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ABSTRACT
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(ERIC) database was utilized to count and categorize over 3,000 articles from
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Results reveal the number of articles relating to ethnicity, gender, class,
and disabilities, as well as intersections among these groups. The study also
examines the attention given to various grade levels, mathematical topics,
and general educational topics, both in the overall pool of articles as well
as in conjunction with each equity group. Results are compared across journal
types as well as between the pool of mathematics education research and the
entire ERIC database. It is concluded that gender research was more prevalent
and integrated into mainstream U.S. mathematics education research than
research on ethnicity, class, or disability. Still, the majority of
mathematics education research focused on student cognition and outcomes with
relatively little attention to contextual or cultural issues. Contains 37
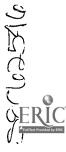references. (Author/NB)

ED 429 847

What's Hot?   What's Not?
A Survey of Mathematics Education Research 1982-1998

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Abstract

This study provides a broad look at mathematics education research published since 1982. The ERIC database was utilized to count and categorize over 3,000 articles from 48 educational research journals, with particular attention to equity issues. The results reveal the number of articles relating to ethnicity, gender, class and disabilities, as well as intersections among these groups. The study also examines the attention given to various grade levels, mathematical topics, and general educational topics, both in the overall pool of articles, as well as in conjunction with each equity group. Results are compared across journal types, as well as between the pool of mathematics education research and the entire ERIC database. The author concludes that gender research was more prevalent and integrated into mainstream, U.S. mathematics education research than research on ethnicity, class, or disability. Still, the majority of mathematics education research focused on student cognition and outcomes, with relatively little attention to contextual or cultural issues.

What's Hot? What's Not?
A Survey of Mathematics Education Research 1982-1998[1]

What topics are focal in mathematics education research? What critical issues are ignored? Scholars often assert that mathematics education research is lacking in one area or another. For example, Reyes and Stanic (1988) and Secada (1992) claim that mathematics education researchers have virtually ignored issues of poverty and social class. Campbell (1991) asserts that mathematics education researchers rarely consider intersections of equity areas (such as ethnicity and gender). Tate (1997) argues that mathematics education research tends to be narrowly focused, restricted to the disciplines of mathematics and psychology. Similarly, Jacob (1998) claims that the mathematics education research community has tended to focus on "cognition without context or culture" (p. 23).

While these claims might seem consistent with one's own impressions of the literature, one still might wonder if these impressions are accurate. One way to verify these impressions is to simply count the number of mathematics education research articles pertaining to various topics. What might such a survey reveal?

This study provides a broad look at mathematics education research, counting and categorizing over 3,000 articles along a number of dimensions, but with particular attention to equity issues. The results reveal the number of articles relating to ethnicity, gender, class and disabilities, as well as intersections among these groups. The study also examines the attention given to various grade levels, mathematical topics, and general educational topics, both in the overall pool of articles, as well as in conjunction with each equity group. While such a study is limited in that it provides only a surface examination of mathematics education research, its breadth offers concrete evidence regarding which research topics tend to receive attention and which tend to be marginalized or ignored by the mathematics education community.

Method

The ERIC database on WINSPIRS CD ROM, which contains over 500,000 abstracts for education-related books, papers, and articles published from 1982 to the present, was the primary data source for this study. With the assumption that peer-reviewed journals have some degree of quality control and credibility and that they more closely reflect the interests and values of "mainstream" research communities than books, this study focused on articles contained in 48 major educational research journals (see Table 1).

Table 1
The 48 Journals Used in this Study

	UNITED STATES (999)	INTERNATIONAL (544)
MATHEMATICS EDUCATION (1543)	*Journal for Research in Mathematics Education* (367) *Journal of Mathematical Behavior* (132) *Focus on Learning Problems in Mathematics* (194) *School Science and Mathematics* (306)	*For the Learning of Mathematics*, Canada (128) *Educational Studies in Mathematics*, Netherlands (385) *Hiroshima Journal of Mathematics Education*, Japan (21) *Mathematical Cognition*, United Kingdom (10)
GENERAL EDUCATIONAL RESEARCH (462)	*American Educational Research Journal* (80) *American Journal of Education* (14) *Community College Journal of Research and Practice* (4) *Educational Evaluation and Policy Analysis* (34) *Elementary School Journal* (72) *Journal of Negro Education* (28) *Review of Educational Research* (9) *Journal of Educational Research* (80) *Journal of Experimental Education* (40) *Educational Researcher* (18) *Journal of Educational Measurement* (32) *Scandinavian Journal of Educational Research* (11) *Educational Research* (12) *Teaching and Teacher Education* (28)	
PSYCHOLOGY & RELATED RESEARCH (758)	*Child Development* (103) *Cognition and Instruction* (22) *Cognitive Psychology* (20) *Contemporary Educational Psychology* (35) *Developmental Psychology* (78) *Journal of Applied Behavior Analysis* (12) *Journal of College Student Development* (5) *Exceptional Children* (23) *Gifted Child Quarterly* (27) *Exceptionality* (2) *Hispanic Journal of Behavioral Sciences* (4) *Journal for the Education of the Gifted* (25) *Journal of Counseling Psychology* (13) *Journal of Early Adolescence* (2) *Journal of Educational Psychology* (142) *Journal of Experimental Child Psychology* (91) *Journal of Social Psychology* (1) *Learning Disabilities Research and Practice* (19) *Remedial and Special Education* (8) *Journal of Learning Disabilities* (79) *Journal of School Psychology* (12) *Educational and Psychological Measurement* (35)	
TECHNOLOGY (248)	*Educational Technology* (20) *Journal of Computers in Mathematics and Science Teaching* (186) *Journal of Educational Computing Research* (26) *Journal of Research on Computing in Education* (16)	

The numbers in parentheses indicate the number of articles ultimately used from each journal or that were in each category.

- <u>Information analysis</u> (ERIC document type number 070) — These articles generally report a synthesis of previous research or literature on a particular topic.

- <u>Viewpoints</u> (ERIC document type number 120) — These articles report an author's opinion or position on a particular topic.

After sifting through the articles using these four categories, the pool of articles was narrowed to only research articles, but it contained many articles that were not relevant to mathematics education. In order to restrict the pool to mathematics education research articles, the ERIC descriptor system was utilized.

A primary feature of ERIC is its extensive thesaurus containing roughly 6,000 descriptors. Every ERIC document is assigned (by the article's author, editor, and/or ERIC clearinghouse expert) several major and minor descriptors that identify its content. ERIC's policy is to assign the most specific descriptors possible to each article. The job of further narrowing and then categorizing articles began with sifting through and sorting the 6,000 ERIC descriptors. While many of the descriptors were not directly relevant to mathematics education research (such as "accidents," "acid rain" or "acting"), hundreds of terms were in some way related to mathematics itself, or to teaching and learning mathematics. The relevant categories of descriptors were developed both "top-down" by considering the meaning of each of the 6,000 ERIC descriptors, as well as "bottom-up" by examining descriptors used in small samples of mathematics education research articles.

The articles were then limited from the general education journals to include only articles containing at least one of over 100 mathematics-related major or minor descriptors.[6] After limiting the articles by both document type and mathematics descriptors, 3,011 articles remained to become the focus of this study. (See Table 1 for the number of articles from each journal that were in this pool of 3,011.)

Analysis of the 3,011 articles involved counting (electronically) the number of articles that contained any major or minor ERIC descriptor pertaining to various equity groups, grade levels, mathematical topics, and general educational topics. (See Table 2 for the specific topics considered.) The descriptors for each topic were carefully selected through analyzing both the ERIC Thesaurus and samples of mathematics education research articles (as described above). As an example of how a category was defined with descriptors, "gender" was defined with the eight relevant ERIC descriptors, "females," "sex," "sex-bias," "sex-differences," 'sex-discrimination,"

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[6] Although initially every mathematics-related descriptor in the ERIC Thesaurus was used, this broad list identified articles not directly related to mathematics education, such as those explaining how to perform statistical analyses of other educational data. Through careful testing of descriptors, a more restricted set of descriptors was developed to glean mathematics education-related articles from general education journals. The articles in the mathematics education journals did not need to be screened by mathematical descriptors.

In choosing these 48 journals, my intent was to include research journals that were at least national in scope, were accessible through the ERIC Silver Platter system, and that focused on mathematics education research or education research more generally. The lists used for the annual reviews of research in mathematics education were a starting point for creating the pool of journals used in this study.[2] Several entries on the annual review lists did not meet these criteria and were deleted.[3] The remaining pool was compared to the complete list of journals ERIC references to confirm that the pool was as complete as possible.

The mathematics education journals in the pool were nicely balanced, with four journals published in the US and four published elsewhere. The general educational and psychological journals were more skewed toward US publication, with a few being published in the UK. Hence, in this study, distinctions between mathematics education journals published in the US versus elsewhere were considered, but U.S. versus international comparisons of other journal types were not made.[4]

The ERIC system contained abstracts and other identifying information for the 23,000 items published in these 48 journals between January, 1982 and early 1998.[5] Yet, these items needed to be limited to strictly research articles on mathematics education before analysis could begin.

While most of the 23,000 items were, indeed, research articles, there were some book reviews, conference summaries, and other non-research items that needed to be deleted from the pool. ERIC document type codes were used to screen for research articles, defined broadly as consisting of these four categories:

- Research/technical reports (ERIC Document type number 143) — These are "research" articles in the traditional sense — they report analyses of new data.

- General or descriptive or evaluative reports (ERIC document type numbers 140, 141 and 142) — These articles describe and/or evaluate particular programs or methods.

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[2] These annual reviews had been traditionally published in the *Journal for Research in Mathematics Education*. Annual reviews of more recent years were distributed by ERIC until the final review was published in 1995. The annual review has now been discontinued.

[3] For example, some journals' emphasized teaching ideas more than research, such as *Teaching Children Mathematics*. A few journals were not in the ERIC Silver Platter system (such as the *Japanese Journal of Educational Psychology* and the *Journal of Educational and Psychological Consultation*). A few other journals were less than national in scope such as the *Alberta Journal of Educational Research* or the *Ohio Journal of School Mathematics*. Finally, some journals focused specifically on subject matters other than mathematics, such as *Journal of Science Education and Technology* and *Physics Teacher*.

[4] In early analyses, comparisons were made between all US journals versus non-US journals, but this comparison was skewed because the types of journals in each group was different. For example, since there are more US journals in ERIC, more specialty journals from the US are represented (such as the *Journal of Negro Education* and *Gifted Child Quarterly*).

[5] The actual ending date varied for each journal, but tended to be between November, 1997 and March, 1998. For the *JRME*, the database only included through November, and, therefore, did not include the special issue on equity that was published in December, 1997.

"sex-fairness," "sex-stereotypes," and "women's education."[7] Other categories were more complex, such as ethnicity, which required about 50 descriptors to encompass all of ERIC's terms, including general ethnicity-related terms (such as "race" or "ethnic discrimination"), as well as terms specific to each ethnic group, such as "Hispanic Americans," "American Indians," etc.

Table 2
Categories of Analysis

Journal Type	Equity Group	Document Type
US Math International Math All Math Psychology Educational Technology General Education All Non-Math Journals All Journals All of ERIC *JRME* Alone	Ethnicity Gender Class Disability Giftedness (as comparison 　group)	Research/Technical Reports General, Descriptive, or 　Evaluative Reports Information Analyses Viewpoints
Grade Level	**Mathematical Topic**	**General Topic**
Early Childhood Elementary Middle School Secondary Elementary/Secondary Post-Secondary/College Adult Basic Education	Numeration, Computation Rational Numbers Algebra Geometry, Measurement Probability, Statistics Calculus, Trigonometry Foundations, Logic Problem Solving	Teacher Background Teacher Actions General Instruction & 　Improvement, Policy Teacher Education Educational Environment Student Ability Student Achievement Student Assessment & 　Evaluation Students in Classrooms Student Affect Cognition & Learning Curriculum Technology

For each topic under consideration, counts were obtained for various journal categories. This allowed comparisons of the attention that various research communities gave to key topics (for example, that the United States mathematics education community gave more attention to ethnicity and gender while the international mathematics education community gave more attention to class, or that mathematics journals gave more attention to teacher education, while non-mathematics journals gave more attention to broader instructional issues). Intersections of each topic with the four equity groups (ethnicity, class, gender, disability, as well as giftedness as a comparison

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[7] "Gender" was not an ERIC descriptor. Due to the need to maintain consistency through the years, several terms in ERIC seem dated, and meanings needed to be carefully discerned using the definitions given in the ERIC Thesaurus.

group) were also examined to determine the degree of attention given to various topics in conjunction with each group. Additionally, for each topic under consideration, counts for all of ERIC were obtained, so that the attention given a particular topic in mathematics education could be compared with the broader education literature. For example, the percentage of mathematics-education articles on gender was compared with the percentage of gender-related items in all of ERIC.

Results

As revealed in Table 1, the pool of 3,011 articles was split fairly evenly between journals specific to mathematics education and those that were not. More specifically, 1543 of the 3,011 articles appeared in mathematics education journals, while 1468 of the 3,011 articles were published outside of mathematics education. Over one fourth (758) of the pool appeared in psychological journals. *JRME* published 367 of the 3,011 articles, or about twelve percent. *Educational Studies in Mathematics* contributed the most articles (385) to the pool, *School Science and Mathematics*[8] contributed 306, *Focus on Learning Problems in Mathematics* contributed 194, *Journal of Mathematical Behavior* contributed 132, and *For the Learning of Mathematics* published 128. Other journals with over one hundred articles contributing to this data base were *Child Development* (103), *Journal of Educational Psychology* (142) and *Journal of Computers in Mathematics and Science Teaching* (186).

The following discussion of specific results begins with a focus on equity groups and then proceeds to focus on document types, grade levels, mathematical topics, and general educational topics, with equity being continually examined in relation to these other issues.

Equity

Ethnicity, gender, class, and disability were the "equity" categories examined. Each of these groups was defined broadly, encompassing all relevant ERIC descriptors to ensure the inclusion of all mathematics education research articles relating to these groups.[9] Hence, "ethnicity" was

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[8] This journal posed a dilemma, as it was a mixture of research and more teacher-centered articles. While 784 articles from this journal were in the ERIC database, only 559 were "research" articles, as defined by document type numbers (as discussed above). Just over half of these articles were about mathematics education. Another dilemma was whether to consider this journal a "mathematics education" journal, which I eventually decided to do since over half of its contents related to mathematics education. Yet we decided to categorize the *Journal of Computers in Mathematics and Science Teaching* as a technology journal instead of a mathematics education journal, as technology was the journal's primary focus.

[9] By "related to" a topic, I mean that an article contained at least one of the descriptors assigned to that topic. For example, an article with the descriptor "sex-bias" is assumed to relate to "gender," although this claim relies on the accuracy of the descriptor, as I have not, in fact, read each of the 3,011 articles. Additionally, in the discussion of the data, for the sake of simplicity, I assume that the number of articles relating to a topic indicates the amount of "emphasis" or "attention" given to that topic. Again, I acknowledge that from the descriptor alone, one cannot discern exactly how much emphasis is given a topic in a particular article. Still, I do assume that overall, more articles "relating to" a particular topic indicates more emphasis (at least of some sort) given to that topic by the

defined with dozens of descriptors pertaining to both general ethnicity and specific ethnic groups, as well as to immigrants and other non-native English speakers. "Gender" was defined with the eight ERIC descriptors relevant to gender, as mentioned above. "Disability" was, again, broadly defined, encompassing all ERIC's descriptors for cognitive, emotional, visual, hearing, ambulatory, and other disabilities.

Class was trickier. Two sub-categories of class were examined — "strictly class," defined by descriptors very specific to socio-economic class (such as "socio-economic status," "working class," etc.) and "broadly class," defined by rather vague descriptors that overlapped with ethnicity and disability, but probably best fit with class (such as "at-risk students," "inner-city" or "disadvantaged"). The class numbers reported in the tables below indicate the total number of articles that had any descriptor from either class category. While 52 articles are reported as relating to class, only 40 contained descriptors from the "strictly class" category.

The category "giftedness" was included both for its intrinsic value, as well as for a comparison group for the four equity groups. Two journals focused specifically on gifted students, and the majority of articles on gifted students came from these journals.

Table 3
Equity Groups by Journal Type

	JRME (367)	US Math (999)	Intl. Math (544)	All Math (1543)	All Non-Math (1468)	Gen. Ed. (462)	Psych (758)	Tech (248)	All Journals (3011)	TOTAL IN ERIC (510,241)
Ethnicity	18	32	3	35	77	53	21	3	**112**	39,652
	4.9%	3.2%	.6%	2.3%	5.2%	11.5%	2.8%	1.2%	**3.7%**	7.8%
Gender	43	89	42	131	192	70	107	15	**323**	30,296
	11.7%	8.9%	7.7%	8.5%	13.1%	13.1%	14.1%	6.0%	**10.7%**	5.9%
Class	4	6	5	11	41	28	11	2	**52**	21,679
	1.1%	.6%	.9%	.7%	2.8%	6.1%	1.5%	.8%	**1.7%**	4.2%
Disability	1	33	3	36	157	6	147	4	**193**	48,915
	.3%	3.3%	.6%	2.3%	10.7%	1.3%	19.4%	1.6%	**6.4%**	9.6%
Gifted	3	8	7	15	73	10	62	1	**88**	6,184
	.8%	.8%	1.3%	1.0%	5.0%	2.2%	8.2%	.4%	**2.9%**	1.2%
Ethnicity or gender or class or disabled	58	149	51	200	423	133	268	22	**623**	121,405
	15.8%	14.9%	9.4%	13.0%	28.8%	28.8%	35.4%	8.9%	**20.7%**	23.8%

Percents in this table are column percents. For example, 4.9% of the 367 *JRME* articles related to ethnicity.

mathematics education community. Later I discuss in more detail what we can tell from the data about the *type* of attention given to various topics.

As Table 3 indicates, 623 (about 21%) of the 3,011 articles "related to" at least one of the four equity categories (ethnicity, gender, class or disability). Gender received the most attention, with 323 articles (about 11% of the 3,011), and disability was second with 193 articles (about 6%). There were just 112 articles (about 4%) pertaining to ethnicity. Class received less than half the attention (1.7%) of the other three categories, and also received less attention than gifted students. The disparity between class and ethnicity/gender was most visible in the US mathematics education journals, in which there were 32 articles on ethnicity, 89 articles on gender, and only 6 articles on class.

Over 2/3 of the 623 equity-related articles appeared in journals not specific to mathematics education. In fact, every group received less attention in the mathematics education journals than in the other journals. Ethnicity and class were represented most heavily in the "general education" journals, while gender, disability and giftedness was represented most in psychological journals.[10] Over 3/4 of the disability-related articles appeared in psychology journals. Disability received little attention in *JRME* (only 1 article), international mathematics education journals (3 articles), and general educational journals (6 articles).

Overall, the US mathematics education journals gave more attention to equity groups than the international journals (14.9% versus 9.4%). Still, although ethnicity, gender, and disability were emphasized more in the US mathematics education articles, a slightly higher percentage of the international mathematics education journals' articles related to class, as well as to giftedness.

Class, ethnicity, and disability received less attention among the 3,011 mathematics education articles in comparison to the entire ERIC database of 510,241 items. For example, while 1.7% of the 3,011 articles related to class, 4.2% of ERIC items related to class. But the percentages of articles on gender and giftedness in mathematics education were about double the percentages of ERIC items relating to these topics.

The above claims are based on the number of articles with a particular set of descriptors, and again, this tells us little about how much emphasis equity actually received within any individual article. Another way to examine the equity articles is to consider the number of articles with a relevant term in the title. This gives some indication of how many articles made equity a primary focus. An examination of the 323 gender-related article titles revealed that just over half of the titles contained a gender-related term. Similarly, over half (68) of the 112 ethnicity-related articles contained an ethnicity-related descriptor in the title. The ratio was smaller for class, with only 20 of the 52 class-related articles containing a class-related term in the title (and the majority of these 20 titles contained euphemistic terms such as "disadvantaged", "urban" or "low-income"). The

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[10]Recall that there were two journals relevant to ethnicity among the general education journals and several journals relevant to disability and giftedness among the psychological journals.

disability-related research was more focused, with over two-thirds of the disability-related articles (135 out of 193) containing a disability-related term in the title.

Combining equity variables

As Table 4 reveals, 437, or almost 15% of the 3,011 articles addressed at least one of ethnicity, class or gender, yet only three articles discussed all three variables together (i.e., Rech, 1996; Reyes & Stanic, 1988; Witthuhn, 1984). Gender was discussed in conjunction with class in 11 articles, and with ethnicity in 29 articles. Ethnicity and class were combined in 13 articles — only two of which appeared in a mathematics education journal (both were in *JRME* — Apple, 1992; Reyes & Stanic, 1988). Overall, the vast majority of articles that combined two of these equity areas appeared in non-mathematics education journals.

Table 4
Unions and Intersections of Equity Variables

	JRME (367)	US Math (999)	Intl. Math (544)	All Math (1543)	All Non-Math (1468)	All Journals (3011)	TOTAL IN ERIC (510,241)
Ethnicity or class or gender	57 15.5%	116 11.6%	48 8.8%	164 10.6%	273 18.6%	**437 14.5%**	77,417 15.2%
Ethnicity & Class	2 .5%	2 .2%	0	2 .1%	11 .7%	**13 .4%**	6,267 1.2%
Ethnicity & Gender	6 1.6%	9 .9%	0	9 .6%	20 1.4%	**29 1.0%**	6552 1.3%
Gender & Class	1 .3%	1 .1%	2 .4%	3 .2%	8 .5%	**11 .4%**	2532 .5%
Ethnicity & Class & Gender	1 .3%	1 .1%	0	1 .1%	2 .1%	**3 .1%**	1141 .2%
Ethnicity & Disabled	0	0	0	0	1 .1%	**1 0%**	2,550 .5%
Gender & Disabled	0	0	0	0	7 .4%	**7 .2%**	1530 .3%
Class & Disabled	0	0	0	0	0	**0**	1,824 .4%
Ethnicity & Gifted	0	3 .3%	0	3 .2%	4 .3%	**7 .2%**	573 .1%
Gender & Gifted	1 .3%	1 .1%	2 .4%	3 .2%	32 2.2%	**35 1.2%**	492 .1%
Class & Gifted	0	0	0	0	0	**0**	243 .05%

Percents in this table are column percents.

Only eight articles examined disability in conjunction with another equity group. Seven of these eight examined gender and disability, and one examined ethnicity and disability (Worthington & Bening, 1988). These numbers are low when compared with the percentage of ERIC items focusing on ethnicity, class and gender in conjunction with disability. Additionally, in the ERIC

database, disability received more attention in conjunction with ethnicity and class than with gender.

More articles examined giftedness in conjunction with gender (35) than with ethnicity (7) or class (0). There was more attention given to both gender and ethnicity in terms of giftedness than in terms of disability in mathematics education, yet the reverse was true in all of ERIC. Among the 3,011 mathematics education articles, no article examined class in conjunction with either disability or giftedness.

A closer look at ethnicity

In this study, about fifty descriptors defined the category "ethnicity," and many of these were specific to individual ethnic groups. Table 5 shows the number of articles among the 3011 that pertained to specific ethnic groups. African-American students received more attention (47 articles or 42% of the 112 ethnicity articles) than other groups. Although this might seem like a great deal of attention, we must keep in mind that these 47 articles comprise less than 2% of the total 3011 articles. Hispanic groups received about half as much attention as African-Americans, and immigrant and Native American groups received the least attention of all groups. It is important to note that these categories are not disjoint — for example, the 6 articles on immigrant groups overlap with the 24 articles on Hispanic groups. There were some articles on ethnicity that only contained general descriptors, such as "race," and these articles are included in the total of 112, but do not appear in a specific column of this table.

Table 5
Articles Relating to Specific Ethnic Groups

	African-American	Hispanic	Native American	Immigrants /Limited English Proficient	Asian-American	Caucasian
Percents are of the 112 Ethnicity Articles	47 42%	24 21%	5 4%	6 5%	12 11%	15 13%

Document Types

We now move from a specific focus on equity to an examination of other topics in conjunction with equity. While the tables above compared the counts for each equity group across many journal types, the remaining tables consider fewer journal comparisons due to the overwhelming nature of the data when each possible topic is compared across both equity groups and journal categories.

ERIC's document type codes were used to examine the type of research published by various journal categories, as well as the type of research relating to each equity group. As explained previously, the pool of 3,011 articles contained the following four document types:

1) Research/technical reports
2) General, descriptive or evaluative reports
3) Information analysis
4) Viewpoints

ERIC articles can be assigned more than one document type number, so there was some overlap among these four categories. As Table 6 reveals, over two-thirds of the 3,011 articles were "research/technical reports," or what might be considered a traditional research article. There were 525 general reports (17%), 399 viewpoint articles (13%) and 180 information analyses (6%). The balance among these document types was fairly consistent for each category of journal,[11] although *JRME* had a relatively high percentage (86%) of research/technical reports and few general reports (3%), and the international mathematics education journals contained a high percentage of viewpoint articles (33%).

For each equity group, the percentage of research/technical reports (with the exception of disability) was slightly higher than the overall average for the 3,011 articles, and the percentage of viewpoint articles was lower. Overall, the percentage for each document type was fairly consistent across equity groups. Still, there were some notable differences, particularly when examining attention given to class within particular journal types.

In contrast with the results for other equity groups, the articles on class in the *JRME* and in all US mathematics journals contained more viewpoints and fewer research/technical reports. In fact, there were only 2 research/technical reports on class in all 676 US mathematics education research articles (both published in 1982 — Carnine & Gersten and Kornbluth & Sabban). This stands in stark contrast to 24 on ethnicity, 64 on gender and 19 on disability. Hence, according to these results, no research/technical report relating to class has been published in any U.S. mathematics education journal since 1982. In contrast, all four of the international research/technical reports on class have been published since 1990 (Atweh & Cooper, 1995; Kaeley, 1990; Kaeley, 1993; Maqsud & Khalique, 1991).

This dearth of research/technical class-related articles in U.S. mathematics education journals could be related to the fact that, upon closer examination, several of the articles on class that have been published do not offer new results, but instead argued that class issues need more attention in mathematics education. For example, of the four *JRME* articles on class, the general *JRME* article

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[11] Again, not every category is listed in the table, due to the overwhelming nature of the data. Still, the percentages for every journal category were examined, and the document types were fairly consistent even for those categories not specifically reported in the table.

was Reyes' and Stanic's (1998) piece about the lack of research on class and intersections among equity variables, and the two viewpoint articles were Apple's (1992) argument that the *Standards* might not go far enough in addressing political/social issues that influence mathematics education, and Romberg's (1992) response to Apple.

The vast majority of research articles on class and mathematics education have been published in general educational journals. In fact, when looking at the document types for each equity category overall, class has the highest percentage of research/technical reports, due to the high percentage of such articles on class from non-mathematics education journals (93%).

Another distinction revealed in Table 6 is that while every other equity category has had several articles that synthesized the information in that area, there was no synthesis of information about class. This could reflect the fact that there is simply less information on class to synthesize.

Table 6
Document Type by Journal Category and Equity Group

	Total	Ethnicity	Gender	Class	Disability
JRME	**367**	**18**	**43**	**4**	**1**
JRME & Research/Technical	316 86%	13 72%	37 86%	1 25%	1 100%
JRME & General	11 3%	3 17%	2 5%	1 25%	0 0%
JRME & Information	22 6%	0 0%	2 5%	0 0%	0 0%
JRME & Viewpoints	33 9%	2 11%	2 5%	2 50%	0 0%
US Math	**999**	**32**	**89**	**6**	**33**
US Math & Research/Technical	676 68%	24 75%	64 72%	2 33%	19 58%
US Math & General	170 17%	6 19%	12 13%	1 17%	3 9%
US Math & Information	67 7%	0 0%	8 9%	0 0%	8 24%
US Math & Viewpoints	148 15%	3 9%	11 12%	3 50%	5 15%
Intl. Math	**544**	**3**	**42**	**5**	**3**
Non-US Math & Research/Technical	317 58%	3 100%	32 76%	4 80%	3 100%
Non-US Math & General	66 12%	0 0%	8 19%	1 20%	0 0%
Non-US Math & Information	38 7%	0 0%	1 2%	0 0%	0 0%
Non-US Math & Viewpoints	182 33%	0 0%	3 7%	0 0%	0 0%
All Journals	**3011**	**112**	**323**	**52**	**193**
All Journals & Research/Technical	2128 71%	89 79%	271 84%	44 85%	132 68%
All Journals & General	525 17%	21 19%	36 11%	6 12%	30 16%
All Journals & Information	180 6%	9 8%	15 5%	0 0%	24 12%
All Journals & Viewpoints	399 13%	5 4%	20 6%	4 8%	15 8%

The percents in this table are partial column percents. For example, 72% of the 18 *JRME* ethnicity-related articles were research/technical reports, while 75% of the 32 US mathematics education ethnicity-related articles were research/technical reports.

13   14

Grade Levels

The ERIC system utilizes about two dozen different grade level labels, including those specific to a particular grade (e.g., "fourth grade"), as well as those spanning multiple grades (such as "junior high school"). ERIC documents are assigned the most specific grade-level label possible, and some are assigned multiple labels (such as "high school" and "post-secondary school"). For this study, ERIC grade-level labels were combined to create the following seven categories:

- Elementary-secondary education — An actual ERIC label assigned to items that discuss general kindergarten through twelfth-grade education.

- Early childhood — Birth up to primary school.

- Elementary education — Kindergarten through eighth grades.

- Middle school — Encompasses ERIC's "intermediate grades " (grades four through six), and "junior high schools" (grades seven through nine).

- Secondary school — Generally considered grades 9-12, but could encompass grades 7-12.

- Post-secondary/college — All education beyond secondary school, including college, two-year colleges, and all post-secondary learning experiences, with the exception of adult basic education.

- Adult basic education — Education provided for adults at the rudimentary level.

Table 7
Grade Levels by Equity Group

	Elementary Secondary Education	Early Childhood	Elem. Education	Middle School	Scndry School	Post-Secondary College	Adult Basic Ed.
TOTAL IN ERIC (510,241)	99,823 20%	18,255 4%	53,061 10%	20,429 4%	68,290 13%	163,465 32%	16,063 3%
All (3011)	**587 19%**	**68 2%**	**1106 37%**	**502 17%**	**763 25%**	**527 18%**	**5 .2%**
Ethnicity (112)	28 25%	2 2%	33 29%	29 26%	23 21%	16 14%	0
Gender (323)	59 18%	2 1%	79 24%	81 25%	123 38%	56 17%	0
Class (52)	4 8%	2 4%	25 48%	16 31%	9 17%	5 10%	0
Disabled (193)	61 32%	3 2%	73 38%	28 15%	20 10%	10 5%	0

The percents in this table are row percents.

The numbers of articles in each grade level category were compared for the entire pool of 3,011 articles, as well as for each equity group. As Table 7 reveals, among the 3,011 articles, elementary

education was given the most attention, while adult basic education and early childhood education were given the least. Specifically, 37% of the 3,011 items pertained to elementary education, with secondary school also receiving significant attention (25%). A little less than 20% of the 3,011 articles focused on each of the post-secondary, middle, and elementary-secondary categories.

While only 5 of the 3,011 mathematics education articles (.2%) pertained to adult basic education, over 16,000 items in the entire ERIC database (3%) related to adult basic education The percentage of ERIC items relating to early childhood (4%) was double the percentage of the 3,011 articles (2%) pertaining to that topic.

Consistent with the overall data, the four equity groups received little attention in relation to early childhood, and not a single article examined a particular equity group in conjunction with adult basic education. While ethnicity, class and disability research peaked at the elementary school level, gender research concentrated on secondary school.

Mathematical Topics:

The entire ERIC thesaurus was searched for words pertaining to mathematical content areas. These descriptors were utilized when gleaning mathematics education articles from general education journals, and they were also used to sort the 3,011 articles by mathematical topic.[12] The mathematical categories considered were:

- Integers (including numeration, computation with integers, number sense).

- Rational number (including fractions, decimals, percents, ratios, and computing with these numbers).

- Algebra.

- Geometry and measurement, including spatial visualization.

- Probability and statistics.

- Calculus, trigonometry.

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[12] One difficult methodological issue was how to include all articles on mathematics education, without including irrelevant articles that used mathematical descriptors because it focused on how to do statistical analysis of general educational issues (such as how to perform certain statistical tests, etc.) I created two different layers of mathematical descriptors, and tended to be conservative when screening general education journals, avoiding descriptors such as "statistical bias" or "mathematical formulas" when searching these journals. I performed several checks with samples to try to ensure that all and only the desired articles were included. I then used a broader set of descriptors when categorizing the pool of 3011 articles by mathematical topic. Yet, I still had a problem. The computer revealed that there were 201 probability and statistics articles in our pool of mathematics education articles, yet many of these articles were relevant to mathematics education but contained statistical descriptors only because they focused on conducting and interpreting statistical results of mathematics education studies, as opposed to teaching and learning probability and statistics. I had to screen for these articles by hand, so that the numbers reported here are only for those articles regarding the teaching and learning of probability and statistics.

- Mathematical foundations, logic, set theory.

- Problem solving.

- Any mathematical topic (the union of all above topics).

Table 8 shows the number of articles regarding each mathematical topic, both for the entire pool of 3,011 articles as well as for each equity group. Overall, 52% of the 3011 articles contained a descriptor pertaining to a specific mathematical topic. Incidentally, this percentage was a bit higher (55%) for mathematics education journals, and even higher for *JRME* (63%).

Table 8
Mathematical Topics by Equity Group

	Integers	Rational Number	Algebra	Geometry & Msmt.	Prob. & Stats	Trig. & Calc.	Math Fndtns.	Problem Solving	Any Math Topic
All (3011)	589 20%	148 5%	215 7%	463 15%	55 2%	59 2%	74 2%	510 17%	1564 52%
Ethnicity (112)	8 7%	0	4 4%	3 3%	1 1%	1 1%	1 1%	8 7%	18 16%
Gender (323)	17 5%	2 1%	11 3%	58 18%	3 1%	4 1%	2 1%	28 9%	118 37%
Class (52)	4 8%	0	0	3 6%	0	0	0	3 6%	7 13%
Disabled (193)	59 31%	3 2%	2 1%	18 9%	0	0	2 1%	32 17%	91 47%

The percentages in the table are row percents.

Over 500 articles or 20% of the 3,011 articles focused on Integers. Problem solving (17%) and geometry (15%) also received considerable attention, while algebra (7%) and rational number (5%) received less. Probability/statistics, trigonometry/calculus, and mathematical foundations received the least attention, with about 2% of the 3011 articles focusing on each of these topics.

While over half of all 3,011 articles focused on a specific mathematical topic, equity-related articles less often focused on a specific mathematical content area. Thirty-seven percent of gender-related articles focused on a particular mathematical topic (most often geometry, with spatial ability accounting for 49 of the 58 geometry-related articles), and 47% of the research on disabled students examined a particular mathematical topic (with integers and problem solving receiving the majority of attention). Only 13% of class-related research and 16% of ethnicity-related research focused on a mathematical topic (most often integers or problem solving). Hence, we do not often ask how particular groups — especially ethnic or class groups — might have special strengths or needs in relation to learning particular topics. Another way to view the data is to consider the percentage of articles on a particular topic that considers an equity group. For example, while it

seems that there is considerable attention to gender and geometry, only 58 of the 463 articles on geometry considered how gender might interact with that topic, and only 3 of the 463 geometry articles considered class or ethnicity.

<u>General Teaching and Learning Topics</u>

After scouring the ERIC Thesaurus for descriptors that seemed relevant in any way to mathematics teaching, learning, and curriculum, I selected and categorized descriptors as follows:

- <u>Teacher characteristics: background, attitudes, and skills</u> (included 12 descriptors, including "mathematics teachers," "teacher attitudes," "teacher qualifications," "teacher background," and also included 2 identifiers — "pedagogical content knowledge" and "knowledge base for teaching")[13]

- <u>Teacher actions, planning, decision making</u> (21 descriptors, including "teaching methods," "teacher role," "teacher behavior," and "classroom communication").

- <u>General instruction, improvement and policy</u> (12 descriptors, including "mathematics instruction," "instructional improvement," "teacher evaluation," and "educational policy").

- <u>Teacher education</u> (14 descriptors, including "teacher education," "student teaching," "teacher educators," and "in-service teacher education").

- <u>Educational environment</u> (5 descriptors: "classroom techniques," "educational environment," "classroom environment," "teaching conditions" and "teacher-student ratio").

- <u>Student ability</u> (10 descriptors, including "mathematical aptitude," "academic ability," "intelligence," "student experience," and "prior learning").

- <u>Student achievement</u> (6 descriptors: "academic achievement," "educational attainment," "mathematics achievement," "achievement gains," "under achievement" and "low achievement").

- <u>Student assessment and evaluation</u> (5 descriptors: "portfolio assessment," "mathematics tests," "student evaluation," "curriculum-based assessment" and "non-graded student evaluation").

- <u>Students in classrooms</u> (7 descriptors, including "student role," "student behavior," "time on task," "ability grouping").

- <u>Student affect and beliefs</u> (10 descriptors, including "mathematics anxiety," "motivation," "student attitudes," "self-esteem").

- <u>Cognition</u> (48 descriptors, including "cognitive development," "cognitive processes," "comprehension," "thinking skills," "cognitive style," "learning," "learning theories," "rote learning," "constructivism").

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[13] In order to avoid continual additions to the carefully controlled ERIC *Thesaurus of Descriptors* and yet still be responsive to the needs of the educational community, ERIC uses identifiers, which can be thought of as highly specific or potentially transient labels. Some identifiers do eventually become descriptors when demand over time shows that it is necessary, as was the case for "knowledge base for teaching," which became a descriptor several years after its initial use as an identifier.

- <u>Curriculum design, texts, and materials</u> (39 descriptors, including "mathematics curriculum," "curriculum development," "manipulative materials," "mathematics materials," "textbooks," "problem sets," "assignments," "homework").

- <u>Technology</u> (23 descriptors, including "educational technology," "computers," "computer software," "computer assisted instruction," "calculators").

While the sets of descriptors for the above categories are disjoint, there are fine lines between the meanings of some categories, and the divisions are, in some sense, artificial. Many articles contained descriptors from several categories, and the ways in which the divisions were drawn between categories could affect the degree of attention a topic appears to receive. For example, if "teachers/teaching" was created as one category encompassing any article relating in any way to teachers or teaching, then perhaps it would look as though teachers and teaching was the major focus of mathematics education research. Hence, results reported here must be interpreted with care.

The number of articles relating to each category was compared for the entire pool of 3,011 articles, as well as for each equity group. A general correlation existed between the number of descriptors defining a particular category and the number of articles in that category — this is not surprising. In some ways, the number of descriptors listed for a category reflects the attention it has received in all educational literature catalogued in the ERIC system. Still, there were notable exceptions to this trend; for example, student achievement had only 6 descriptors yet had 700 articles, while teacher education had 14 descriptors yet only 186 articles.

Table 9
General Teaching and Learning Topics by Journal Type and Equity Group

	Tea. Char.	Tea. Acts	Instr	Tea. Ed.	Ed. Env	St. Chr.	St. Ach	St. Asmt	St. in Clsrm	St. Afct	Cognition	Curr	Tech
All (3011)	317 11%	598 20%	1414 47%	186 6%	137 5%	437 15%	700 23%	165 5%	125 4%	365 12%	1464 49%	522 17%	446 15%
Ethnicity (112)	7 6%	14 13%	26 23%	1 1%	4 4%	16 14%	76 68%	5 4%	6 5%	28 25%	30 27%	14 13%	7 6%
Gender (323)	15 5%	30 9%	71 22%	5 2%	13 4%	74 23%	149 46%	16 5%	14 4%	98 30%	82 25%	24 7%	23 7%
Class (52)	4 8%	14 27%	17 33%	0	2 4%	9 17%	36 69%	0	2 4%	11 21%	14 27%	6 12%	4 8%
Disabled (193)	9 5%	46 24%	101 52%	4 2%	0	39 20%	63 33%	23 12%	9 5%	13 7%	92 48%	24 12%	21 11%

The percentages in the table are row percents.

Of the above 13 categories, cognition was the most "popular," relating to 49% of the 3,011 articles (see Table 9). Incidentally, *JRME* and the mathematics education journals had an even higher percentage of articles pertaining to cognition, with 57% and 55%, respectively. In contrast, only 18% of all ERIC items related to cognition.[14]

General instruction was also popular, with 47% of the articles relating to this topic. Yet, while the term "instruction" might convey to some that the articles in this category were specifically about teaching, it is worth noting that the vast majority (85%) of the articles in the general instruction category were there solely because they contained the descriptor "mathematics instruction." Relative to "teaching," ERIC defines "instruction" more broadly, encompassing elements of teaching, curriculum and classroom environment. There is no "mathematics teaching" or "mathematics learning" descriptor in the ERIC Thesaurus, and, therefore, many articles relating to mathematics education tend to be tagged with the rather generic "mathematics instruction" descriptor. In contrast, the descriptors for cognition were more specific to thinking and learning while not referring to mathematics specifically. Therefore, it is safer to assume that the articles relating to "cognition" are, indeed, about thinking and learning than it is to assume that the articles in the "general instruction" category are specifically about teaching.

Student achievement was also a popular topic, with 700 (or 22%) of the 3,011 articles relating to this topic. Similarly, teacher actions was focal in 20% of the articles. Curriculum (17%), technology (15%), student characteristics (15%), student affect (12%), and teacher characteristics (11%)[15] also received significant attention. Teacher education (6%), student assessment (5%), educational environment (5%) and students in classrooms (4%) received the least attention.

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[14]Some of this difference might reflect the fact that only research articles were included in the pool of 3,011, while ERIC contains a broader spectrum of literature.

[15] Again, it's important to note that the majority of articles in the "teacher characteristics" category are there because of the rather generic descriptor "mathematics teachers." As in the case of "mathematics instruction," these descriptors specific to mathematics tend to be used liberally to denote that an article relates to mathematics education. Upon closer examination of the "teacher characteristics" category, I found that only 1% of the 3,011 articles related to teacher knowledge and skills, 3% related to teacher affect, and 1% related to teachers' experience or background characteristics.

An examination of ethnicity, class, gender, and disability in relation to the various topics reveals several trends. Relative to the entire pool of 3,011 articles, the equity groups received less attention in conjunction with teacher characteristics, teacher education, curriculum and technology. The percentage of gender and ethnicity articles relating to teacher actions was also relatively low. Additionally, ethnicity, class and gender received relatively little attention in conjunction with cognition and much attention in terms of affect, while the reverse was striking for disability. Still, perhaps the most marked trend in Table 9 is that while only 23% of the 3011 articles related to student achievement, the number increased to 33% for disabled students, 46% for gender, and 68% for ethnicity and 69% for class. In other words, while less than one-fourth of all the articles related to achievement outcomes, over two-thirds of the articles on ethnicity or class related to achievement outcomes.

Discussion

There is limited information we can obtain from a study such as this, and some cautions are in order. The results rely on the accuracy of the ERIC descriptor system, as well as researcher decisions made regarding which categories to consider and what descriptors should define them. The results reveal the number of articles that were assigned descriptors relating to various categories. The results do not provide much detail about the degree of emphasis or type of attention given to a topic in any individual article. However, despite these limitations, some inferences can be made from the results reported above.

Overall Counts For Equity Groups

While the percentage of mathematics education research articles on gender was about double the percentage of ERIC items on gender, the reverse was true for ethnicity, class, and to a lesser extent, disability. The disparity between gender and the other equity groups was larger when looking at strictly mathematics education journals, where the percentage of articles on ethnicity, class, and disability was even lower.

The number of articles on ethnicity and disability was particularly low in international mathematics education journals, while the number of articles on class was particularly low in U.S. mathematics education journals. Class was the one equity group to have fewer articles than giftedness among the 3,011. While the percentage of all ERIC items relating to class was more than triple the percentage of ERIC items on giftedness, the percentage of the 3,011 articles on giftedness was almost double the percentage on class.

Hence, both gender and giftedness received a relatively large amount of attention among the 3,011 articles, when compared to the entire ERIC database. It makes sense that gender is a special area of concern in mathematics education research, as women have traditionally been under-represented in mathematical careers more than in other careers. It is less clear why giftedness receives more attention in relation to mathematics education, but a likely and perhaps undesirable assumption underlying this difference is that mathematical ability is more of an innate "gift" than ability in other fields. Another explanation could be that mathematics is assumed to be a particularly important field for the well-being of society and, therefore, talent must be actively cultivated early.

Analyses of intersections among equity groups revealed a lack of attention to the ways in which various group memberships interact. More attention was given to intersections of gender and giftedness (35 articles) than to any intersections of equity groups. Most striking was the dearth of articles examining intersections of disability with other equity groups . The 3,011 articles gave no attention to class in terms of either disability or giftedness. There was more attention given to ethnicity in terms of giftedness (7 articles) than in terms of disability (just one article), while the reverse was true in all of ERIC. On one hand, the situation for ethnicity seems positive -- researchers do not assume that ethnicity should be more relevant to disability than to giftedness. Yet, are we ignoring important realities about the disproportionate numbers of minority and lower-class children who are placed in special education?[16] Perhaps we are afraid in mathematics

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[16] For example, one study of urban school districts revealed that black children were three times as likely as white children to be considered "educable mentally retarded." In contrast, white students were three times as likely as black students to be considered gifted (Meier, Stewart & England, 1989).

education to be politically incorrect and discuss ethnicity and class in relation to being disabled. Or might disability-related research be so isolated in psychological spheres that mainstream mathematics education researchers do not consider it much at all?

Other Topics in Conjunction with Equity Groups

This study went beyond counting the number of articles pertaining to each equity group and examined the articles with attention to grade levels, mathematical topic, and general educational topic. Disregarding the equity groups for a moment, there were some overall trends in the 3,011 articles worth noting. The grade-level data indicate that primary attention was given to K-12 education (with elementary education receiving more attention than secondary), and that little attention was given specifically to early childhood or adult basic education.

The mathematical topics data reveal that over half of the 3,011 articles pertained to a particular mathematical topic, and that numeration/computation was the most popular topic examined, with problem solving and geometry/measurement also receiving significant attention. Relatively little attention was given to probability/statistics, trigonometry/calculus, or mathematical foundations.

As mentioned previously, the data on teaching and learning need to be treated with care, as there were fine lines between many categories, and some categories contained descriptors that seemed to be used as a mathematics education "catch all" of sorts. What seems quite clear, though, is that cognition was a very popular topic, with about half of the 3,011 articles pertaining to it. In contrast, relatively little attention was given to teacher education, student assessment, educational environment, and students in classrooms.

When examining grade levels, mathematical topics, and general educational topics in conjunction with the equity groups, we obtain more detail regarding the type of attention each group has received.

Gender

According to the data, research on gender concentrated on secondary levels. Only 2 articles pertained to gender in early childhood education (pre-kindergarten). It is not surprising that much

gender research has concentrated on upper grades, given that these are the years where the largest differences in mathematical performance have been found. Still, some recent research revealed gender differences in problem-solving strategies as early as first grade. (Fennema, Carpenter, Jacobs, Franke, & Levi, 1998; Sowder, 1998). These findings suggest we need to give more attention to females in earlier grades. Additionally, the fact that no articles examined gender in conjunction with adult basic education could be a concern, given the gender issues embedded in the realities of teen pregnancy and subsequent links among single motherhood, dropping out of school, and poverty (AAUW, 1992).

In terms of mathematical topics, gender received less topic-specific attention when compared with the entire pool of 3,011 articles, but more attention when compared with ethnicity and class. About half of the topic-specific gender articles were in the geometry/measurement category, with the majority of these pertaining to spatial visualization. Integers and problem solving also received significant gender-related attention. In contrast, virtually no attention was given to gender in conjunction with rational number, probability and statistics, trigonometry and calculus, and mathematical foundations.

A comparison of the data on gender with the overall pool of 3,011 articles revealed that gender received about half the attention in relation to cognition, curriculum, teacher actions, teacher characteristics, teacher education, instruction, and technology, yet double the attention in relation to achievement and affect. Almost half of the articles on gender related to student achievement, and almost one-third of the articles pertained to student affect. It is striking that much less attention was given to teaching, with virtually no attention given to gender in relation to teacher education.

Ethnicity & Class

According to the data, research on both ethnicity and class peaked in elementary school. Still, the articles for ethnicity were more evenly distributed among elementary, middle school and secondary school, than the articles on class, which were quite concentrated on elementary levels. Again, virtually no attention was given to either early childhood education or adult basic education in relation to class or ethnicity. This dearth seems odd, particularly for class, given the obvious

links between class and both early childhood programs (such as Head Start) and adult basic education.

While over half of the 3,011 articles focused on a particular mathematical topic, only 16% of ethnicity-related research and 13% of class-related research gave attention to a particular topic. The majority of these articles pertained to integers and problem solving. There were no articles on class in relation to rational number, algebra, probability/statistics, trigonometry/calculus, and mathematical foundations. Hence, it appears that mathematics education researchers rarely examine the special strengths or needs ethnic or class groups have in relation to various topics.[17] Additionally, the grade-level and topic data combine to indicate that ethnicity and class are rarely studied in conjunction with upper-level topics, such as algebra and calculus, which often serve as college and occupational gatekeepers.

In examining ethnicity and class in relation to general educational topics, we see that the majority (over 68%) of articles on these two equity groups pertain to student achievement. When we consider that only 4% of articles on ethnicity or class pertain to educational environment, less than 5% relate to students in classrooms, and that only one article examined teacher education in relation to ethnicity (and none for class), one gets the impression that we look more at outcomes of these equity groups than how schooling experiences contribute to these outcomes. The fact that student affect and characteristics are also given some attention in relation to ethnicity and class suggests that when we do look beyond the outcomes to how they are created, we tend to look at students' individual characteristics, as opposed to the effect of particular mathematical topics, curricula, teachers, or school environment on these students. Additionally, with only 5 articles relating to ethnicity and assessment and no articles relating class and assessment, it also appears that we give little attention to how we actually assess these students' achievement, including potential biases in our methods.[18]

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[17] There is evidence to suggest, for example, that lower-class students might look at statistics differently than middle-class students (Lubienski, 1997). One would hope to see more attention given to helping those with the most barriers to overcome in our society learn statistics and other mathematical ideas necessary for analyzing, using and improving societal systems.

[18] British researchers recently found that the disparity between lower- and middle-class students' performance on standardized mathematics tests was greater on contextualized problems, due to unexpected way in which lower-class

Disability

There was a considerable jump in research on disability from early childhood to elementary education (from 3 to 73 articles). Only 15% of disability-related research focused on secondary or post-secondary levels, and no disability-related research examined adult basic education. We might consider the possibility that more research is needed earlier on disabilities and their relation to learning fundamental mathematical concepts (such as counting, comparing) that begin well before kindergarten. More attention might also be needed in relation to older learners with disabilities.

Unlike the other equity groups, almost half of the disability articles related to a particular mathematical topic. But as with class and ethnicity, the majority of these articles related to integers, with less but still significant attention given to problem solving and geometry/measurement. Virtually no attention was given to disability in relation to other mathematical topics.

In examining disability in relation to general educational topics, we see that, unlike the other equity groups, about half of the articles related to student cognition and to instruction, with significant attention also given to student achievement and teacher actions. With the majority of disability-related research being published in psychological journals, it is no surprise that cognition received such focus. Research on disability might need to broaden to include more attention to socio-emotional factors, including student affect, and educational environment, as well as cultural factors, including class and ethnicity.

Conclusions/Implications

When examining the data overall, the results support claims regarding a lack of attention to class, and to interactions among equity groupings. The data also reveal a large, overall emphasis on student cognition and achievement, and a relatively small emphasis on classroom processes, as well as on equity groupings in relation to these processes. These results seem to support Jacob's

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students interpreted these problems (Cooper, Dunn, & Rodgers, 1997). This raises questions about ways in which equity concerns could interact with assessment.

(1998) claim that mainstream mathematics education research has tended to focus on "cognition without context or culture."

Still, in some ways, the data convey a success story. From the data, one could argue that the mathematics education community has been responsive to the under-representation of women in mathematics, with gender-related research being widely accepted and utilized to help us understand and address gender gaps in mathematics achievement over the past few decades (American-Association-of-University-Women, 1992). The sheer numbers convey this — 323 articles, or over 10% of the mathematics education research articles published over the past 16 years considered gender in some way. As a specific example of the research community's responsiveness to issues of gender, when a gender gap in spatial ability was discovered, this became an area of concern for the mathematics education community, with 49 articles being published on gender and spatial abilities.

There is another way in which the research on gender and mathematics can be viewed. When looking over the list of first authors of the 323 gender-related articles, one sees many names repeatedly, with thirteen authors having published three or more articles.[19] Several of these names are well-known in mathematics education research, and several of their articles were published in *JRME* and other well-respected, U.S. education journals. This evidence indicates that a researcher can become established through doing gender-related research and/or that some established researchers chose to include gender in their research programs.

Still, some might caution that gender needs more attention, or perhaps a different type of attention than it has been receiving. While this might be true, the field of gender research in mathematics appears successful in terms of earning and sustaining attention and respect, particularly when contrasted with the situation for ethnicity and class.

Only one author published more than two of the 52 articles on class (Mevarech, 1985; Mevarech, 1991; Mevarech & Amiran, 1982), and four researchers authored exactly two articles

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[19] The thirteen are: Benbow, Bridgeman, Ethington, Fennema, Friedman, Hackett, Hollinger, Leder, Liben, Linn, Marsh, Newman, Ruthven.

relating to class (Emanualson, Kaeley, Mandeville, White). No article from any of these five authors appeared in a U.S. mathematics education journal.

Like class, only one author published more than two of the 112 articles on ethnicity (Cardelle-Elawar, 1990; Cardelle-Elawar, 1992; Cardelle-Elawar, 1995), and five authors published exactly two articles (Jones, Matthews, Reynolds, Waxman, and Whang). But unlike class, several of these authors' articles appear in well-respected U.S. education journals, including *JRME*. One notable feature, though, is that the articles published in the US mathematics education journals tended to report "good news" about achievement gaps closing or that, as Secada (1995) puts it, offer solutions that "fit mainstream agendas for reform and research" (p. 149). For example, Jones (1987; Jones & et al., 1984) was one of two authors to publish two ethnicity-related articles in JRME. One article reported that the race gap in the NAEP results was shrinking, and the other reported that test scores rise equally for minority and white students if they take more math courses.

In light of Secada's (1995) claims that those who try to raise serious equity concerns about poverty or ethnicity tend to be marginalized and held to higher standards of proof, these patterns raise the question of whether those who enter mathematics education careers with critical concerns about ethnicity and class are quickly discouraged. Issues involving funding, the publication process, and cultural incongruities between the researchers' backgrounds and that of academia (for those researchers who come from a minority or lower-class background) might contribute to the differences we see between the list of recurrent researchers on gender versus the lists of "one-hit wonders" for ethnicity and class. In fact, one interesting study could involve following up with those researchers who published an article on ethnicity or class in well-established journals and then never published again. Perhaps these researchers continue to publish, but not specifically in mathematics education.

Still, perhaps there are other reasons for the relative lack of research on class and ethnicity. In the case of class, perhaps so little attention is given to class, particularly in U.S. mathematics education journals, because we in the U.S. cling to a belief in equal opportunity for all, and we are

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not as ready to admit the existence or importance of classes as those in other countries. Or perhaps we tend to throw up our hands when confronted with class-based differences in mathematics achievement because many problems lower-class students face seem far beyond the school's control. Additionally, class is simply difficult to study. Not only is it relatively difficult to obtain class background information for students, but researchers can easily be attacked for defining class categories in problematic ways (since there is little agreement on how to define class groups — Duberman, 1976) and for insulting students by "labeling" them lower-class. In our attempts to move away from deficit theory, we have tended to limit our attention to the positive aspects of diversity. While gender and ethnic differences give richness and character to our society, there are fewer positive things to say about large disparities of wealth and power, particularly for those at the bottom rungs of society.[20] Hence, perhaps the strictly positive rhetoric surrounding current discussions of diversity could be limiting the attention we give to class issues, and perhaps constraining the ways in which ethnicity research is focused.

The situation for research on disability is, yet, another case altogether. While disability had a large number of articles relative to class and ethnicity, the vast majority of these articles appeared in psychological journals. Many researchers appear to be doing coherent, respected lines of research in this field, with over ten researchers authoring three or more articles in the pool. While these researchers tended to publish in psychological journals pertaining to disabilities, an exception to this rule was that several of these recurrent researchers also published in *Focus on Learning Problems in Mathematics.* (e.g., Montague, 1995; Parmar & Cawley, 1995; Woodward, 1995). Additionally, Baroody was a notable exception in being the only recurrent author on disability who published primarily in non-psychological journals, including *JRME* and *Educational Studies in Mathematics* (Baroody, 1986; Baroody, 1988). Still, overall, while disability-related research appeared to receive significant attention, it was not generally included in mainstream mathematics education research literature. The trends regarding disability-related research raise questions

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[20] This is not to say that lower-class cultures do not have strengths or that middle-class cultures do not have weaknesses. Yet, there are some difficult realities of lower-class life that tend to be ignored amidst recent attempts to move away from deficit views of diversity.

regarding the costs and benefits of the existence of journals specific to a particular group. While having several psychological journals relating specifically to disabled students might allow more research on disabled students to be published, one wonders if this ultimately promotes the isolation and marginalization of these strains of research.

In closing, although this study involves comparisons across educational research communities and across various topics, we should not assume that all research communities should be the same or that all topics should be treated equally. For example, gender has traditionally interacted with mathematics learning in ways that differ from other subject areas. Hence, while there has been more research on gender than on any other equity group, we cannot conclude that gender has received "too much" attention or that each equity group must receive the same amount or even type of attention. This study cannot speak to the quality of the research that has been published and cannot dictate how much is "enough."

This study does provide one type of evidence that can help us understand the degree to which particular topics have been addressed by various research communities. These comparisons can help us get a better sense of our character as a research community, including our priorities, strengths and weaknesses.

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