# Declining Gender Differences from FIMS to TIMSS

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**Abstract:** This paper examines the findings of the three IEA studies (FIMS, SIMS and TIMSS) on the variation among countries of gender differences in mathematics achievement, and places them in the context of the increasing presence of women in mathematics and the overall decrease in gender differences in mathematics achievement over the period examined, from 1964 to 1995.

**Kurzreferat:** *Von FIMS zu TIMSS: Geschlechtsunterschiede nehmen ab.* Der Beitrag untersucht die Ergebnisse der drei IEA Studien FIMS, SIMS und TIMSS im Hinblick auf die Variation der Geschlechtsunterschiede in Mathematik in den verschiedenen Ländern. Sie werden in einen Zusammenhang gestellt mit der zunehmenden Präsenz von Frauen in der Mathematik und dem globalen Rückgang von Geschlechtsunterschieden in mathematischer Leistung im Untersuchungszeitraum von 1964 bis 1995.

**ZDM-Classification:** C40, D10

## 1. Introduction

Because mathematics is an increasingly important part of the school curriculum, there is growing pressure on educators to find effective ways to teach mathematics well to all students, male and female, from kindergarten to the upper level of secondary school. Understanding effectiveness in teaching mathematics continues to be a concern of the International Association for the Evaluation of Educational Achievement (IEA), which has undertaken three studies that sought to quantify this effectiveness in some detail. These studies, conducted in 1964, 1980–82, and 1995, have helped understand the effectiveness of instruction in various countries, in mathematics as well as in other subjects, by providing a great deal of information on a large number of factors fundamental to teaching and learning, among them curricular frameworks, textbooks, classroom organisation, and societal and parental support.

The IEA studies sought to compare the levels of mathematics achievement in different school systems by applying a common set of performance tests, organised by content topic and by grade. The degree to which such comparisons are valid, and the significance that can be attached to the resulting rank ordering of countries, have been debated extensively (Freudenthal, 1975; Howson, 1999). It is generally acknowledged in any case that the primary value of the IEA studies lies in the detailed information they provide about teaching and learning in each school system separately (Travers and Westbury, 1989). The expectation is that on the basis of this information each school system will be able to identify areas where better school practices are likely to lead to significant improvement in performance.

It was never a declared aim of the IEA studies to investigate gender differences in achievement or in attitudes towards mathematics, but these studies have in fact been particularly important to our understanding of gender differences, mainly because they have made it possible to conduct cross-cultural investigations with samples large enough to ensure stable results. These investigations of the IEA data have provided convincing evidence that gender differences vary widely from country to country, with the degree and direction of variation depending greatly on topic and grade level. In some countries the studies revealed marked gender differences favouring males in some topics, in other countries no gender differences were found, and in a few countries the studies showed gender differences that favoured females. These findings are potentially of major importance, as they indicate that some educational systems do provide, wittingly or unwittingly, educational conditions that work to prevent an achievement gap between males and females in mathematics.

With respect to gender differences in mathematics achievement, however, the IEA studies did more than reveal great inconsistencies among school systems. They also provided a wealth of information about the degree and direction of gender differences in a number of other variables, such as attitudes towards mathematics, curriculum, and classroom organisation, and in so doing opened the door to a much more detailed understanding of gender differences in achievement.

The findings of the IEA studies are significant for another reason as well. In showing that gender differences in mathematics achievement vary in magnitude and direction from country to country, they call into question the validity of the claim made by a number of researchers that there are innate differences between males and females in mathematical ability.

More than thirty years elapsed between the first and third IEA studies. Over this interval, from 1964 to 1995, gender issues assumed a much higher profile among educators, as in society as a whole, and substantial changes occurred in the mathematics curricula and the classroom practices of most of the participating countries in response to the demand for educational equity. In addition, the presence of women in mathematics increased dramatically during this time, partly as a result of intervention programs aimed at encouraging their participation. Thus to best appreciate the contribution of these studies to our understanding of gender differences in mathematics education, it is necessary to place each study within the context of the degree of representation of women in mathematics and of what was known about gender differences in achievement at the time it was carried out.

## 2. FIMS: The First International Mathematics Study

### *2.1 What was known about gender differences in mathematics up to the 70s?*

The First International Mathematics Study (FIMS) first collected data in 1964, at a time when there was little reliable information on how gender differences in mathematics achievement vary from country to country. At the time of FIMS it was taken for granted in most countries, mainly on the basis of North American psychological studies, that males outperformed females in mathematics at the secondary school level and beyond. In reviewing educational and psychological research published prior to 1965, Maccoby (1966), for example, concluded that boys do better at arithmetical reasoning in high school, even though girls learn to count at an earlier age. Many researchers also claimed that boys demonstrated superior performance and better attitudes towards mathematics in general (Aiken, 1971; Anastasi, 1958).

The literature on cognitive gender differences was analysed somewhat later in a book which came to be regarded as an authority in the field, *The Psychology of Sex Differences,* by Eleanor Maccoby and Carol Jacklin, published in 1974. The authors categorized as "unfounded beliefs" the ideas that girls have less self esteem, have less motivation to achieve, are more social and more easily influenced. They also regarded gender differences in willingness to compete or in level of anxiety about mathematics as "open questions." On the other hand, they went as far as to claim that four sex differences were "fairly well established": (1) girls have better verbal ability, (2) boys are more aggressive, (3) boys have better visual-spatial skills, and (4) boys are better at mathematical tasks. Maccoby and Jacklin also believed that these sex differences were due to genetic factors, a belief which was not contested for some time.

In reviewing these so-called "fairly well established" differences, Sherman (1978) and others later found them to be quite small. In particular, the widely accepted notions that males are superior to females on visual spatial tasks, and that this difference in spatial skills is an important factor in gender differences in mathematics achievement in general, was challenged in the late seventies and early eighties. A number of articles appeared showing in the first place that the construct of spatial ability had not been well defined, and moreover that any gender differences in performing spatial tasks were both small and inconsistent. In addition, the very relationship between spatial ability and mathematical achievement was challenged by a number of researchers on the grounds that spatial ability, however defined, varied widely within the sexes, that there was little evidence that it was important to mathematics achievement, and that in any case it didn't contribute much to the explanation of sex differences in mathematics achievement (Caplan, MacPherson and Tobin, 1985; Fennema and Sherman, 1977; Hyde, 1981).

### *2.2 Women's presence in mathematics as revealed by FIMS*

The First International Mathematics Study (FIMS) collected data in 1964 and 1970. Ten countries participated in FIMS in the initial data collection: Australia, Belgium, England, the Federal Republic of Germany, Finland, Japan, Netherlands, Scotland, Sweden, and the United States. France and Israel joined the study six years later.

According to Keeves (1973), who analysed data from the first ten countries, there were marked differences between the participating countries in the presence of women in school mathematics, as well as in their presence in the terminal year of secondary school and in universities. Fourteen-year-old male and female students were equally represented at the end of elementary school in all ten countries, as expected. At the end of secondary school, however, the ratio of male to female mathematics students varied greatly from country to country. It ranged from 0.8 in Finland (10 girls for every 8 boys) to 1.8 in the Netherlands (10 girls for every 18 boys), with a median of 1.4. Enrollment in mathematics courses at the terminal secondary school level was even more heavily male, with a ratio ranging from 1.7 in Finland to 7.1 in Belgium, with a median of 2.4. Clearly, girls were severely under-represented in mathematics courses at the end of secondary school at that time.

When FIMS first collected its data, universities were largely male institutions. As reported by Keeves (1973), Finland stood out in 1964 with a one-to-one ratio of male to female students in the first year of university. In the other nine countries that participated in FIMS, Keeves found a ratio of male to female students ranging from 1.4 in the United States and Sweden to 4.9 in the Netherlands. The median ratio was 2.6.

The situation was even worse for university enrollments in science. The situation in Finland was again the most favourable to women, with a ratio of male to female science students of only 1.2. Among the other nine countries that participated in FIMS, the ratio of male to female students (in 1970) ranged from 2.0 in Sweden to as high as 6.7 in Japan and the Netherlands, with a median of 3.5. At the time of FIMS, then, there were clearly large gaps in participation level between women and men in higher education in general and in science in particular.

### *2.3 FIMS working hypotheses*

IEA researchers formulated a set of working hypotheses on gender differences in the wake of the FIMS data collection, following a review of some 18 research papers and books written between 1927 and 1964. Understandably, these hypotheses reflect the knowledge and the attitudes of the time. The researchers conceded, however, that in the matter of "sex differences," despite a great deal of investigation, "conclusive findings as to possible causes of observed differences have not as yet been obtained" (Husén, 1967, p. 239). They hoped to further their understanding of the extent of the differences between the sexes through an examination of the cross-cultural data collected in 1964 and 1970.

The three hypotheses stated for the 13-year-old population (Population I) were:

1) There will be no differences in overall mathematics achievement between boys and girls.
2) There will be slight differences favoring the girls on highly verbal problems.
3) There will be slight differences favoring the boys on computational problems (Husén, 1967, p. 239).

### *2.4 Findings and explanations: Population I level*

In overall mathematics achievement, Keeves (1973) found that boys performed better than girls in all ten original FIMS countries, showing the first working hypothesis of the IEA researchers to be untenable. He also found some variation among countries in the size of the gender differences at the 13-year-old level (Population I), with the smallest difference in the United States and the largest in Belgium and the Netherlands.

Regarding the second and third hypotheses, it was possible to conclude from the results only that the second hypothesis was untenable because even more unexpectedly, there was a significant difference favouring boys in both highly verbal problems and computation. In any case, however, there was a significant interaction between country and gender on both the verbal and the computation scores.

When Steinkamp, Harnisch, Walberg, and Tsai (1985) re-analyzed the 1964 and 1970 FIMS data at the Population I level (13-year-olds), using the data from all twelve FIMS countries, they found that boys outperformed girls in 10 out of 12 countries in overall mathematical achievement, with eight of these differences reaching statistical significance. The range of effect was quite small, however, accounting for only 1% to 9% of population variance.

Steinkamp and her colleagues identified a number of important contextual variables for gender differences in mathematics subjects. Student attitude accounted for less than 16% of inter-country variance in mean scores in overall achievement. The opportunity to learn and the amount of homework, however, proved to be important factors. In countries where more homework was assigned, gender differences were smaller, suggesting that initial differences in out-of-class experience can be overcome. Similarly, gender differences were smaller in countries with high rates of female employment. Finally, gender differences were very small at low levels of achievement; in other words, there was little difference between boys who are poor in maths and girls who are poor in maths. From this study Steinkamp et al. concluded, for overall mathematical achievement, that:

1) gender differences are small;
2) it is impossible to know whether or not initial potential is equal;
3) psycho-social factors play a role in creating or reducing differences;
4) biology may play a role because of the pervasiveness of differences; and
5) the differences in school achievement by themselves are not large enough to produce the huge differences that exist in course selection, occupational choice and professional status.

### *2.5 Findings and explanations: Population II level*

Comparisons between sexes were more complex at the pre-university level (Population II), because of the large differences in the participation rates of the sexes. Keeves (1973) was able to conclude, however, that differences in achievement between the sexes were even greater at this age level than at the Population I level. Husén (1967) had expected that the original three hypotheses would hold true for this population as well, even though there was a concern that the large number of girls dropping out at both the school and subject level would distort the findings in this age group. The pooled results showed “clear” differences in favour of boys, however. Once again boys showed greater achievement than girls in solving both verbal and computational problems, and indeed, contrary to what might have been expected in light of the second hypothesis, their advantage was greatest with verbal problems.

Harnisch, Steinkamp, Tsai and Walberg (1986), in a reanalysis of the FIMS data, determined the magnitude, direction, and nature of gender differences among 17-year-olds in ten countries. They came to the conclusion that achievement differences were small but pervasive across cultures. Males scored higher on overall achievement in all ten countries. In all but one of the ten countries, these differences, though small, were statistically significant (possibly as a result of the large sample size). Percentages of variance accounted for by gender as measured by the $\omega^2$ index were rather small, ranging from 0% to 12%.

Despite the above findings, the authors added that “the pattern of differences – which are pervasive, always favor males, and persist across cultures – are not inconsistent with a biological etiology” (p. 236). In the part of their paper devoted to summary and implications the authors did back off somewhat from this statement, saying that “patterns emerging in the data suggest that differences between the sexes are not immutable, however, and provide empirical evidence that non-biological factors play a role in determining the magnitude of gender differences” (p. 241).

## 3. SIMS: The Second International Mathematics Study

### *3.1 What was known about gender differences in mathematics in the 80s?*

Most SIMS data were collected in 1980–1982. From 1978 there had been a proliferation of research on gender and mathematics, and this continued through 1990. The focus of attention was on how poorly the schools were doing in making mathematics and science accessible for girls, and on ways to achieve gender equity in mathematics and science education. Leder (1992) has reported that as many as 10% of the articles published in the *Journal for Research in Mathematics Education* during these years discussed various aspects of gender differences. This is in addition to a large number of books and reports also published in the same period.

It is noteworthy that the terms used in discussing differences between the sexes changed between the first and the second IEA studies, with “gender differences” gaining prominence over “sex differences.” The term “gender” came to be seen as appropriate when describing psychological, social, attitudinal, and cultural characteristics, with “sex” reserved for the discussion of immutable biological characteristics.

### *3.2 Controversy over biological factors*

While the majority of researchers were turning in this period to environmental factors for the explanation of any persisting gender gaps in achievement and participation, Benbow and Stanley (1980, 1983) published reports supporting the existence of biological influences on mathematical aptitude. Their studies focused on biological correlates of differences in cognitive abilities among mathematically precocious youth, and suggested that the substantial gender differences in mathematics achievement they identified among talented grade 7 and grade 8 students had been determined by exposure to prenatal hormones or other biological factors. These studies were highly publicised at the time, particularly in the popular media.

The biological argument was not without its scholarly critics, however. Bellisari (1989), for example, reviewed several of the studies published by Benbow and Stanley, and concluded that their studies presented faulty interpretations of the data and promoted unsupported claims of innate female inferiority in mathematical ability. She also suggested that a "more constructive approach could be offered by social and behavioral science research exploring and documenting ways American culture enforces prevailing stereotypes in educational, occupational, and social settings" (p. 278). Beckwith (1983) also criticized the Benbow and Stanley studies for overestimating alleged biological factors and underestimating the role of socialization factors in the development of mathematical performance.

### *3.3 Women's presence in mathematics in the 80s and 90s*

While many researchers debated why women were severely under-represented in mathematics, Chipman and Thomas (1985) argued that the problem of girls' participation and achievement in mathematics was not as severe as believed. Indeed, during the 1970s and 1980s women made enormous strides in higher education in general, as well as in mathematics and science studies in particular. The large gaps in enrollment between men and women at the upper secondary school and university levels, so evident in the 1970s, were considerably reduced in the 1980s and 1990s. In many countries women now constitute over 50% of all university students.

In Canada, for example, women received only 43% of all bachelor degrees in the academic year 1972–73, but their percentage has risen to 56% by 1994–95. During that same period, enrollment of men at the bachelor level increased by 33%, whereas enrollment of women increased by 127% (Statistics Canada, 1996). Although enrollments of women in undergraduate studies of science and mathematics do not reach the 50% level in all the countries that participated in the IEA studies, they are close to 50% in both the United States and Canada.

### *3.4 Research focus and intervention programs*

In the late seventies, as mentioned earlier, researchers turned their attention from biological to environmental factors as determinants of gender differences in mathematical achievement. Indeed, in most of the theoretical models proposed from the late seventies through the late eighties to account for such differences the focus was upon environmental variables. Studies examined the effect of variables such as differential participation in non-compulsory mathematics courses (Armstrong, 1981), attitudinal factors (Mura, 1987; Perl, 1982), the perceived different treatment of males and females (Becker, 1981), teacher-student interactions (Fennema and Peterson, 1986), or a combination of societal influences, teacher and student attitudes and curricula (Reyes and Stanic, 1988).

In several countries, but most notably in the United States and Canada, the focus on societal and environment variables resulted in a plethora of gender-equity programs in the schools, designed to equalize the treatment of boys and girls in mathematics education and to encourage girls to take more secondary mathematics courses and to pursue careers in mathematics and related fields.

These programs were developed and supported by a number of important women's organizations established during this period, among them the Association for Women in Mathematics (AWM), founded in 1971, and the International Organization for Women and Mathematics Education (IOWME), founded in 1980. These organisations, strongly influenced by the feminist movement of the 1970s, saw it as their goal to increase the presence of women in mathematics at all levels of education as well as in the professions. To this aim they not only worked to provide well-researched recommendations for change, but also insisted on benchmarks, on tangible evidence of change and on accountability on the part of institutions. In addition, they took pains to document the progress of women, both in mathematics enrollments and in appointment to academic and professional positions. Their premise was that women could be perfectly good, even great, mathematicians if given the opportunity.

### *3.5 SIMS structure*

As mentioned, the Second International Mathematics Study (SIMS) collected most of its data between 1980 and 1982. Two populations were studied: Population A, the grade with a modal student age of about 13, and Population B, the grade with a modal student age of 18 (which in most countries is the last grade of secondary school). Twenty countries participated in Population A (Belgium Flemish, Belgium French, British Columbia, Ontario, England, Finland, France, Hong Kong, Hungary, Israel, Japan, Luxembourg, The Netherlands, New Zealand, Nigeria, Scotland, Sweden, Swaziland, Thailand and the United States). Only 15 of these countries participated in Population B.

### *3.6 SIMS results: Findings for Population A (13 years olds)*

Analysis of the data collected in 1981-1982 by the Second International Mathematics Study (SIMS), which compared mathematics achievement in 20 countries at age 13, has shown not only that gender differences vary widely from country to country, but also that they are smaller than differences among countries (Hanna, 1989, 1994). The test items were grouped into five subtests: Arithmetic, Algebra, Geometry, Measurement, and Descriptive Statistics. In five of the 20 countries girls did as well as boys or outperformed boys in one or two of the five subtests, in five other countries no gender-related differences were observed in any subtest, while in the remaining ten countries it was boys who did as well as girls or better on one to five of the subtests.

At the Population B level (last year of secondary school), the results of the seven subtests (Sets, Number Systems, Algebra, Geometry, Finite Mathematics, Analysis, and Probability) for the 15 participating countries showed an overall increase in the gender gap, with a clear indication that girls were less successful than boys. In no country did girls perform better than boys on any of the seven subtests. Only in two countries did boys and girls perform about the same in most of the subtests; in three countries there were gender differences in the boys' favour in up to three of the subtests, and in the remaining 10 countries boys performed better on 4 to 6 of the 7 subtests.

### *3.7 Women's presence in mathematics as revealed by SIMS*

Looking at students taking mathematics in the last year of secondary school, the first IEA study (FIMS) showed a median ratio of males to females of 2.4, with a range from 1.7 to 7.1. This ratio proved to be lower for SIMS, with a much narrower range. With the exception of two countries, Hungary and Thailand, where more females than males were taking mathematics in secondary school, the ratio of males to females ranged from 1.0 to 2.0 for most of the countries, with only three countries having a ratio greater than 2.0. The maximum ratio was for Hong Kong (3.8) (Garden and Livingstone, 1989). In other words, more girls, on a proportional basis, were taking mathematics courses up to the last year of secondary school by the time of SIMS. Unfortunately, as discussed earlier, they were still scoring lower than boys in most countries.

## 4. TIMSS: The Third International Mathematics and Science Study

### *4.1 The move to equity in mathematics education (1982–1995)*

The TIMSS data were collected in 1995. By that time gender-equity programs aimed at encouraging girls to take mathematics and science courses in secondary school had proved very successful in both the United Sates and Canada. Perhaps they were too successful, since recent statistics show that girls outnumber boys in these courses. The new concern over low enrollments of boys in mathematics and science has been a subject of public discussion, notably in the Wall Street Journal (Ravitch, 1998). According to recent data published by the US Department of Education on the 1990 and 1994 secondary-school graduation classes, there were more girls than boys in both biology and chemistry. Only in physics were male enrollments higher than those of females, with a ratio of males to females of about 1.2. In every other science course, the differences between boys and girls were slight or favoured girls. The figures also showed that 43% of female graduates were taking college-preparatory programs in 1994, compared with only 35% of male graduates.

It is perhaps ironic that the concern now turns to the low participation of males in science and mathematics. As we have seen, the under-representation of females up to the seventies led to suggestions that mathematics might be an area inherently foreign to the female mind, or that there might be other biological reasons for their low participation. Today's under-representation of men in mathematics studies does not seem to have led to such suggestions. Instead, and rightly so, researchers tend to invoke sociological explanations for this situation, and suggest, to motivate young men to pursue studies in mathematics and science, the use of intervention programs of the sort that proved so successful with women.

### *4.2 Fairness in assessment*

In the late 1980s and the 1990s, the focus on gender equity in education led to a concern for fairness in assessment. This is a serious concern, because test results are used in high-stake decisions that affect the future of individuals in their pursuit of higher education, employment or licensing. The desire to achieve fairness, that is, to arrive at comparable test validity for different individuals and for males and females as groups, led in turn to increased attention to assessment factors, such as test design, development, administration, and use, that might have a bearing on gender differences in performance (Willingham and Cole, 1997). The argument was made that assessment instruments ought to take into account similarities and differences in experiences, interests, and other factors. In the case of TIMSS, such considerations prompted the use of assessment formats other than the traditional multiple choice test.

### *4.3 TIMSS findings (Populations 1, 2, and 3)*

TIMSS surpassed its two predecessors in the number of countries participating, in the number of populations tested, and in the types of test included. Over 40 countries took part, and three populations were tested. Population 1 consisted of students in the adjacent grades 3 or 4 (where most of the students were 9-year-olds) and Population 2 of students in the adjacent grades 7 or 8 (where most of the students were 13-year-olds). Population 3 comprised students in their final year of secondary school as well as other students who were taking an advanced mathematics course containing calculus. Unlike FIMS and SIMS, where tests consisted solely of multiple-choice items, the TIMSS tests included open and extended response items.

The findings presented here are based on initial TIMSS reports (in hard copy and posted on the web, http://www.csteep.bc.edu/timss1/Items.html, by Mullis et al., 1997 and 1998 and by Beaton et al., 1996). Additional gender-difference analyses of the data by other researchers have not yet been published.

For Population 1, according to Beaton and Robitaille (1999), gender differences were small or essentially nonexistent in most countries. The few gender differences that did exist tended to favour boys, however, in both Grade 3 and Grade 4.

In Grade 3 there were no gender differences on any of the seven content areas in 8 of the 24 participating countries. Boys had higher scores than girls in one content area in 6 of the countries, in two content areas in 3 countries, and in 3 to 5 content areas in 5 countries. Girls had higher scores than boys only in one content area in one country and in two content areas in two countries.

In Grade 4 the situation was a little better, with either no gender differences, or differences in the girls' favour, in 14 of the 25 participating countries for one or three of the seven content areas. In 7 of the other 11 countries boys did better only in one content area, while in the remaining four countries boys did better in 2 to 4 content areas.

In Population 2 (Grades 7 and 8) most countries showed no gender differences, but the few statistically significant differences again tended to favour boys. In Grade 8, girls did better than boys in Algebra in most countries, though the differences were not statistically significant. There were no statistically significant differences between boys and girls in Proportionality either. Out of the 41 countries that participated in the testing, there were significant differences favouring boys in only one country for the three areas of Geometry, Fractions, and Data Representation, in two countries for Mathematics overall, and in four countries for the area of Measurement. The results for Grade 7 were quite similar. There were few gender differences and, with the exception of Algebra, the few differences that existed were in the boys' favour.

In Population 3, gender differences in mean achievement on the test as a whole, for students who had taken advanced mathematics, were statistically significant in eleven of the sixteen participating countries. Examination of the results by content area showed that in five countries there were no statistically significant differences between boys and girls on any of the three content areas, and that in four countries there were no significant differences in one or two of the content areas. In the remaining seven countries, however, there were significant differences in all three content areas, all of them favouring males.

Population 3 also showed considerable variation in the relative number of male and female students taking advanced mathematics courses. While in six of the 16 countries 20% or more males than females were enrolled in these courses, in three countries this difference was between 6% to 10% or less, and in four countries the numbers of males and females were nearly identical. In the remaining three countries (Germany, the Czech Republic and Austria), more females than males were taking advanced mathematics; the differences in their favour were 14%, 18% and 24% respectively.

In sum, the results of the TIMSS cross-national study, encompassing more than 40 countries and about half a million boys and girls, indicate that up to Grade 8 there are very few gender differences of any significance. The results also show that at the level of advanced mathematics, in the last grade of secondary school, as many as one third of the participating countries have successfully created a set of conditions whereby gender differences have in effect disappeared.

## 5. Conclusion

The clear message from the IEA cross-national studies is that gender differences in mathematics decreased considerably over the thirty years or so which these studies covered, and indeed are on the way to disappearing. Perhaps the most significant contribution of the IEA international comparisons, in the context of gender studies, is to have revealed that several countries have in effect achieved gender equity in mathematics. This fact presents a challenge to those countries that have not yet done so. They should find out how this was accomplished, and in particular what educational practices were successful in bringing about gender equity and how these could be implemented in their respective educational settings.

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# Vorschau auf Analysethemen der nächsten Hefte

Für die Analysen der Jahrgänge 32 (2000) bis 33 (2001) sind folgende Themen geplant:

- Computergestütztes Lösen offener Probleme im Mathematikunterricht
- Mathematikdidaktische Forschung im Primarbereich
- Mathematik an Hochschulen lehren und lernen
- Analysis an Hochschulen
- Mathematik in der Ingenieurausbildung
- Theoretische Betrachtungen zu Schulbuchanalysen.

***Vorschläge für Beiträge zu o.g. Themen erbitten wir an die Schriftleitung.***

# Outlook on Future Topics

The following subjects are intended for the analysis sections of Vol. 32 (2000) to Vol. 33 (2001):

- Computer-aided solution of open problems in mathematics teaching
- Research in primary mathematics education
- Teaching and learning mathematics at university level
- Calculus at universities
- Mathematics and engineering education
- Concepts and issues in textbook analyses.

***Suggestions for contributions to these subjects are welcome and should be addressed to the editor.***