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ABSTRACT

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Contextual Analysis of Problems in Algebra I Textbooks

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Contextual Analysis of Problems in Algebra I Textbooks

Introduction

Mathematics has the potential for being less context dependent that most subjects. For many years little thought was given to social context or to making the teaching of mathematics more relevant to the experience of students. During the second half of this century, public pressure in the United States led to increased emphasis on achievement in science and mathematics. Educators reflected that concern, and American textbook publishers began to alter the design of textbooks to make them more visually appealing and to include information intended to increase motivation.

Over the last two decades, educational researchers have become concerned over the issue of equity in mathematics education. American publishers have been criticized for producing mathematics textbooks which were targeted primarily for an audience of white males. Educators and researchers challenged authors to make textbooks more responsive to females and members of ethnic minorities and more relevant to the life experiences of students.

Review of Literature

The achievement record of the American student when compared to students in other developed countries has becomean increasing source of concern. This review of literature will examine the following explanations which have been proposed to account for differences in mathematics ability: (1) talent rather than hard work (2) innate gender differences favoring males and (3) the socialization process. Finally, the new curriculum and evaluation standards of the National Council of Teachers of Mathematics will be discussed briefly.

Myths of American Culture

Kenshaft (1988) has pointed out the popular myth in American culture that math achievement is the result oftalent rather than hard work. She noted that United States students rank last in mathematics among the developed nations in almost every international math test, including those comparing 18-year-olds in the 99th percentile. Only 40 percent of American ninth graders even attempt beginning algebra. In contrast, half of China's ninth graders pass the trigonometry test which is a prerequisite for admission to tenth grade. Calculus is required for admission to college in Japan and in many European countries. Kenschaft's view is that United States students who overcome the strong cultural bias against mathematics by completing first year algebra should be encouraged to continue in mathematics.

Earlier research on gender and achievement consistently found performance differences favoring males and hypothesized biological differences (ASDE, 1987). As hypotheses were discarded, more recent biological arguments have been based on differences in specific categories of spatial ability. New evidence tends to indicate that these differences may be more related to speed of performance than to ability and call into question the existence of an innate gender difference in visual-spatial ability, (Gallagher, 1989).

A recent (Friedman, 1990) meta-analysis of studies on gender differences in mathematical tasks has reported continuation of the trend toward reduction in effect sizes and reports that the average sex difference is now very small. The differences reported increased with the age of the study sample. When other variables were controlled, gender differences were found to be smaller in minority groups. Data from the Second International Mathematics Study (SIMS) (Ethington, 1990) produced no substantial gender effects across eight countries. This information must be evaluated

with attention to the unfavorable comparison of mathematical performance of American students when contrasted with students in other counties. The Ethington study found that effects associated with countries were the predominant effects, with American students comparing unfavorably to Japanese students.

Other studies have focused on the process of socialization. Fennema and Sherman (1977) found that when statistical adjustment was made for social attitudes, males and females did not differ significantly in mathematical achievement. Clearly, the socialization process is more amenable to change than the biological domain. Many scholars are moving away from the notions of differential ability as an explanation. Tobias (1978) has examined the problem of mathematics anxiety in light of the cultural context. Frequently educators are characterizing the problem as math avoidance (Kenschaft, 1988; ASDE, 1987).

Historical Context

A 1986 study of elementary mathematics textbooks (Nibbelink, Stockdale, & Mangru) found a reduction of gender bias in the context of math problems over time. By the early 1980's textbook authors were avoiding the issue in various ways (avoiding references to people, using gender-free labels, using gender-neutral role problems). These authors proposed that textbook writers challenge stereotypes by creating problem contexts that were not only nonsexist, but openly antisexist.

Alaska (ASDE, 1987) has taken a leadership role in promoting gender equity by mandating the biennial training of certificated personnel in the recognition of sex bias in instructional materials and in instructional techniques which may be used to overcome the effects of sex bias. The Alaska Equity in Math resources emphasize that math avoidance is not limited to girls, but they effectively portray the cultural attitudes which have contributed to this situation. Illustrations from Weitzman and Rizzo's

(1975) study of mathematics textbooks provide graphic examples of stereotypical attitudes.

Concerns about equity still exist. In March, 1989, Sadker, Sadker, and Steindam reported in an article in Educational Leadership, "Girls are the only group who enter school scoring ahead and 12 years later leave school scoring behind. The decline of academic achievement experienced by half our population remains an invisible issue," (1989, p. 46). They strongly appealed for attention and resources to be directed toward the math and science deficits frequently experienced by females and minorities. Their line-by-line analysis of 138 articles on reform appearing from 1983 through 1987 found that only about 10 percent expressed concerns about equity and only 1 percent discussed gender equity.

Educators are pointing to the need for change in attitudes toward girls and mathematics. Researchers who have considered social composition of classrooms recommend that teachers encourage girls to be assertive in the mathematics classroom by raising expectations, (Strauss, 1988).

The proportion of female and minority students enrolled in mathematics courses tends to decrease as number of years in school increases. Sells (1978) made the important point that mathematics is the "critical filter" which can severely limit the career options of those who avoid taking advanced mathematics courses. Math avoidance is more acceptable for females than for males according to current social norms in the United States.

The National Research Council (1989) reported that the half-life of American mathematics students from high school through graduate school is about one year. That is, the number of mathematics students decreases by roughly one-half with each increasing year of schooling.

NCTM Standards

The National Council of Teachers of Mathematics (NCTM) developed An Agenda for Action: Recommendations for School Mathematics of the 1980's (1980). Among the recommendations were more focus on problem solving, a broader understanding of basic skills in mathematics, a wider range of evaluation measures, and increased public support for mathematics instruction. This document was followed by Curriculum and Evaluation Standards for School Mathematics (1990). This called for a new curriculum with greater emphasis in grades 9-12 on real-world problems, use of computer utilities and methods, greater integration of topics, and inclusion of probability and statistics and less emphasis on computation and manipulation of expressions.

The new standards call for a new approach to mathematics instruction which actively involves students, encourages variety in instructional formats, employs calculators and computers as tools, requires students to use mathematics to communicate, and incorporates maintenance of learning and embedded review. Among the instructional formats proposed are small group activities, individual exploration of topics, peer instruction, whole class discussions, and mathematics projects.

The literature indicates that new textbooks can be expected to do more than adjust older formats for gender and ethnic exclusiveness. Educators should be able to expect increased content and new approaches to instruction. Extensive staff development activities are under way to assist teachers in applying the new instructional methods in the classroom (M. Claytor, South Carolina Department of Education, personal communication, February 7, 1990).

Method

This study examines textbooks adopted for first year algebra classes in South Caroiina in 1984 and 1990. Selection of the first year algebra texts was based on a review of literature which showed a clear trend in mathematics enrollment: the proportion of females and minorities in mathematics classes has tended to be inversely related to number of years in school. Since the first year of algebra could be considered a critical time for influencing motivation to undertake further studies in mathematics, it seemed reasonable to suppose that attitudes portrayed in textbooks at that level might be especially important.

This study compared the five first-year algebra textbooks adopted by for use in South Carolina in each of the last two adoptions, 1984 and 1990. Copies of the 1984 textbooks were made available by the R. L. Bryan Company. In addition to direct comparison of the texts, I interviewed Carole McQuinn, director of textbook sales. She graciously provided insights, logistical support, and sales information.

Copies of the 1990 textbooks were made available by the South Carolina State Department of Education. Marjorie Claytor, Mathematics Consultant, South Carolina Department of Education, provided materials, insights, and information about the adoption process and recommendations of the adoption committee.

The initial working hypothesis was that all texts would be relatively similar. A study of ethnicity and sex-role assignments based on the hypothesis that all major textbook publishers would have responded similarly to research findings may have produced limited information. However, two factors argued for a different type of study. First, one of the five texts adopted in 1984 was radically different from the other four in its approach to the subject matter. Because the textbooks were significantly more different than had been anticipated, a reductionistic approach was

deemed inadequate. Secondly, initial examination of the texts showed that textbook authors have clearly made changes in response to criticisms such as those cited in the review of literature. In order to more adequately represent the similarities and differences among the books, the construct of "problem context" was extended to include the entire context of the textbook and to historical context. This resulting study is holistic, rather than ethnographic in its design. Time and resources did not permit interviews with authors and publishers. Triangulation of data was accomplished through direct examination of textbooks and interviews with persons involved directly in the adoption process, in textbook sales, and in mathematics education.

Sampling of Problems

Page 110 or the nearest group of word problems to page 110 was selected as the location for sampling. The choice was taken from a copy of an 1894 algebra text (Wentworth, 1894) which was made available by Karan Smith, a mathematics educator, for comparison with modern texts. A note above the preface read, "If you want to know who my fellow is look on page 110." In addition to providing a randomly selected number, the note supplied some indication of what concerned this young female algebra student almost a century ago." On page 110, above the set of problems about sums and differences of numbers and ages of fathers and sons, this female student had written, "You of course." The assumption that women would prefer other interests to math is evident throughout this nineteenth century text. Women are absent from the problem contexts. A typical problem reads, "The sum of the ages of a father and his son is 80 years. The son's age increased by 5 years is one-fourth of the father's age. Find their ages." (Wentworth, 1894, p. 111).

For this study, the last problem of the basic set sampled was generally used. Challenge and extension problems were not included. If another problem in the set provided more of the flavor of the text, the substitution has been noted and explained.

The Adoption Process

In South Carolina, texts are adopted for a six-year period. Unless exceptional circumstances exist, a maximum of five texts are adopted for each level of mathematics. The twelve members of the adoption committee receive copies of materials for independent review. The most recent committee for algebra texts was composed of seven classroom teachers, four district math coordinators, and a mathematics consultant from the South Carolina Department of Education. In addition to committee meetings, members keep logs of their review activities which may include 30 minute meetings with representatives from each textbook company. Members rate the texts independently and report their results by weighted category. Weights are 50% content (including attention to higher order thinking, which was mandated by current South Carolina reform legislation), 20% organization and methodology in text, 10% readability, 10% auxiliary materials, 5% physical characteristics, 5% special considerations (inclusiveness in gender and ethnicity, etc.).

Some texts can be eliminated immediately. For the remaining texts, committee members ratings are averaged in each of the six weighted categories, and the results are shared. Members may discuss features of the textbooks and defend their choices. The raters may change their opinions and alter ratings in some areas as a result of this deliberation. Final evaluation is based on these revised ratings, and may result in complete consensus.

Results

The Algebra I texts approved for use in South Carolina at the 1984 adoption are listed alphabetically by author:

Dolciani, M. P., Brown, R. G., Ebos, F., and Cole, W. L. (1984). Algebra: Structure and method. Book 1. Boston: Houghton Mifflin Company.

Foster, Al. G., Rath, J. N., and Winters, L. J. (1983). Merrill Algebra I. Columbus, OH: Charles A. Merrill Publishing Company.

Keedy, M. L., Bittinger, M. L., Smith, S. A., and Orfan, L. J. (1984). Algebra. Menlo Park, CA: Addison-Wesley Publishing Company.

Nichols, E. D., Edwards, M. L., Garland, E. H., Hoffman, S. A., Mamary, A., and Palmer, W. F. (1982). Holt Algebra I. New York: Holt Rinehart and Winston Publishers.

Saxon, J. H. (1981). Algebra I: An incremental development. Norman, OK: Saxon Publishers, Inc.

The first four are produced by well-known major textbook publishers. The fifth is an interesting phenomenon. It was written and promoted by its publisher, John Saxon. Results of a field test are summarized in the preface. Saxon contends that the traditional method concentrates too heavily on mastery of a new concept at the expense of long term retention and depth of understanding. This text provides continual review in contrast to the periodic review exercises in traditional texts. Instead of offering numerous problems so that a teacher can select only those which appear to be most relevant for the class, the Saxon text emphasizes that only the necessary problems have been included. Therefore, each student is expected to work all of the problems. Also, the order of presentation of topics in the Saxon text differs from the that of the more traditional texts.

Research Comparing Two of the Textbooks

The complete evaluation results of this study comparing the Saxon non-traditional approach with the a more typical Dolciani text in seven schools are available through ERIC (McBee, 1984). Analysis of covariance was used to compare scores of

students on a locally constructed test and on the California Achievement Test for the following year. In both cases the Spring, 1981 California Achievement Test total math score served as the covariate. Students using the Saxon text had a significantly higher mean score on the dependent measures. Students using the Dolciani text had slightly fewer absences and turned in homework slightly more frequently than those using the Saxon text. The majority of the teachers preferred the Saxon text.

Textbook Sales for the Year of Adoption

Textbook sales for the year of adoption were used to compare the popularity of the various texts among educators in the state who were responsible for text selection (See Table 1). The lowest priced book is the $24.15 Saxon text. The remaining books are clustered in a range from $25.19 for the Merrill book to $25.98 for the Houghton Mifflin volume.

TABLE 1: ALGEBRA I TEXTBOOK SALES IN YEAR OF ADOPTION

(1984)

Houghton Mifflin	**********	11425
Addison-Wesley	*******	8765
Charles E. Merrill	***	4928
Holt Rinehart & Winston	***	4675
Saxon Publishers	***	4660

Personal communication, C. McQuinn, R. L. Bryan Company, August 3, 1989.

The Houghton Mifflin and Addison-Wesley texts were clearly the most popular. Houghton Mifflin texts accounted for about 33 percent and Addison-Wesley for about 25 percent of sales. Combining the total number of books sold for the remaining three

publishers produces a total accounts for 41 percent of the textbook sales. Almost 14 percent of the sales were for the non-traditional Saxon text.

Sampled Problems

The following problems were taken from the 1984 group of textbooks:

Dolciani, et al. Houghton Mifflin Company.

"20. The three countries of greatest area in the world are the Soviet Union, Canada, and China, with a combined areas of 41,939000 km2 (square kilometers). The area of Canada is 415,000 km2 greater than that of China, while the combined area of Canada and China is 2,8165,000 km2 less than that of the Soviet Union. What is the area of each country?" (page 103).

Foster, et al. Charles A. Merrill Publishing Company.

"Write a ratio for the unit cost of each item. Then compare the rations to determine which of the two items is the better buy....

20. A dozen extra large eggs for $1.19 or a dozen large eggsfor 99 c, if the extra large eggs weigh 27 ounces and the large eggs weigh 24 ounces." (page 116)

Keedy, et al. Addison-Wesley Publishing Company.

"Solve....

64. Rafael spent $2011 to drive his car last year. He drove 7400 miles. He paid $972 for insurance and $114 for his registration fee. If the only other cost was for gas, how much did gas cost per mile?" (page 113)

Nichols, et al. Holt Rinehart and Winston Publishers.

"15. A team won 8 games and lost 2 games. The number of games won is what percent of the games played?"
(page 110)

Saxon, Saxon Publishers, Inc.

"3. In a picaresque novel about the Spanish Main the ratio of picaros to picaras was 13 to 5. If there were 600 picaras, how many picaros were in the novel?"
(Third of six problems on page 111)

The problem from the Houghton-Mifflin text provides information in addition to creating a problem context. It asks the student to expand horizons and apply algebra to a world-wide context without reference to gender or ethnicity

The Addison-Wesley and Merrill and Holt problems provide contexts which include everyday events. The Merrill and Holt problems are devoid of gender and ethnicity. The Addison-Wesley text chooses a name which indicates that the authors are directly addressing the issue of inclusiveness for ethnic minorities.

The problem from the Saxon text uses Spanish nouns which sort the population by gender and which would be obscure to many readers. It is the third of six problems in the set sampled. Three involved number relations and the remaining two examined the ratio of pigs to goats and chickens to ducks. Overall, problems in the Saxon text are shorter and more fanciful.

Direct Comparison of Textbooks

Content had been the major consideration in the adoption process. Since this study examined context, a matrix was constructed to compare the five textbooks with respect to motivational factors, comprehension cues, technical aids, and philosophical position. These were distributed as follows:

> Motivational factors: Inclusion of historical notes, biographies of scientists and mathematicians, career information, applications, and photographs.
>
> Comprehension cues: Use of color and graphics.
>
> Technical aids: Inclusion of material related to use of calculators and computers.
>
> Philosophical position: Emphasis and predominant philosophy.

Comparison of the texts (See Appendix) reveals similarities among the first four texts, with the Saxon text clearly taking a very different no-frills approach. Although not evident from the matrix, the Saxon text is highly theoretical, and it contains far

fewer word problems and fewer exercises. Among the remaining texts, the Houghton Mifflin text places much more emphasis on how people, past and present, use mathematics. The Addison-Wesley text stands out for its visual attractiveness. The Merrill text is highly task-oriented. The Holt Rinehart & Winston text is notable for its large print, extensive use white space, and problem-solving flow charts; these features combine to convey the appearance of simplifying the content.

Summary of Texts Adopted in 1984

The popularity of the Houghton-Mifflin text, which places the most emphasis on women and minorities in mathematics and scientific field, is an indicator that many educators are attuned to the importance of motivating women and minorities to pursue mathematics.

The choice of Addison-Wesley as the second most popular text could be related to either the attractiveness of the book itself or its business-like utilitarian orientation.

The Saxon text has made an impact. Initial estimates from interviews placed it as the second most popular. The intensity of the opinions of those educators who favor the Saxon approach may have distorted the estimates. Sales figures indicate that the Saxon text was the least popular of the five.

The Merrill and Holt texts are the least innovative. The Holt text offers the advantage of appearing more simplified, and its repetition of flow charts for problem solving might be helpful for students.

Three interesting insights emerge from this portion of the study. First, all textbook authors have accommodated those who have complained about the target audience for earlier texts. Houghton Mifflin has been most responsive with its obvious

focus on contributions and potential careers of a variety people. Merrill has given some space to career possibilities, and is more subtly non-sexist. Addison-Wesley has taken a relatively neutral approaches. Holt is closest to earlier textbooks. Saxon is clearly the maverick. His book challenges and spoofs a variety of stereotypes by including problems with obscure nouns as subjects, space creatures, various ethnic groups, and one problem in which "Carolyn" plows a field, a clear challenge to sexist stereotypes.

Secondly, the appearance of a non-traditional text published by its author, rather than my one of the major publishing houses, is a surprise. The success and popularity it enjoys among its advocates suggest that a new approach may have been needed for some time.

Finally, the variety of approaches to an area which might be supposed to have little social content is interesting. The alignment of the textbooks with differing traditions in educational philosophy are a clear indication that those responsible for adoption of texts in South Carolina recognize the need for options.

The 1990 Textbooks

Texts selected for current use in South Carolina are listed in alphabetical order:

Brown, R. G., Dolciani, M. P., Sorgenfrey, R. H., Cole, W. L. (1990). Algebra: Structure and Method, Book 1. Boston: Houghton Mifflin Co.

Dilley, C. A., Meiring, S.P., Tarr, J.E., Taylor, R. (1990). Heath Algebra 1. Lexington, MA.: D. C. Heath and Co.

Foster, A. G., Rath, J. N., Winters, L. J. (1990). Algebra One. Columbus, OH: Merrill Publishing Co.

McConnell, J. W., Brown, S., Eddins, S., Hackworth, M., Usisklin, Z. (1990). The University of Chicago School Mathematics Project Algebra. Glenview, IL.: Scott, Foresman and Co.

Smith, S. A., Charles, R. I., Dossey, J. A., Kredy, M. L., Bittinger, M. L. (1990). Addison-Wesley Algebra. Menlo Park, CA: Addison-Wesley Publishing Co.

School Districts Currently Choosing

The Heath and Merrill texts are endorsed by the committee for use with average algebra students, and the Addison-Wesley, Houghton Mifflin, and Scott, Foresman texts are recommended for both average and above average students. School districts are currently involved in the process of selecting texts from those which have been recommended. No indication of popularity as determined by sales information is currently available.

Sampled Problems from 1990 Textbooks

The following problems were again sampled by locating the problems closest to page 110 in each textbook.

Brown, et al., Houghton Mifflin Co.

"Solve each problem using the five-step plan to help you....

14. A 1000 L tank now contains 240 L of water. How long will it take to fill the tank using a pump that pumps 25 L per minute?" (page 113)

Dilley, et al., D. C. Heath and Co.

"Solve these puzzles by starting with the result and performing the inverse operations in the reverse order....

75. Write this equation as a puzzle similar to those in Exercises 69-71. 'The number I am thinking of' is represented by n in this equation.

$$3 \cdot \left(\frac{n}{2} + 2\right) - 1 = 202$$

What number am I thinking of?" (page 112)

Foster, et al., Merrill Publishing Co.

"Use an equation to solve each problem....

56. June Carlos earns $125.48 per week in salary and 8.25% commission on all sales. How much must she sell in order to earn $200 per week?" (page 113)

McConnell, et al., Scott, Foresman and Co.

"6. During one week, the price of World Wide Widget stock changed as follows. Find the net change.

Monday	Tuesday	Wednesday	Thursday	Friday
down $2\frac{1}{4}$	up $\frac{1}{2}$	down $\frac{1}{8}$	down $\frac{1}{2}$	up 2"

(page 110)

Smith, et al., Addison-Wesley Publishing Co.

"23. Your total assets are $170. You borrow $300 to go on vacation. What is your net worth now?"

(page 110)

The problems reflect the influence of the new mathematics standards. Four use real world settings (time for pumping water, commission, change in stock, net worth), and the fifth encourages the student to practice communication by writing a problem setting in addition to finding the solution to a number puzzle.

Four of the sampled problems contain no reference to gender or ethnicity. Such neutral contexts are one way to avoid unintentional social messages. Caution is still in order regarding gender-based comparisons. We cannot assume that the texts no longer perpetuate stereotypes. The problem prior to the one sampled in the Merrill text includes the sentence, "He earned $974 last week." One must ask whether students will not mentally contrast this salary to June's ambition of earning $200 per week.

Overview of Inclusiveness

Scanning the texts reveals extensive use of neutral subjects (i.e. a golfer, a consultant in the Addison-Wesley text), and attention to inclusiveness in ethnicity. As counter evidence, a few of the pages sampled suggest a tendency for some authors to include more problems with males as subjects than with females as subjects. Another gender issue is referenced, perhaps unintentionally, by the inclusion of problem about

cadets, accompanied by a color photo of a group of cadets, on page 445 of the Heath text. The Citadel, the military college of the state of South Carolina, has recently refused to admit female cadets. Here is a situation in which the social context could change during the time that the text is in use. There are occasional examples of challenge to gender stereotypes. For example, one problem in the Houghton-Mifflin text says, "Vanessa built a rectangular pen for her dogs," (page 237).

Photographs, biographies, and names used in problem contexts are indicators of attention to variety in gender and ethnicity. The Houghton-Mifflin text is notable for its inclusiveness with regard to gender, ethnicity, and age. The other texts show less evidence of attention to variety, especially in choices of historical and career biographies presented.

Direct Comparison of 1990 Textbooks

A matrix similar to the previous one was constructed to compare the five textbooks with respect to motivational factors, comprehension cues, technical aids, and philosophical position. (See Appendix).

The new generation of textbooks is more attractive than the last. All five texts incorporate color graphics and color photographs. All five include calculator and computer exercises. Four of the five have included exercises explicitly designed as practice to prepare students for taking standardized tests.

The five textbooks adopted for 1990 have all included some provision for spiral review. The major companies have modified their texts to provide more distributed practice. Some have incorporated spiral review into each lesson, while one has provided a spiral assignment guide in the teacher's manual.

The 1990 texts do not sort as easily by philosophical orientation as the former group. The Scott, Foresman text is notable for its integration of topics. McConnell et al. have incorporated applications, career information and historical notes into problem contexts. The Addison-Wesley text also emphasizes direct applications of real world situations in problem settings and integrates career information into problem contexts. These two are clearly Pragmatist. The Heath text also has a strong problem-solving emphasis. All five new texts have addressed career applications and history in some way. The emerging trend combines historical, biographical, or career information with problem applications. Remnants of the traditional curriculum are most evident in the Merrill and Houghton-Mifflin texts. Philosophically, there appears to be less range and variety in this group of texts. All five indicate a tendency for authors to move toward a Realist or Pragmatist perspective.

Conclusion

Clearly, this group of texts shows that the new NCTM curriculum standards are beginning to influence the design of textbooks. Some are inserting additional information and activities into relatively traditional formats, while others are integrating information and applications more thoroughly into problem solving activities.

The textbooks show evidence of attempts to display the relevance of mathematics for everyone. Many of the problem contexts describe everyday applications without references to incidental characteristics of people. The problem of stereotyping has not been totally eliminated, but progress is evident. Females and members of minority groups are included in a variety of roles. Textbooks differ in degree of sensitivity to these issues. Some show indications of careful attention to variety in gender, ethnicity, and age; others have allowed examples of stereotypic attitudes to remain.

Although the Saxon text was not one of the five adopted for 1990, its influence seems to have spread to the other textbook publishers through the inclusion of spiral review features. The newly adopted texts share an emphasis on problem solving and applications to daily life which was not a feature of the Saxon text.

Many students and teachers may not be prepared for the change in methodology which accompanies the new curriculum. They are likely to be capable, but many have become comfortable with an algorithmic approach to mathematics. The new curriculum calls for a new range of skills. A problem-solving approach emphasizes tasks such as problem representation, conjecture, estimation, interpretation, and communication.

The new textbooks offer innovative resources, but new textbooks alone are not sufficient to change the focus of mathematics from algorithm to application. In the final analysis, teachers will determine the degree of change in instructional methodology. Probably the greatest challenge currently faced by educators is providing staff development which will assist teachers in altering traditional teaching methods in order to fully utilize the new materials.

Educators in all subject areas need to be sensitive to the fact that math avoidance is widespread. Many people in the United States maintain a cultural bias which underrates the importance of skill in mathematics. It is a tragic waste of mind power to allow this bias to go unchallenged. The real-world emphasis of the new generation of texts is a step toward the goal of increasing awareness of the relevance and importance of mathematics.

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APPENDIX

1984 MOTIVATION

Publisher	Historical Notes	Biographies	Career Information
Houghton Mifflin	12	13 both sexes; ethnic variety) descriptions	10
Addison-Wesley	No	No	8 descriptions
Charles E. Merrill	No	(career introductions: 6) (Both sexes; ethnic variety)	
Holt Rinehart & Winston	(Contributions of 4 men)		6 problems
Saxon Publishers	No	No	No

1984 MOTIVATION (Continued)

Publisher	Applications	Photos
Houghton	Yes	B/W: Both sexes Ethnic variety
Addison	Yes	Color: Objects & settings
C Merrill	Yes	B/W: Both sexes Ethnic variety
Holt	Yes	No
Saxon	No	No

1984 COMPREHENSION CUES

Publisher	Use of Color	Use of Graphics (other than diagrams)
Houghton Mifflin	Red	Boxed areas
Addison-Wesley	Variety of colors	Color comments Boxed areas
C. Merrill	Orange	Boxed areas
Holt	Red	Flow charts Extra white space
Saxon	No (Except gray)	Comments

1984 TECHNICAL AIDS

Publisher	Calculator	Computer BASIC
Houghton-Mifflin	Key in exercises	Interspersed programs with explanatory text
Addison-Wesley	Detailed explanation	Appendix
C. Merrill	Instructions & key in exercises	Appendix
Holt	Key in exercises	Interspersed programs & Appendix
Saxon	No	No

1984 PHILOSOPHICAL ORIENTATION		
Publisher	Emphasis	Predominant Philosophy
Houghton-Mifflin	Utility & motivation	Reconstructionism
Addison-Wesley	Career goals & Immediate reinforcement	Pragmatism
C. Merrill	Proficiency & logic	Perennialism
Holt	Not stated--Inference: Reduction of threat	Realism
Saxon	Retention & depth of understanding	Existentialism

1990 MOTIVATION			
Publisher	Historical Notes	Biographies	Career Information
Houghton Mifflin	8	8	8 descriptions
Heath	7	5 combined career biographies	
Merrill	4 historical biographies		combined with applications
Scott, Foresman	11 in problems	No	12 in problems
Addison-Wesley	12 including 4 biographies		combined with applications

Publisher	1990 MOTIVATION (Continued) Applications	Photos
Houghton Mifflin	20 topics plus problem extensions	Color
Heath	28 contexts & problem extensions	Color
Merrill	15 topics plus problem extensions	Color
Scott, Foresman	78 topics in problems	Color
Addison-Wesley	> 45 context and problems	Color

Publisher	1990 COMPREHENSION CUES Use of Color and graphics (other than diagrams)	Additional Comprehension Aids
Houghton Mifflin	Multicolor type and tint blocks	Explicit study strategies
Heath	Multicolor type	Study hints and tint blocks
Merrill	Multicolor type and tint blocks	Summarizes methods
Scott, Foresman	Multicolor type and tint blocks into exercises	Representations & strategies built
Addison-Wesley	Multicolor type and tint blocks	Explains strategies & incorporates critical thinking exercises

Publisher	1990 TECHNICAL AIDS Calculator	Computer BASIC	Test Practice
Houghton Mifflin	Interspersed	Interspersed	Appendix & interspersed college entrance
Heath	Interspersed	Interspersed	College entrance
Merrill	Interspersed		Appendix & interspersed Standardized
Scott, Foresman	Appendix & interspersed	Appendix & interspersed	No
Addison-Wesley	Interspersed	Appendix & interspersed	College Entrance

Publisher	1990 TECHNICAL AIDS (cont.) Graphing Utility	Spiral Review
Houghton Mifflin	Available	Each lesson
Heath	Available	Each lesson
Merrill	Instructions for graphing calculator	2-4 mini-reviews & 1 cumulative review per chapter
Scott, Foresman	Available	Each lesson
Addison-Wesley	Available	Each lesson

Publisher	1990 PHILOSOPHICAL ORIENTATION Emphasis	Predominant Philosophy
Houghton-Mifflin	Utility in society	Reconstructionism with traditional content
Heath	Problem solving	Realism
Merrill	Proficiency & logic	Perennialism
Scott, Foresman	Language of mathematics & active participation	Pragmatism
Addison-Wesley	Critical thinking & communication	Pragmatism