting, focusing, simplifying, abstracting and transforming the data (Miles & Huberman, 1994). Next, inferences were made to determine what the data indicate (Krippendorff, 1980). Once these components of this procedural model were completed, data were analyzed using various statistical techniques.

Another component of Krippendorff’s (1980) procedural model was validation. Validation means confirmation, corroboration, evidence or proof. According to Krippendorff, validation was likely to be impossible because it required past experiences with analyzing the kind of data at hand or the availability of concurrent indicators about the phenomena to be inferred. The adapted procedural model for this study did not include the component of validation. This study was not designed to provide direct evidence, proof, or confirmation of gender-related differences in middle grades mathematics textbooks.

Krippendorff’s Procedures in Content Analysis

Kippendorff conducted the first well-documented content analysis (Popping, 2000). Krippendorff (1980) provided a logical design to conduct content analytic research. He recommended content analysts adapt these components as needed. His logical design has been adapted in this study. Krippendorff’s content analysis procedural model was applied to the illustrations and text in middle grades mathematics textbooks for this study. Components included unitization, sampling, recording, data reduction, inference, analysis, and interpretation of results. The following paragraphs describe in detail how this content analysis model was applied to illustrations and text in this study.

Figure 2 displays the adapted procedural model for illustrations. In Figure 2, raw observations were considered to be illustrations in the middle grades mathematics textbooks. According to Narahara (1998), illustrations in literature are often used to help explain and clarify text. The unitization scheme included examining illustrations which had a person and using specific traits shown in Table 4, if necessary, to determine a person's gender. A random sample of illustrations with a person was examined. An instrument and coding rules with recording units for illustrations were designed to reduce the data so illustrations of interest could be coded in an analyzable form (see Appendices B and C).

Figure 3 shows the illustrations adapted procedural model for text. In Figure 3, raw observations were texts in the middle grades mathematics textbooks. The unitization scheme was the text where students were actively engaged. A sample of the text could have included exercises, tests, examples, practice problems, or any text where students were expected to be actively engaged. The coding rules and instrument for text were designed to reduce the data so text of interest could be coded in an analyzable form (see Appendices D and E). The instrument for text shows recording units used in this study.

Adapted Krippendorff's Procedures in Content Analysis to Illustrations

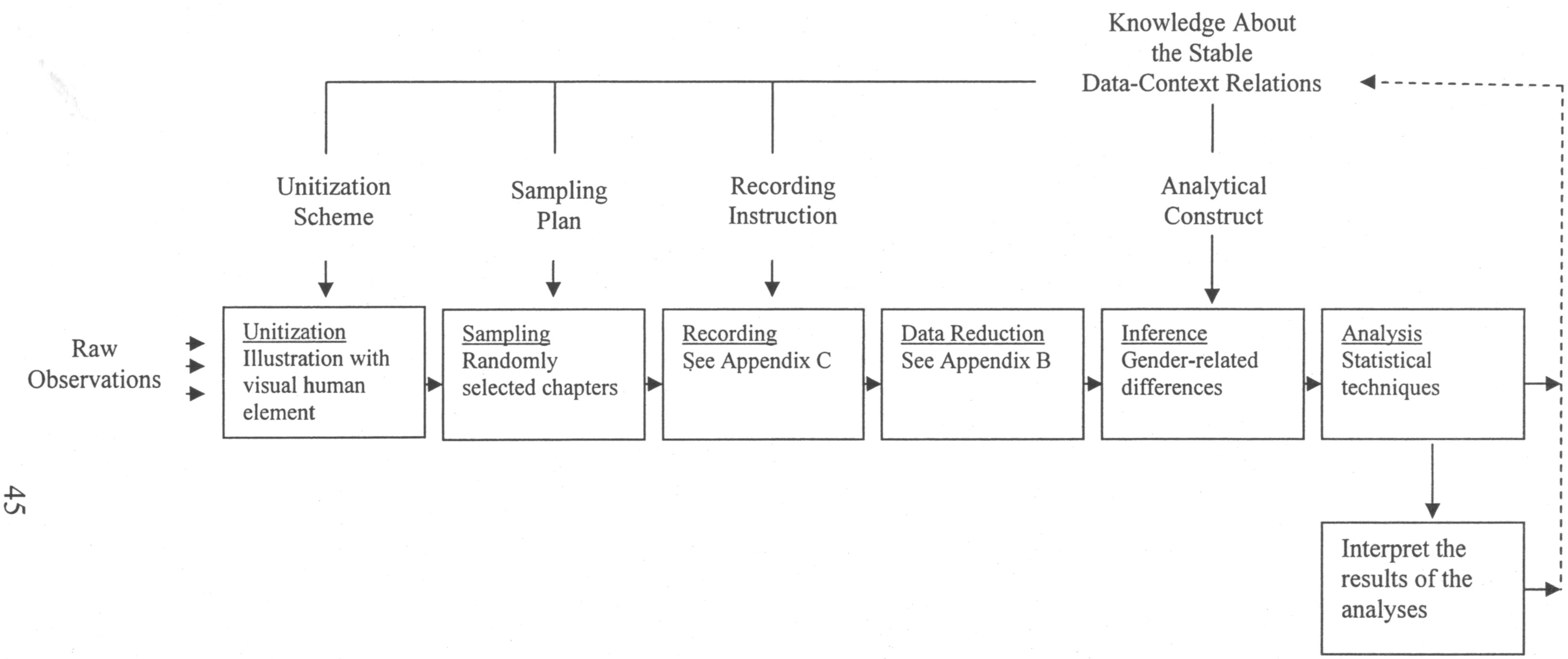

Figure 2. Application of Krippendorff's procedures to illustrations.

Note. From Content Analysis: An Introduction to Its Methodology (p. 54), by K. Krippendorff, 1980, London: Sage Publication.

Adapted Krippendorff's Procedures in Content Analysis to Text

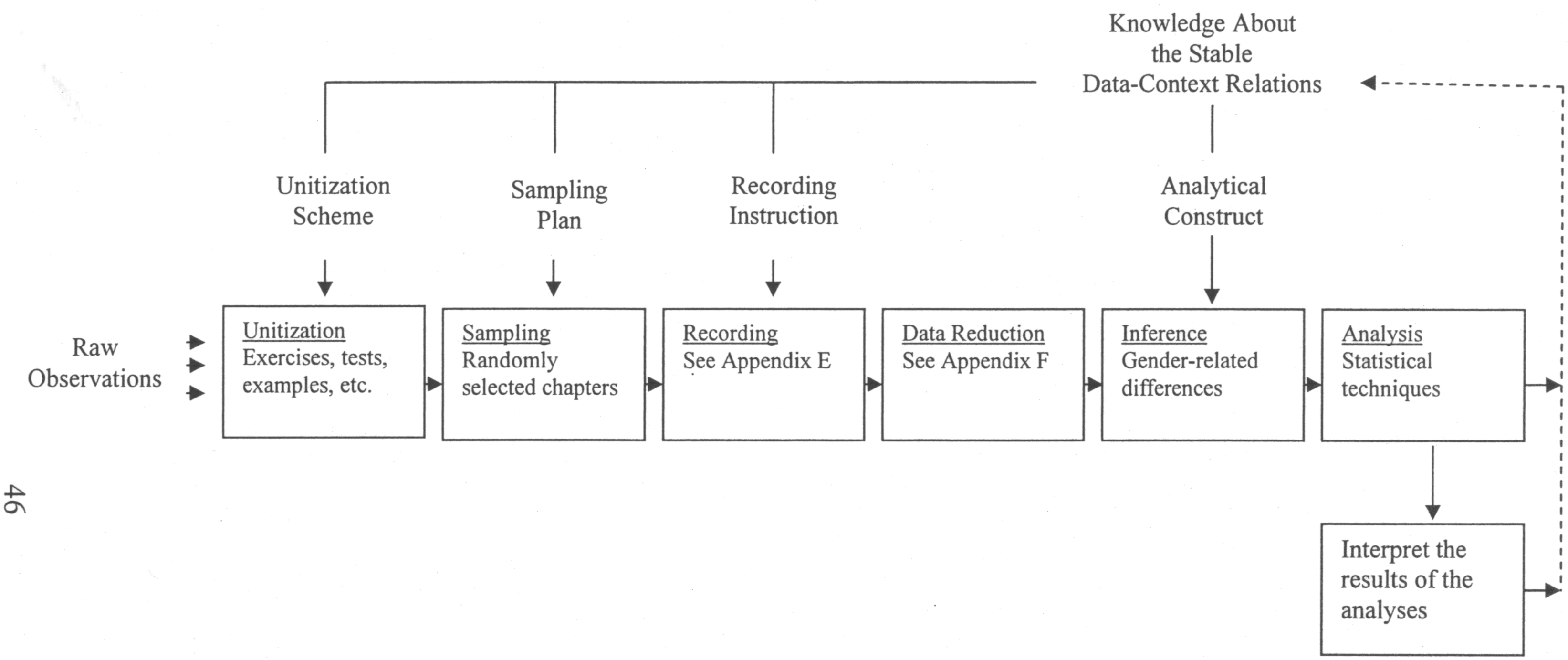

Figure 3. Application of Krippendorff's procedures to text.

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Data Collection

The main methods of data collection were examination of illustrations and text according to predetermined sampling procedures and recording information using coding instruments. Coding rules and instruments were designed for both illustrations and text so data could be systematically and consistently collected. Actual instances of gender-related differences discovered in the illustrations and text were also included to support findings. Before full extraction of the data, a preliminary collecting and coding of the data were performed to verify the procedure for consistency.

Preliminary collecting and coding of data. According to Popping (2000), the person collecting and coding the data must insure intercoder reliability. This referred to the extent to which data collected and coded produce similar results when the same data have been collected and coded by more than one person (Weber, 1990). The coding rules were designed to consistently collect the data of interest (see Appendix C and Appendix E). Preliminary collecting and coding of the data improved coding rules and instruments for the illustrations and text in this study. Popping recommended revising coding rules when necessary during preliminary collecting and coding of data. During the preliminary data collection and coding process for this study, coding rules and instruments were revised to accommodate new data of interest or situations.

A preliminary sample of the illustrations and text was collected and coded for one middle grades mathematics textbook by the researcher. One hundred ninety (190) records were coded for the preliminary textual analysis. One hundred sixty-nine (169) records were coded for the preliminary illustration analysis. A dissertation committee member experienced in content analysis coded the same information for illustrations and text, to insure coding rules and instruments were applied in a consistent manner. Intercoder reliability was determined to provide readers with confidence in the conclusions drawn by the researcher and the consistency of the data collection process.

The results of the intercoding process for text revealed some minor changes needed to be made. Two typing errors were corrected and two records showed the same activities coded differently. These changes were minor and would not have had an impact on the reliability of the results. After discussing other discrepancies and examining the coding rules, the researcher and a committee member came to consensus and made the following changes. (a) The role was changed from traditional to nontraditional for one record, (b) the role was changed from neutral to traditional for three records, (c) the role was changed from traditional to neutral for three records, and (d) the role was changed from neutral to nontraditional for seven records. Many of the changes were due to careless errors. In addition, five records consisting of groups such as people (3) girls (1) and boys (1) were excluded; therefore, 185 records were left. The gender unspecified language (Schau & Scott, 1984) such as people was excluded, because the term referred to both females and males. There were two records that used the group terms “girls” and “boys.” Similar to Clarkson (1993), if people’s names were shown, then their genders were determined if possible. To compare the total occurrence of females and males, each person name was counted separately. Since number of occurrences could not be determined for the group terms “girls” and “boys”, they were excluded. For comparison purposes, no group terms were included.

The results of the intercoding process for illustrations revealed a 100 percent agreement. In other words, the committee member would have coded the 169 cases for illustrations the same. With procedural reliability satisfied, the complete collecting and coding of data were performed by the researcher.

<u>Coding instruments.</u> Coding instruments were designed to collect data systematically while observing certain coding rules for illustration and textual analysis (Appendices B and D). Content analysis required a systematic classification system to help determine the characteristics of a body of material (Frechtling, Sharp, & Westat, 1997).

An emergent coding process was used to create instruments. Although some coding rules and instrument classification items were drawn from existing methods, others were developed inductively during the data collection process and the analysis process. According to Maxwell (1996), any significant pre-structured method has led to a lack of flexibility to respond to emergent insights. This emergent coding approach allowed instrument classification items and coding rules to be established without preconceived notions. When necessary, coding rules were revised to accommodate newly discovered circumstances. For example, zeros were assigned to all classification items without data of interest. In addition, *Saxon* textbooks did not have chapters, but lessons. The instrument was changed from CH (chapter) to CH_LE (chapter or lesson).

<u>Coding instrument for illustrations.</u> The coding instrument for illustration analysis was developed with ten classification items. These items were textbook number (BK), chapter or lesson (CH_LE), page number (PG), number of illustrations (IL), letter (LETTER), number of people in an illustration (PEOPLE), gender (GENDER), situation (SITUATION), role (ROLE), and narrative of action or event (DESCRIBE). The following paragraphs are explanations and coding rules which help to define

classification items. The classification items textbook number (BK), chapter or lesson (CH_LE), page number (PG), number of illustrations on a page (IL), and letter (LETTER) were used to locate illustrations in the textbooks. Textbook numbers (BK) were arbitrarily assigned a value of one through six. The chapter or lesson (CH_LE) and page number (PG) were recorded for each illustration. The number of illustrations (IL) on a page was recorded. A reference letter (LETTER) was assigned to each illustration on a page. For example, the letter of the alphabet (a, b, c...) was assigned clockwise for each illustration on a page with a human element (Table 3).

The total number of people (PEOPLE) in an illustration was counted and recorded. In some instances, people in a crowd were abstract and could not be counted. The gender of each person in an illustration, if identifiable, was categorized as a male, female or ambiguous. Another classification item was gender (GENDER). The gender of a visual human element was determined by examining a person’s clothing, hairstyle, jewelry, physical features, or text descriptions (see Table 4). If the gender could not be determined, then the visual human element was categorized as ambiguous.

These characteristics of gender were similar to the ones used by Northam (1982) to distinguish males from females. In primary mathematics textbooks for gender representation, Northam noted females illustrated in dresses, elaborate hairstyles and hair ribbons; and males illustrated in cropped short hairstyles. Table 4 presents the clothing, hairstyle, jewelry, physical features, or text descriptions, which defined a person as a male or female in an illustration. A person’s gender can be determined if three of the five categories (clothing, hairstyle, jewelry, physical features, or text descriptions) were applicable to a male or female.

Table 3

Classification Items and Explanations for Illustrations

Classification Items	Explanations
BK	Number assigned to textbook
CH_LE	Chapter or Lesson
PG	Page number
IL	Number of illustrations on a page
LETTER	A letter (e.g., a, b, c...) to help identify an illustration on a page; clockwise, assign a letter left to right to illustrations on a page
PEOPLE	Number of humans in an illustration
GEND.ER	0=none, 1=male, 2=female and 3= ambiguous (use Table 4 to help determine gender, if necessary)
SITUATION	Action or event (a brief description to help identify traditional, nontraditional or neutral role)
ROLE	Assign 1=traditional, 2=nontraditional, 3=neutral and 0=unable to determine (based on situation)
DESCRIBE	Brief narrative of perceived action or event

Table 4

Categories to Help Determine Gender

FEMALE	MALE
Clothing:	Clothing:
1. dress/skirt	1. pants
2. shoes	2. shoes
3. scarf/headdress	3. shirt style
4. shawl	4. tie
5. lace/ruffles	Hair styles:
6. maternity	1. hair cut
Hair styles:	2. mustache/beard
1. long hair	3. sideburns
2. pony tail	4. bald/semi-bald
3. braids	Jewelry:
4. ribbons/bows	1. ear ring
Jewelry:	2. male watch
1. pearls	3. male ring
2. ear rings	Physical features:
3. feminine bracelets	1. chest
4. chokers	2. masculine figure
5. female watch	large hands/feet
6. female ring	Other:
Physical features:	1. wallet

FEMALE	MALE
1. breasts 2. feminine figure 3. small hands/feet Other: Make-up (lip stick, rouge, et cetera.) colorful nail/toe polish purse Text descriptions referring to illustrations	Text descriptions referring to illustrations

Other classification items were situation (SITUATION), role (ROLE), and describe (DESCRIBE). The category called situation could be a word or phrase used to identify the action or activity a person was engaged (e.g. sports, housekeeping, and baby-sitting). The category was used to determine the role (ROLE) of each gender. Role could be classified as traditional, nontraditional, or gender-neutral. The background or text descriptions were used to determine the situation. A brief description or narrative (DESCRIBE) of perceived action or event was recorded for additional information to help define gender-related roles.

Coding instrument for text. The coding instrument for text was developed with thirteen classification items. The main classification items are textbook number (BK), chapter or lesson (CH_LE), page number (PG), reference number (REF_NO), type (TYPE), gender (GENDER), agency (AGENCY), action (ACTION), object (OBJECT), situation (SITUATION), and role (ROLE). Two of the classification items were to indicate gender as possessive (AG2) and used to indicate passive verb (AC2) (Table 5).

Explanations and coding rules helped to insure consistency in collecting the data of interest. Explanations in Table 5 were used to define and code classification items. The first five classification items - textbook number (BK), chapter or lesson (CH_LE), page number (PG), reference number (REF_NO), and type (TYPE) - were used to find data in textbooks used in this study. Textbook numbers (BK) were arbitrarily assigned a value of one through six. Chapter or lesson (CH_LE) and page number (PG) were recorded for each page.

Table 5

Classification Items and Explanations for Text

Classification Items	Explanations
BK	Number assigned to textbook
CH_LE	Chapter or Lesson
PG	Page number
REF_NO	The number assigned to the exercise, test, example, practice, problem solving or understanding, et cetera
TYPE	The heading used for the section where the text was found such as exercises, tests, examples, problem solving, understanding and et cetera
GENDER	0=none, 1=male, 2=female and 3=neutral
AGENCY	The initiator or doer of action or subject

Classification Items	Explanations
AG2	Type "*" to indicate gender as possessive
ACTION	Verb showing action (may include infinitive phrase)
AC2	Type "*" to indicate passive verb
OBJECT	Target of the action
SITUATION	Description to help identify role
ROLE	Based on American society assigned: 0=none, 1=traditional (female in female role; male in male role), 2=nontraditional (female in male role or male in female role), 3=neutral (either gender role)

Reference number (REF_NO) was the letter or numerical value already assigned to an item. Type (TYPE) described the subtitle of the section where text was located (e.g., exercise, test, example, practice, problem solving, understanding, etc.).

Another classification item was gender (GENDER). Gender specific terms were classified as male, female or gender-neutral (Table 6). In this study, the classification items were similar to the ones used by Macaulay and Brice (1997). Macaulay and Brice identified Pat, Kim, Chris, and Sandy as gender-neutral names. Those names were therefore identified as gender-neutral in this study. If there was no pronoun or illustration referring to a person, or if the gender could not be determined, then these names were also coded as gender-neutral in this study. Names repeated more than once in an item were counted only once. Furthermore, if a following item referred to the same person in a previous item, then those repeated names were not counted again. Pronouns, groups and other specific words used for both female and male were not counted.

Table 6

Gender Specific Terms

Female	Male	Gender-Neutral
Proper Names She/her Girl Woman/women Mother Grandmother Wife Daughter Granddaughter	Proper Names He/him Boy Man/men Father Grandfather Husband Son	If there was no pronoun or illustration to help determine gender, then a name such as Chris, Kim, Pat and et cetera was categorized as gender-neutral.

Popping's (2000) scheme for semantically coding data was employed in this study. A semantic approach to textual analysis was used to define the classification items agency (AGENCY), action (ACTION) and object (OBJECT). Popping used "Agency: the initiator or an activity, Position: the position regarding the agency's activity, Action: the activity under consideration; and Object: the target of this activity" (p. 28). Similar to Popping's (2000) scheme, the components and definitions of agency, action and object were used in this study. Agency referred to the initiator or doer of action or character in an item, representing a single person. Action referred to the verb and possibly include an infinitive phrase to describe action or activity under consideration. Object was the target of the action.

Other classification items were situation (SITUATION) and role (ROLE). Situation was a brief description used to determine if a person participated in a traditional, nontraditional or gender-neutral role. Lindsey (1997) defined gender roles as those expected attitudes and behaviors which a society associated with each sex. In this study, traditional role was defined as those expected attitudes and behaviors which American society associated with each gender, and nontraditional role was defined as those expected attitudes and behaviors which North American society does not associate with each gender.

The classification item "AG2", an asterisk (*) was used to indicate gender as being possessive (e.g. Molly's shop). For the classification item "AC2", an asterisk (*) was used to indicate a passive verb (e.g. was, has). There were cases when a page did not have any data of interest. Those pages were coded by assigning the number zero to all classification items, except for AG2 and AC2.

Data Analysis

The data analysis techniques for this study were exploratory methods of content analysis, descriptive statistics, and chi square. Descriptive statistics were used to describe or summarize data (Gay & Airasian, 2000). This analysis allowed data to be displayed in an organized and compressed form so conclusions could be drawn. Furthermore, these techniques were used to discover patterns and relationships.

Chi square was used to compare proportions actually observed to the proportion expected and to determine if they were significantly different (Gay & Airasian, 2000). In this study, chi square was used to determine whether there were significant differences among gender, grade level, and gender roles. Expected proportion could be based on past data or the assumption that the groups were equally represented (Gay & Airasian). Even though past studies have shown unequal proportions of gender representation in instructional materials, in this study the expected proportion was based on the assumption of equal representation of females and males in middle grades mathematics textbooks in southwest Georgia. SPSS version 9.0, a statistical software program, was used to calculate chi square (SPSS Inc., 1999).

Summary

The research questions were designed to investigate: to what degree do middle grades mathematics textbooks used in southwest Georgia represent females and males in both illustrations and text? The variables were gender, gender roles, and grade level. The scope of this study was limited to mathematics textbooks used in school systems in southwest Georgia. The focus was middle grades which included the sixth grade and seventh grade. Sampling procedures were based on Krippendorff's procedural model. The sample used in this study was the three most frequently used sixth grade and seven grade mathematics textbooks. Personnel in southwest Georgia school systems identified these books. Twenty percent of the chapters and lessons in the middle grades mathematics textbooks were randomly selected. The illustrations and text on each page of the selected chapters and lessons were examined. Content analysis was one of the main research methods used. Details of Kippendorff's procedural model for content analysis used in this study was explained in this section. Coding instruments for illustrations and text were developed for data collection. A preliminary collecting and coding of the data was conducted to insure intercoder reliability or consistency in collecting and coding data. Data analysis included the use of content analysis, descriptive statistics, and chi square.

Chapter 4

RESULTS

The aim of this study was to examine to what degree middle grades mathematics textbooks used in school systems in southwest Georgia represented females and males in illustrations and text. Conducting a content analysis allowed the researcher to analyze factors related to the portrayal of gender in middle mathematics textbooks. A quantitative approach of content analysis was used in this study (Popping, 2000). Content analysis was used to reduce an enormous amount of data into analyzable, numerical form. One of the most common forms of representing data for content analysis was cross-tabulation of the frequencies of occurrences (Kippendorff, 1980). To increase readers' confidence in the findings, one could not only report frequencies and percentages, but perform a test of statistical significance (Krippendorff). For this study, chi square test was performed to determine if there were statistically significant differences in the representation of gender in illustrations and text. According to Gay and Airasian (2000), chi square was a nonparametric test of significance used when data were nominal scale and in the form of frequency counts or percentages. In this section, relevant findings for each research question have been presented. SPSS version 9.0 was used to compute descriptive statistics and to test significance (SPSS, 1999).

Content Analysis for Illustrations

Six hundred fifty-four (654) cases were recorded from four of the six middle grades mathematics textbooks used in southwest Georgia. Two middle grades mathematics textbooks did not have illustrations, but had text and diagrams without people. Four hundred sixty-six (466) cases in four of the six textbooks had no data of interest. In other words, there was no mention of people; therefore, these cases were excluded from this analysis. Similarly, Clarkson (1993) and Parker (1999) examined mathematics textbooks and found writers often used no reference to people. According to researchers, writers seemed to be following a safe path by not mentioning people to avoid the problem of producing sexist material in a sexist society. After excluding these 466 cases from illustration analysis, 188 cases remained to investigate for gender representation. The following are findings.

Research Questions for Illustrations

1. Are males more likely to appear in illustrations of middle grades mathematics textbooks than females?

Initially, there were 188 cases. Eighty-five (45 percent) of the persons depicted in illustrations were males, 80 (43 percent) were females. Twenty-three (12 percent) cases were of ambiguous gender and could not be classified as either male or female. These 23 cases were excluded, leaving 165 cases for this analysis. About 51 percent of the 165 illustrations in middle grades mathematics textbooks included males and 49 percent included females. There was no statistical difference in the number of middle grades mathematics textbook illustrations by gender, χ^2 (1, $\underline{N}$ = 165) = 0.13, $p > .05$. In other words, males were not more likely to appear in illustrations of middle grades mathematics textbooks than females. Results of crosstabular analysis for question one have been displayed in Table 7.

Table 7

Cross-tabulation of Gender by Grade Levels for Illustrations

	Sixth		Seventh		Total		
Gender	n	P	n	P	n	P	Significance
Males	53	50.5	32	53.3	85	51.5	0.42
Females	52	49.5	28	46.7	80	48.5	

2. Is there a difference between gender roles and gender in illustrations of middle grades mathematics textbooks?

Initially, there were 188 cases. Twenty-three (23) cases out of 188 were excluded, leaving 165 cases for this analysis. These 23 cases were of ambiguous gender and could not be classified as either male or female. Approximately 24 percent of the total roles identified in illustrations were traditional, nearly 8 percent were nontraditional, and about 68 percent were gender-neutral. Further analysis by gender indicated roughly 35 percent of males and 11 percent of females were depicted in traditional roles; and about 1 percent of males and 16 percent of females were portrayed in nontraditional roles. Nearly 63 percent of males and 73 percent of females were associated with gender-neutral roles. There was a statistically significant gender difference by roles for illustrations χ^2 (2, $\underline{N}$ = 165) = 21.61, $\underline{p} < .05$. Caution is needed since a sample size less than five could create unstable statistics. Results of crosstabular analysis of gender roles by gender for illustrations have been displayed in Table 8.

Table 8

Cross-tabulation of Gender Roles by Gender for Illustrations

	Males		Females		Total		
Role	n	P	n	P	n	P	Significance
Traditional	30	35.3	9	11.3	39	23.6	0.00*
Nontraditional	1	1.2	13	16.3	14	8.5	
Gender-Neutral	54	63.5	58	72.5	112	67.9	

Note. *$p < .05$.

3. Is there a difference between gender roles and grade levels in illustrations of middle grades mathematics textbooks?

Approximately 21 percent of the total number of roles were classified as traditional, 8 percent were classified as nontraditional, and 71 percent were classified as gender-neutral. Examination by grade indicated roughly 25 percent of the roles in the sixth grade mathematics textbooks were categorized as traditional and 16 percent of the roles in the seventh grade mathematics textbooks were categorized as traditional. Nearly 3 percent of the roles in the sixth grade mathematics textbooks were labeled as nontraditional and 13 percent of the roles in the seventh grade mathematics textbooks were labeled as nontraditional. About 72 percent of the roles for sixth grade mathematics textbooks were considered as gender-neutral and 70 percent of the roles for seventh grade mathematics textbooks were considered as gender-neutral. There was a statistically significant difference between gender roles and grade levels for illustrations, χ^2 (2, N =

188) = 7.52, $p < .05$. Results of crosstabular analysis for question three have been displayed in Table 9.

Table 9

Cross-tabulation of Gender Roles by Grade for Illustrations

	Sixth		Seventh		Total		
Role	n	P	n	P	n	P	Significance
Traditional	28	24.6	12	16.2	40	21.3	0.02*
Nontraditional	4	3.5	10	13.5	14	7.5	
Gender-Neutral	82	71.9	52	70.3	134	71.3	

Note. *$p < .05$.

Content Analysis for Text

Examination of text from six middle grades mathematics textbooks yielded 1643 cases. No data of interest, meaning no mention of people, was included in 1204 cases from analysis, resulting in 439 cases for analysis. Clarkson and Parker (1999) examined mathematics textbooks and found similar results. According to the researchers writers seemed to follow a safe path by not mentioning people to avoid the problem of producing sexist material in a sexist society. After excluding 1204 cases from textual analysis, 439 cases remained to answer research questions in this study. The following are findings.

Research Questions for Text

4. Are males more likely to appear in the text of middle grades mathematics textbooks than females?

Initially, there were 439 cases. Five (5) cases out of 439 cases were excluded, leaving 434 cases for this analysis. These five cases were of ambiguous gender and could not be classified as either male or female. About 50 percent of the total number of text cases in middle grades mathematics textbooks depicted males and 50 percent of the text cases depicted females. There was no statistical difference in the frequency counts of middle grades mathematics textbook text by gender, χ^2 (1, N = 434) = 0.15, p > .05. In other words, males were not more likely to appear in the text of middle grades mathematics textbooks than females. Results of crosstabular analysis for question four have been displayed in Table 10.

Table 10

Cross-tabulation of Gender by Grade for Text

	Sixth		Seventh		Total		
Gender	N	P	N	P	n	P	Significance
Males	107	49.1	110	50.9	217	50.0	0.39
Females	111	50.9	106	49.1	217	50.0	

5. Is there a difference between gender roles and gender in text of middle grades mathematics textbooks?

Initially, there were 439 cases. Five (5) cases out of 439 cases were excluded, leaving 434 cases for this analysis. These five cases were of ambiguous gender and could not be classified as either male or female. Approximately 20 percent of the total number of roles identified in the text were traditional, roughly 13 percent were nontraditional, and about 67 percent were gender-neutral. Further examination by gender indicated 29 percent of males and 11 percent of females were depicted in traditional roles. About 7 percent of males and 18 percent of females were portrayed in nontraditional roles. Nearly 64 percent of males and 71 percent of females were associated with gender-neutral roles. There was a statistically significant difference between gender roles and gender, χ^2 (2, N = 434) = 28.54, p < .05. Results of crosstabular analysis of gender roles by gender for text have been displayed in Table 11.

Table 11

Cross-tabulation of Gender Roles by Gender for Text

	Males		Females		Total		
Role	n	P	n	P	n	P	Significance
Traditional	63	29.0	24	11.1	87	20.0	0.00*
Nontraditional	16	7.4	40	18.4	56	12.9	
Gender-Neutral	138	63.6	153	70.5	291	67.1	

Note. *p < .05.

6. Is there a difference between gender roles and grade levels in text of middle grades mathematics textbooks?

Approximately 20 percent of the total roles were classified as traditional, 13 percent were classified as nontraditional, and 67 percent were classified as gender-neutral. Examination of grade level text revealed approximately 20 percent of the roles in the sixth grade mathematics textbooks were categorized as traditional and 19 percent of the roles in the seventh grade mathematics textbooks were categorized as traditional. Nearly 15 percent of the roles in the sixth grade mathematics textbooks were labeled as nontraditional and 13 percent of the roles in the seventh grade mathematics textbooks were labeled as nontraditional. About 64 percent of the roles for sixth grade mathematics textbooks were considered gender-neutral and 71 percent of the roles for seventh grade mathematics textbooks were considered gender-neutral. There was no statistically significant difference between gender roles and grade levels for text, χ^2 (2, N = 439) = 2.96, $p > .05$. Results of crosstabular analysis for question six have been displayed in Table 12.

Cross-tabulation of Gender Roles by Grade Levels for Text

	Sixth		Seventh		Total		
Role	n	P	n	P	n	P	Significance
Traditional	45	20.3	42	19.4	87	19.8	0.23
Nontraditional	34	15.3	22	10.1	56	12.8	
Gender-Neutral	143	64.4	153	70.5	296	67.4	

Summary

This study was designed to investigate the representation of females and males in middle grades mathematics textbooks used in schools in southwest Georgia. Content analysis and chi square were used to analyze the data of interest. These were the main findings: (a) Males were not more likely to appear in illustrations of middle grades mathematics textbooks than females. (b) There was a statistically significant difference between gender roles and gender in illustrations. (c) There was a statistically significant difference between gender roles and grade levels in illustrations. (d) Males were not more likely to appear in text of middle grades mathematics textbooks than females. The difference in occurrences of females and males was not statistically significant. (e) There was a statistically significant difference between gender roles and gender in the text. (f) There was no statistically significant difference between gender roles and grade levels in text. Overall, there were relatively even frequency counts of females and males represented in both illustrations and text of middle grades mathematics textbooks used in southwest Georgia. However, patterns emerged which indicated the use of more gender-neutral language and some stereotyping of females and males when analyzing the other gender roles.

Chapter 5

DISCUSSION

The major purpose of this study was to examine gender-related content of middle grades mathematics textbooks used in classrooms in southwest Georgia. Similar to other textbooks, the content in mathematics textbooks may exhibit gender role stereotypes and display gender biases. Since students were required to spend a large amount of time interacting with the content in mathematics textbooks, females and males could be socialized into stereotypical gender roles. Gender representation in educational material has been considered one factor contributing to the achievement gap between females and males in mathematics. The literature review for this study revealed numerous studies conducted on gender and children's literature, but few studies conducted on mathematics textbooks and gender.

To further make sense of the data, researchers (Macaulay & Brice, 1997) used categories which were constructed based on words or phrases in text. In this study, 'data driven' categories (Popping, 2000) were constructed based on words, phrases, or pictures. Only findings regarding relevant categories to researcher questions were reported below in the discussion section. This study supplied the following information about gender representation in mathematics textbooks used in southwest Georgia.

Are males more likely to appear in illustrations and text of middle grades mathematics textbooks than females? In middle grades mathematics textbooks, male were not more likely to appear in illustrations and text. Equally, 217 females and males were depicted in the text. In contrast, Maculay and Brice (1997) and Narahara (1998) found males appeared almost twice as often as females in sentences. Likewise, Davis and McDaniel (1999) indicated 61 percent of the character appearances in text were males, compared to 39 percent of females in children's books. In this study, eighty-five (85) males compared to 80 females were shown in illustrations. There was no significant difference in the appearance of females and males in illustrations. In contrast, Narahara (1998) found males images appeared in children's books more than twice as often as females. Furthermore, Northam (1982) found females were underrepresented in illustrations of mathematics textbooks for junior students (what we considered middle school).

Some researchers (Davis & McDaniel, 1999; Maculay &Brice,1997; Narahara, 1998; Northam, 1982) observed males depicted more often than females in educational materials such as textbooks. However, this study supported other researchers' (Creany, 1995; Clarkson, 1993) findings. They claimed the gap was narrowing between the number of female and male occurrences in education materials such as mathematics textbooks. Based on this study, it appeared authors have focused more on the frequency counts of female and male references in middle grades mathematics textbooks and focused less on the portrayal of males and females in traditional and nontraditional roles in these textbooks.

Is there a difference between gender roles and gender in illustrations and text of middle grades mathematics textbooks? For instance, researchers found less progress has been made on factors pertaining to the portrayal of gender roles (Evans & Davies, 2000;

Macaulay & Brice; 1997; Northam, 1982). In this study, the researcher revealed similar results. There were statistically significant differences between gender roles (traditional, nontraditional, gender-neutral) and gender (male, female) in illustrations and text of middle grades mathematics textbooks used in southwest Georgia. The majority of females and males were depicted more in gender-neutral roles in illustrations and text. Males were portrayed in more traditional roles than females in both illustrations and text. Furthermore, females were depicted more in nontraditional roles than males in both illustrations and text.

Gender-neutral roles. In this study, both females and males were found in more gender-neutral roles than any other role in illustrations and text of middle grades mathematics textbooks used in southwest Georgia. Approximately 71 percent (134 cases) of females and males in illustrations were pictured in gender-neutral roles. About 67 percent (291 cases) of females and males in text were depicted in gender-neutral roles.

During the sixties and seventies, an increase in the number of gender-neutral roles occurred due to emphasis placed on gender equity. In 1972, Congress passed laws such as Title IX to promote equal educational treatment on the basis of gender. Many organizations have published guidelines to assist and suggest ways to avoid gender biased language in writing educational materials such as textbooks. Writers and publishers of textbooks have attempted to use gender-neutral language suggested by APA, National Council of Teachers of English, and others. Finding in this study of females and males depicted in more gender-neutral roles than traditional or nontraditional roles was likely related to these efforts.

Textbook authors and publishers seemed to avoid dealing with the challenge of gender equity by casting females and males in a large number of gender-neutral roles instead of equitable traditional and nontraditional roles. In the mathematics textbooks Parker (1999) examined, she found most cases referring to a specific gender were of neutral interest or of interest to the same gender. According to Clarkson (1993), "One reason for depicting people in textbooks is clearly to give a message that mathematics is not just working with abstract symbolism, but affects people in their day to day lives" (p. 15). The researcher agrees that portraying females and males in largely gender-neutral roles may not be the solution to gender equity issues in mathematics textbooks. Based on our society, mathematics is not a gender-neural role, but a traditional role for males. It seems reasonable to conclude that gender-neutral roles will not challenge stereotypical views reflected in our society. However, the portrayal of both genders in more nontraditional roles would challenge stereotypical views reflected in our society.

Traditional Roles. In this study, males were portrayed in more traditional roles than females in illustrations and text of middle grades mathematics textbooks. Roughly 35 percent of males and 11 percent of females were depicted in traditional roles in illustrations. Approximately 29 percent of males and 11 percent of females were depicted in traditional roles of text. Similarly, Davies and Evans (1990) found more males depicted in traditional roles. In my study, the same pattern emerged, confirming what Davies and Evans concluded, that males were stereotyped more in traditional roles.

One data driven category of interest was occupation. Macaulay and Brice (1997) found the kinds of occupations each gender participated in were highly stereotyped. Similar results were found in this study. For text, truck drivers and presidents of the

United States were identified as traditional occupations for males. For illustrations, males were associated with occupations considered traditionally male roles such as automotive engineer, carpenter, park ranger, mathematicians, and presidents. Illustrations included images of presidents of the United States (Clinton and Franklin) and mathematicians (Pythagoras and Descrates). Northam (1982) also revealed that mathematics textbooks published between 1970 to 1978 for students whose ages range from 3 through 13 reinforced mathematics as a masculine activity by including only male mathematicians. Authors in the 21st century seemed to fail to consider the significance of reinforcing mathematics as a masculine activity by excluded images of female mathematicians. On the other hand, occupations such as nursing and babysitting were traditional roles associated with females. Four (4) out of 5 females were labeled as babysitters. Schau and Scott (1984) might have considered these images as "sex-equitable," because the textbooks reflected reality. It appeared that these images in mathematics textbooks reinforced "sex-biased" expectations reflected in society.

Another category of interest for researchers (Evan & Davies, 2000) was sports. It also seemed as though efforts were made to portray females in more sports activities. However, these sports seemed less aggressive. According to Evan and Davies, males who avoided tough aggressive play were labeled as "sissies." In this study, males were depicted in active or aggressive sports, such as basketball, baseball, football, and soccer. Females were associated with fewer contact sports such as track and gymnastics. Evans and Davies (2000) reported textbooks have yet to become non-sexist by portraying females and males in both traditional and nontraditional roles. The researcher agrees with

Parker (1999) that authors could feel uncomfortable dealing with gender roles and found it was easier to deal with frequency counts of females and males in textbooks.

Nontraditional roles. Another finding in this study was females portrayed more in nontraditional roles than males in illustrations and text of middle grades mathematics textbooks. For illustration analysis, approximately 1 percent of males were pictured in nontraditional roles compared to 16 percent of females. For textual analysis, approximately 7 percent of males compared to 18 percent of females were illustrated in nontraditional roles. For example, males were depicted as a babysitter, baking cookies, and sewing curtains.

In this study, it seemed as though authors and publishers have made less progress in depicting males in more nontraditional roles. Few researchers have explored the masculine side of this gender equity issue, even though Evans and Davies' (2000) study demonstrated more attention needed to be directed toward the depiction of males. In this study, males were portrayed largely in roles considered traditionally masculine in our society. It appeared, researchers have focused more on the representation of females in education materials because of the attention to women's issues. It seemed reasonable to conclude that since the majority of the attention has been on the representation of females, publishers and authors seemed to be responding to the demand of gender representation by portraying more females in nontraditional roles in middle grades mathematics textbooks. They might have considered this as progress for the representation of females in textbooks.

Recommendations

Females and males alike should be encouraged to pursue educational and career choices based on their ability and not preconceived gender roles. Additional research in this area is needed to continue addressing gender inequalities in education and to assess our progress in reducing bias and stereotyping in educational materials such as textbooks. This was especially true at the middle school level, which were critical years when students define their identity, assess their abilities, and consider career choices that may determine their future. In addition, as other researchers pursue gender equity topics in the future, it is recommended that they direct more attention on the examination of males in gender roles of illustrations and text of mathematics and other textbooks.

Limitations

This study was conducted on a sample of middle grades mathematics textbooks used in southwest Georgia. These textbooks, to a large extent, represented only a cross-section of middle grades mathematics textbooks used nationwide. Examining additional middle grades mathematics textbooks may strengthen the outcome of future studies. In addition, Chafetz (1988) indicated, "gender role stereotypes vary within the broader culture by social class, region, race and ethnicity and other sub-cultural categories" (p. 70). A person with a different cultural background than the researcher may categorize gender roles differently for females and males. The findings of this study were based on bivariate and not multivariate statistical analysis.

Implications

This study provided support for the need to continue the awareness of gender biased in mathematics textbooks. There were significant differences between gender roles and gender in illustrations and text of middle grades mathematics textbooks examined in this study. There were relatively even frequency counts of females and males represented in both illustrations and text of middle grades mathematics textbooks. However, patterns emerged which indicated the use of more gender-neutral language and some stereotyping of females and males when analyzing gender roles. In both illustration and textual analysis, females and males were portrayed in more gender-neutral roles than any other role. In illustrations and text, males were depicted in more traditional roles than females; and females were portrayed in more nontraditional roles than males.

Gender differences in the portrayal of females and males in educational materials have significant implications. Publishers and authors should take another look or a closer look at how males and females are portrayed in illustrations and text of middle grade math textbooks. Reading textbooks was one mean of socializing students into gender roles (Witt, 1996). Some of the societal stereotypical gender roles were reflected in illustrations and text of middle grades mathematics textbooks. Stereotypical roles reflected in textbooks seemed detrimental to students' perception of mathematics. Students may restrict their interests and experiences to those roles deemed appropriate in our society for their particular gender (Creany, 1995).

Females should be encouraged to enjoy and to continue their study in mathematics (Parker, 1999). According to Arbor et al. (1999), females have made progress in mathematics. This progress has been due to research efforts to increase the awareness of the subtle factors affecting females' performance and participation (Arbor et al., 1999). The type of experiences females have in middle school mathematics classes is critical to their participation and achievement in mathematics and mathematics-related careers.

Findings in this study should provoke more research in this area. Other factors should also be examined such as internalized belief systems about mathematics, external factors such as sex discrimination in education and in employment (Kimball, 1989). Societal stereotypes should be challenged since gender differences were reflected in textbooks. Furthermore, at the state level or local level, a committee should ensure that mathematics textbooks address gender-biased in illustrations and text.

Future Research

Gender role stereotypes among various cultural groups may exist. There was an indication authors and publishers tried to represent other cultures in illustrations and text. For example, names such as Armando, Delgado, Hiroshi, Majko, and Pedro were included in text. Illustrations were also used to reflect cultural diversity. However, researchers suggested gender representation to be disproportionate in regions with high ethnic concentrations (Denton & Muir, 1994). Cultural representation was not the focus of this study, but may be worthy of investigation. Clarkson (1993) reported change was under way for gender representation, but could not say the same for ethnicity balance.

Conclusion

As previous literature suggested, the results of this study reiterated that most of the time people were not present in the mathematics illustrations and text. There were very few males in traditional females' roles and few females in traditional males' roles, but a large number of both females and males in gender-neutral roles. Furthermore, the difference in the number of occurrences of males and female was small. Based on this study, it appeared authors have focused more on the frequency counts of references of females and males in middle grades mathematics textbooks and focused less on other characteristics associated with the portrayal of gender roles in these textbooks.

Gender roles are constantly changing in our society, because of educational opportunities, single parenting, and cultural changes. School culture has tended to reflect our society. Gender appropriate roles were learned through school-related activities, as well as textbooks (Ballantine, 1997). Textbooks helped perpetuate gender stereotypes. A textbook could also be a tool used to encourage females and males to consider a variety of gender roles, including future professional choices.

Middle school students spend a great deal of their time using textbooks in mathematics classes. The middle school years are critical. This is the time when students define their identity, assess their abilities, and consider career choices that could determine their future. Identifying factors which influence students at this level could likely assist with understanding gender differences and mathematics choices.

REFERENCES

Arbor, A., Sanders, J., & Peterson, K. (1999). Close the gap for girls in math-related careers. The Education Digest, 65(4), 47-49.

Alexander, W. M., & McEwin, C. K. (1989). Schools in the middle: Status and progress. Columbus, OH: National Middle School Association.

American Psychological Association. (1994). Publication manual of the American Psychological Association (4th ed.). Washington: American Psychogical Association.

Armstrong, J. M. (1981). Achievement and participation of women in mathematics : Results of two national surveys. Journal for Research in Mathematics Education, 12(5), 356-372.

Armstrong, J. M., & Price, R. A. (1982). Correlates and predictors of women's mathematics participation. Journal for Research in Mathematics Education, 13(2), 99-109.

Ballantine, J. H. (1997). The sociology of education: A systematic analysis (4th ed.). Upper Saddle River, NJ: Prentice Hall.

Banks, J. (1993). Multicultural education: Development, dimensions and challenges. In J. W. Noll (Ed.), Taking sides: Clashing views on controversial educational issues (10th ed., pp. 108-117). Guilford, CT: Dushkin/McGraw-Hill.

Block, J. H. (1976). Debatable conclusions about sex differences. Contemporary Psychology, 21, 517-522.

Catsambis, S. (1994). The path to math: Gender and racial-ethnic differences in mathematics participation from middle school to high school. Sociology of Education, 67(3), 199-215.

Chafetz, J. S. (1988). Feminist sociology: An overview of contemporary theories. Itasca, IL: F. E. Peacock Publishers.

Chipman, S. R., Marshall, S. P., & Scott, P. A. (1991). Contents effects on word problem performance: A possible source of test bias? American Educational Research Journal, 28(4), 897-915.

Clarkson, P. (1993). Gender, ethnicity and textbooks. The Australian Mathematics Teachers, 49(2), 14-16.

Creany, A. D. (1995). The appearance of gender in award-winning children's books (Report No.150). Chicago, IL: Annual Conference of the International Visual Literacy Association. (ERIC Document Reproduction Service No. ED 391 510)

Davis, A. P., & McDaniel, T. R. (1999). You've come a long way, baby-or-have you? Research evaluating gender portrayal in recent Caldecott-winning books. Reading Teacher, 52(5), 532-536.

Denton, K. L., & Muir, S. P. (1994). Making every picture count: Ethnicity in primary grade textbook photographs. Social Education, 58(3), 156-158.

Doll, R. C. (1986). Curriculum improvement: Decision making and process (6th ed.). Boston: Allyn & Bacon.

Duffy, J., Gunther, G., & Walters, L. (1997). Gender and mathematical problem solving. Sex Roles, 37(7/8), 477-494.

Eccles, J., Wigfield, A., Harold, R. D., & Blumenfeld, P. (1993). Age and gender differences in children's self- and task perceptions during elementary school. Child Development, 64, 830-847.

Eggen, P., & Kauchak, D. (1999). Educational psychology (4th ed.). Upper Saddle River, NJ: Merrill.

Ethington, C. A. (1992). Gender differences in a psychological model of mathematics achievement. Journal for Research in Mathematics Education, 23(2), 166-181.

Evans, L., & Davies, K. (2000). No sissy boys here: A content analysis of the representation of masculinity in elementary school reading textbooks. Sex Roles, 41(3/4), 255-270.

Feldman, S. S., & Elliott, G. R. (1993). At the threshold: The developing adolescent. Boston: Harvard University Press.

Fennema, E., & Hart, L. E. (1994). Gender and the JRME. Journal for Research in Mathematics Education, 25(6), 648-659.

Foley, C. L., & Boulware, B. J. (1996). Gender equity in 1990 middle school basal readers. Reading Improvement, 33, 330-223.

Foxman, E., & Easterling, D. (1999). The representation of diversity in marketing principles texts: An exploratory analysis. Journal of Education for Business, 74(5), 285-289.

Frank, F. W., & Treichler, P. A. (1989). Language, gender and professional writing: Theoretical approaches and guidelines for nonsexist usage. New York: Modern Language Association.

Frechtling, J., Sharp, L., & Westat, Inc. (Eds.) (1997). User-friendly handbook for mixed method evaluations. Arlington, VA: National Science Foundation.

Gay, L. R., & Airasian, P. (2000). Educational research: Competencies for analysis and application (6th ed.). Upper Saddle River, NJ: Prentice Hall.

George, P. S., & Alexander, W. M. (1993). The exemplary middle school (2nd ed.). New York: Holt, Rinehart and Winston, Inc.

Georgia Department of Education. (2001). Superintendent's desk. Retrieved February 10, 2001, from http://www.doe.kas.ga.us/infomationresources/textbooks.html

Goodman, J. L. (1993). Reading toward womanhood: The baby-sitters club books and our daughters. Tikkun, 8(6), 7-11.

Hyde, J. S., Fennema, E., & Lamon, S. J. (1990). Gender differences in mathematics performance: A meta-analysis. Psychological Bulletin, 107(2), 139-155.

Hyde, J. S., Fennema, E., Ryan, M., Frost, L. A., & Hopp, C. (1990). Gender comparison of mathematics attitudes and affect: A meta-analysis. Psychology of Women Quarterly, 14, 299-324.

Irvin, J. L. (1992). Transforming middle level education: Perspectives and possibilities. Boston: Allyn and Bacon.

Irvin, J. L. (1996). Developmental tasks of early adolescence: How adult awareness can reduce at-risk behavior. Clearing House, 69(4), 222-226.

Jackson, L. A., & Fleury, R. E. (1995). The numbers game: Gender and attention to numerical information. Sex Roles, 33, 559-568.

Kimball, M. M. (1989). A new perspective on women's math achievement. Psychological Bulletin, 105(2), 198-214.

Krippendorff, K. (1980). Content analysis: An introduction to its methodology. London: Sage Publications.

Lindsey, L. L. (1997). Gender roles. Upper Saddle River, NJ: Prentice Hall.

Lounsbury, J. H. (1992). Perspectives on the middle school movement. In J. L. Irvin (Ed.), Transforming middle level education: Perspectives and possibilities (pp. 3-15). Boston: Allyn and Bacon.

Lubienski, S. T. (2000). Who's counting? A survey of mathematics education research 1982-1998. Journal for Research in Mathematics Education, 31(5), 626-633.

Macaulay, M., & Brice, C. (1997). Don't touch my projectile: Gender bias and stereotyping in syntactic examples. Language, 73, 798-826.

Maxwell, J. A. (1996). Qualitative research design: An interactive approach. London: Sage Publications.

McCarthy, C. (1990). Multicultural education, minority identities, textbooks and the challenge of curriculum reform. Journal of Education, 172(2), 118-130.

McClelland, D. C. (1974) How and why to code historical documents as the psychological interpretation of history. Unpublished manuscript, Harvard at Cambridge, MA.

Mid-Atlantic Equity Consortium. (2000). Federal laws and regulations governing equality and access issues in education. Retrieved September 5, 2000, from http://www.maec.org/fedlaws.html

Miles, M. B., & Huberman, A. M. (1994). An expanded source book: Qualitative data analysis (2nd ed.). London: Sage Publications.

Milgram, J. (1992). A portrait of diversity: The middle level student. In J. L. Irvin (Ed.), Transforming middle level Education: perspectives and possibilities (pp. 16-27). Boston: Allyn and Bacon.

National Assessment of Educational Progress. (2000). The nation's report card state mathematics 2000: Report for Georgia. (NCES 2001-519 GA). Washington, DC: United States Department of Education.

National Council of Teachers of English. (2003). Guidelines for Gender-Fair Use of Language. Retrieved September 25, 2003, from http://www.ncte.org/positions/gender.shtml

Narahara, M. (1998). Gender bias in children's picture books: A look at teachers' choice of literature (Report No. 143) Long Beach, CA: Exit Project EDEL 570, University of California. (ERIC Document Reproduction Service No. ED 419 247)

Nibbelink, W. H., Stockdale, S. R., & Mangru, M. (1986). Sex-role assignments in elementary school mathematics textbooks. Arithmetic Teacher, 19-21.

Northam, J. (1982). Girls and boys in primary maths [sic] books. Education 3-13, 10(1), 11-14.

Ozmon, H. A., & Craver, S. M. (1999). Philosophical foundations of education, (6th ed.). Upper Saddle River, NJ: Prentice Hall.

Palmquist, M. (2001). Content analysis. Retrieved September 8, 2001, from http://fiat.gslis.utexas.edu/~palmquis/courses/content.html

Parker, K. (1999). The impact of the textbooks on girls' perception of mathematics. Mathematics in School, 28(2), 2-4.

Popping, R. (2000). Computer-assisted text analysis. London: Sage Publications.

Purcell, P., & Stewart, L. (1990). Dick and Jane in 1989. Sex Roles, 22, 177-185.

Pyszkowski, I. (1993). Multiculturalism: Education for the nineties: An overview. Education, 114(1), 151-159.

Reynolds, A. J. (1991). The middle schooling process: Influences on science and mathematics achievement from the longitudinal study of American youth. Adolescence, 26(101), 133-159.

Reys, R., Reys, B., Barnes, D., Beem, J., & Papick. (1998). What is standing in the way of middle school mathematics curriculum reform? Middle School Journal, 30(2), 42-48.

Ryan, K., & Cooper, J. M. (1998). Those who can, teach (8th ed.). Boston: Houghton Mifflin Company.

Sanchez T. (1997). Multiculturalism: Practical considerations for curricular change. In F. Schultz (Ed.), Multicultural education 97/98 (pp. 161-163). Guilford, CT: Dushkin/McGraw-Hill.

Schau, C. G., & Scott, K. P. (1984). Impact of gender characteristics of instructional materials: An integration of the research literature. Journal of Educational Psychology, 76(2), 183-193.

Seegers, G., & Boekaerts, M. (1996). Gender-related differences in self-reference cognitions in relation to mathematics. Journal for Research in Mathematics Education, 27(2), 215-241.

Singh, M. (1998). Gender issues in children's literature (Report No. EDO-CS-98-08) Bloomington, IN: Clearinghouse on Reading, English and Communication. (ERIC Document Reproduction Service No. ED424591)

Spear, R. C. (1992). Appropriate grouping practices for middle level students. In J. L. Irvin (Ed.), Transforming middle level education: Perspectives and possibilities (pp. 244-274). Boston: Allyn and Bacon.

SPSS version 9.0 [Computer software]. (1999). Chicago, IL: SPSS Inc.

Steele, C. M. (1997). Domain specificity and habits of the mind: An investigation of patterns of high level development. Journal of Early Adolescence, 15, 319-343.

Stevenson, C. (1992). Teaching ten to fourteen year olds. New York: Longman.

Tesser, A. (1995). Advanced social psychology. New York: McGraw-Hill.

Titus, J. J. (1993). Gender messages in education foundations textbooks. Journal of Teacher Education, 44(1), 38-45.

Vermeer, H. J., Boekaerts, M., & Seegers, G. (2000). Motivational and gender differences: Sixth-grade students' mathematical problem solving behavior. Journal of Educational Psychology, 92(2), 308-315.

Weber, R. P. (1990). Basic content analysis (2nd ed.). Newbury Park, CA: Sage.

Walsh, M., Hickey, C., & Duffy, J. (1999). Influence of item content and stereotype situation on gender differences in mathematical problem solving. Sex Roles, 41(3/4), 219-240.

Whitehead, J. M. (1996). Sex stereotypes, gender identity and subject choice at A-level. Educational Research, 38(2), 147-160.

Witt, S. D. (1996). Traditional or androgynous: An analysis to determine gender role orientation of basal readers. Child Study Journal, 26(4), 303-321.

APPENDICES

Appendix A: Mathematics Textbooks Recommended by Georgia

Appendix B: Coding Instrument for Illustrations

Appendix C: Coding Rules for Illustrations

Appendix D: Coding Instrument for Text

Appendix E: Coding Rules for Text

Appendix F: IRB Approval

Appendix G: Permission of Sage Publications, Inc.