Dissertation abstracts:

Scientific evidence related to teaching and learning mathematics

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Abstract

This categorical analysis explores the mathematics education doctoral dissertations archived in UMI *Digital Dissertations* (1991-2005) and 115 abstracts of doctoral dissertations from 46 institutions offering doctoral degrees in 2004. The goal of this study is to a) index changes in the numbers of mathematics education doctoral candidates and b) describe major dissertation elements. The underlying purpose of the study is to help researchers identify under-researched topics in mathematics education. Trend data suggest little change in the numbers of mathematics education dissertations produced in the past 15 years. Categorical analysis of the 2004 abstracts of dissertations produced with a mathematics education focus suggest that the majority (65%) of the dissertations use qualitative methods, there is an nearly equal representation of research on college, secondary, and middle school levels, the ratio of male to female dissertation authors is approximately 1 to 2. Recommendations from the research suggest that carefully written abstracts may offer the best options for strengthening research strands needed to inform the teaching and learning of mathematics. Other recommendations suggest that the development and application of a more extensive taxonomy or coding scheme to document

dissertation research that focuses on mathematics education may help to identify under-represented topics in mathematics education.

Introduction

Although mathematics educators are engaged in a wide range of activities that may include the teaching of undergraduate- and graduate-level mathematics education courses as well as undergraduate- and graduate-level courses in mathematics (Reys, 2006), many assume major responsibilities for building strong research strands in their discipline. Much of this research work begins with their dissertation research and continues in their role as a dissertation advisor to emerging mathematics education scholars. This focus on research at the university level helps to identify and advance important, under-researched issues relating to mathematics education, and add to existing scientifically-based recommendations for policy and practice.

Reflecting the need for evidence-based research that is likely to facilitate the development of mathematics skills at all levels of education, one may observe an increased interest in the a) development of a sufficient number of mathematics educators to conduct meaningful research and b) recommendations forthcoming from research that focuses on mathematics education. For instance, researchers note an acute shortage in the number of trained mathematics education doctorates (Dubinsky, 1996; Glasgow, 2000; Reys, 2000, 2002, 2006; Reys & Dossey, 2008) and a lack of research focusing on the preparation of mathematics teachers (Cochran-Smith & Zeichner, 2005). The

National Council of Teachers of Mathematics notes the need to target “research to questions that are identified as key problems of importance to practice” (NCTM Research Committee, 2006, p. 76). And, the National Mathematics Advisory Panel (NMP), the U.S. Department of education acts on the need to examine and summarize scientific evidence relating to the teaching and learning of mathematics (U.S. Department of Education, 2006b, para. 3). These concerns are among those addressed in the final NMP (2008) report that recommends using research to “ensure the coherent growth of research addressing important questions in mathematics education” and increasing the “national capacity to conduct and utilize rigorous research” (*xxvi*).

Given the current spotlight on mathematics education, research is needed in order to strengthen the strands of research that support mathematics teaching and learning and illuminate related issues that include teacher preparation and best practice. Since research may begin or be advanced by dissertation research that focuses on mathematics education, there is value in exploring the contents of this body of literature to search for answers to questions such as the following: What can we learn from doctoral research in mathematics? What trends appear in the numbers and the demographics of mathematics education doctorates, in what context is the doctoral research being conducted (i.e., topics, level, research methods), and how may doctoral research in mathematics education add to the information that is needed by various educational communities?

The study described in this report was initiated in the summer of 2006. It utilizes a categorical analysis of the abstracts of dissertations that focus on mathematics education. The goal of the study was to describe the research contained in a) the dissertations completed by a set of individuals who received their doctorates in 2004 and b) the historical records and coding provided by *Dissertation Abstracts International.* A review of literature, also initiated in 2006, suggested that information from dissertations would add to existing literature on this topic. To set a boundary on the volume of dissertations focusing on mathematics education and any trend data, the researcher limited the exploration of trend data to a 15-year period (1991-2005) and the categorical analysis of dissertation abstracts to one year (2004). The research questions are shown below:

- What trends appear in the numbers of mathematics education dissertations produced between 1991 and 2005 in the UMI archive of *Digital Dissertations*? In one year (2004), what is the proportion of male doctorates to female doctorates?
- What useful information may be found in the UMI abstracts that are archived in *Digital Dissertations* for 2004? Specifically, what topics in mathematics education are being researched, at what level is the research being conducted, what research methods are being used, and what recommendations are presented?

Literature Review

The author conducted several reviews of literature relating to the quantity and content of doctoral research to ensure that the most recent information could be incorporated in the research. Initial reviews conducted using the Educational Research Information Center [ERIC] in 2006 suggested that there was a need for current research to extend the work that was done in the 70's, 80's and 90's. For example, Suydam (1979, 1985), Owens (1996), and Reed and Owens (2000) prepared categorical listings of dissertation research and their work has been published in the *Journal for Research in Mathematics Education*. However, no similar categorical research on doctoral dissertations has appeared in the ERIC database subsequent to 2000. Searches were conducted again in 2/19/07 and 7/30/08. On 7/30/08, 25 records were found in ERIC using "research in mathematics education", "research on mathematics education", and "doctoral dissertations".

Evidence of National Interest

As indicated above, the documents found in the ERIC searches include a number of annual reports of dissertation research relating to mathematics education. (For example, 22 entries from the 7/30/08 search appear to be annual reports published in the *Journal for Research in Mathematics Education.)* Of particular interest to this study is the most recent report, the work of Reed and Owens (2000). Reed and Owens reviewed all dissertations (n=295) abstracted in *Dissertation Abstracts International* in 2000, (p. 1). Each dissertation included in

their report was identified by the dissertation title, author, grade level, and focus. The Reed and Owens report, sponsored by the U.S. Department of Education Office of Educational Research and Improvement [OERI] and illustrating the longstanding interest in the content of mathematics education dissertations, is representative of a sequence of similar annual reports that have been archived in ERIC since the early 70s. It should be noted that the numbers of dissertations contained in these annual reports may differ from those reported by other researchers for the same time period due to the fact that the dissertation database is active. Indeed, new research studies may be added to ERIC at any time.

Evidence of Critical Need

Contained in research literature is evidence of a critical need for mathematics education doctorates (Dubinsky, 1996; Glasgow, 2000; Reys, 2000, 2002, 2006). For example, Glasgow estimated that there were 120 graduates produced annually from 1993-1995. Reys (2000) noted that the National Research Council (NRC) reported even fewer numbers, a yearly average of about 70 mathematics doctorates between 1982 and 1998 (p. 1269). Using the 1998 NRC summary report as a source of information, Reys added that nearly "80% of current mathematics education faculty" in doctoral-granting institutions will be eligible for retirement within the next ten years" (p. 1269). There is additional support for the belief that there continues to be a critical need for more mathematics education doctorates (Reys & Dossey, 2008)

Preparation, Quality, and Communication of Research on Mathematics Education

A major piece of literature has been recently published to address the preparation, quality, and communication of research on mathematics education (Reys & Dossey, 2008). In this volume, Reys, Glasgow, Teuscher, and Nevels (2008) index the doctoral production in mathematics education between 1960 to 2005 using data self-reported by the student as the 'primary field of dissertation research' and as provided by the National Opinion Research Center [NORC] (p. 3). Reys, et al. acknowledge that the NORC data upon which their report is based may not capture all of the graduates who pursued the study of mathematics, indicating that "Some graduates who pursued the study of mathematics education report that they did not mark 'mathematics education' as their major field (Glasgow, 2000). Instead, they indicated the department within which the mathematics education program resided" (p. 3). In this research report, Reys, et al. (2008) indicate that 843 doctorates in mathematics education were granted in the 90's and projected 863 doctorates would be graduated in the 00's (p. 5). They also note a gender shift in the numbers of male to female graduates, reporting that 60% of graduates are female when in previous decades, as opposed to the 5 to 1 ratio of males to females reported in the 60's (p. 5).

In earlier research reports, Reys (2000) and Glasgow (2000) suggest that the preparation of future graduates of doctoral programs in mathematics may

need to be changed to meet the demand for mathematics education doctorates. Reys and Glasgow note the difficulty of identifying people who have completed doctoral studies; both agree that there is a shortage of doctorates in mathematics education and offer suggestions in support of their view . For example, Glasgow writes:

> This study corroborates past reports that a critical shortage of doctorates in mathematics education exists. It also points out that the present process and techniques used to count these doctorates yields incomplete or inaccurate results. Although a study of this magnitude would be difficult on a regular basis, some sort of regularly scheduled survey of doctorates in mathematics education would be most helpful. This would be a valuable project for an existing professional organization to assume. (Glasgow, p. 132)

Reys (2000) recommends that the National Science Foundation [NSF], National Research Council [NRC], American Mathematics Association [AMA], Mathematics Association of America [MAA], and National Council of Teachers of Mathematics [NCTM] work together to increase the numbers of doctorates in mathematics education. One of the three steps that Reys (2000) believes essential is that of developing "a procedure (maybe similar to the Annual American Mathematical Society Survey) that provides a valid measure of the number of doctorates in mathematics education that are awarded and the location of these programs" (Reys, p. 1270).

Other researchers are interested in focusing attention on issues relating to the quality of doctoral studies and the need to communicate the outcomes of such research. Schoenfeld (2000), for example, provides arguments for and against using various forms of research in mathematics education; Eisenhart and DeHaan (2005) suggests that the demand for "scientifically based" research implies the "need for more education researchers who can conduct scientifically based studies" (p. 3) and noted that training in research methods is a critical part of the process.

The communication of the research findings is critical to the successful use of application of research, as noted by the NCTM Research Committee (2006) with the committee's suggestion that the roadblocks to communication are "cultural differences, methodological difficulties, governmental barriers, and insufficient bridges of communication between the community of practitioners and the community of researchers" (p. 79). The Research Committee posited that the "practitioner with a working knowledge of both research and teaching may be of greatest help in brokering the grounds for communication" (p. 80).

The doctoral researcher and dissertation team are challenged to design meaningful research, expand and clarify existing research, and report the outcome of the research to the widest audience possible. To be able to a) successfully link new research to existing research or b) design research to address recommendations forthcoming from research, it is essential to be able to search for, find, and evaluate related research. For example, one of the major sections of a research report or dissertation is the literature review. Educational

researchers have stated that “being intimately familiar with the professional literature in your general area of interest is a necessary prerequisite to problem identification” (Johanson & Brooks, 2002, p. 2). Boote and Beile (2005) have noted the centrality of the dissertation literature review to the production of useful research. Not only do today’s electronic library resources enable researchers to access dissertation abstracts, but it is now possible to read full text of dissertations that have previously been unavailable.

Research based on Abstracts

Given that the information contained in dissertation abstracts may help students’ and researchers’ to locate research pertinent to their own work and that the abstracts may be able to index trends in the production of mathematics education doctorates, the author reviewed a small sample of documents that address standards for writing abstracts. The following are some illustrations of that literature.

The fifth edition of The American Psychological Association (APA) manual offers suggestions for writing the brief and comprehensive summaries that are characteristic of a well-written abstract (2001, p. 12-14). The APA manual, for example, lists the components that should be included in the abstract of an empirical study (problem, subjects, method, findings, and conclusions). More detailed guidelines may be found in (AERA, 2007; Galvin, 2004; Pyrczak, F. 2005; Smith & Krathwohl, 2005). Recent publications (Boote & Beile, 2005; Hostetler, 2005; Kelly & Yin; 2007; Kennedy, 2007) discuss the important part the

abstract plays in establishing and maintaining the qualities needed in order to find research meaningful. Samples and guidelines for crafting narrative and structured abstracts are available online from ERIC using http://www.eric.ed.gov/ERICWebPortal/resources/html

Method

The research method required a plan for selecting data from the UMI Digital Dissertation archive and a plan for selecting institutions from which to view dissertation research found in the UMI archive. The first set of data provided the trend data that is used to view the change in numbers of dissertations with a mathematics education focus. The second set of data provided a subset of UMI abstracts of dissertations completed at institutions with doctoral mathematics education programs from which to view the characteristics of dissertation research conducted recently (2004). While the selection of data are similar to that of Reys, Glasgow, Teuscher, and Nevels (2008) and Glasgow (2000), it was anticipated that there would be similar results. In this research, the subject code for "mathematics education" was used to locate all dissertations with "mathematics education" and this set was reduced by institutions with doctoral programs in mathematics education.

Data

On 6/30/06, a search for dissertation abstracts with "mathematics education" as the subject (SU(0280)) was conducted using ProQuest's archive of

UMI Digital Dissertations. The search identified 7598 doctoral dissertations and masters' theses (http://proquest.umi.com). A subsequent search on 3/7/07 identified 7975 doctoral dissertations and masters' theses. Of the 7975, 7181 were doctoral dissertations. More dissertations are added to this database as time passes, so a more recent search might yield more abstracts. The 3/7/07 search produced 4495 doctoral dissertations with a subject code for "mathematics education" within the last 15 years (1991-2005), approximately 300 annually.

Because the archive of dissertations is active (dynamic), abstracts from the dissertations of doctoral degrees awarded in 2004 were selected for review with the expectation that this sample would be relatively stable and suitable for description. To focus on dissertations awarded in a specific year, the code corresponding to the "degree date", for example DDT(2004), was added to the search.

A more focused search (UMI code: SC(XXXX)) was conducted using the school code of the specific universities with doctoral programs in mathematics education posted on the SIGMAA Research in Undergraduate Mathematics (RUME, 2004) web (www.rume.org/phd.html). The universities on the RUME list were separated from the UMI archive to form a subset of research completed at universities with doctoral programs in mathematics education for analysis. The RUME list, last updated on 12/23/2004, was retrieved for this study on 6/29/2006. It is described by the organization as a preliminary list of 46 institutions, two of which have joint programs with other listed institutions. The 46 institutions

provide an approximation of the numbers of degrees awarded at institutions specifically designed to prepare doctorates in mathematics education. Appendix A lists the RUME institutions and illustrates the numbers of doctorates awarded during this period.

Trend data representing the numbers of dissertations with a focus on mathematics education arise from a simple search of the UMI archive from 1991-2005. The second set of data (2004) provides a more focused view of the content of dissertations in mathematics education. Attached to each dissertation record are descriptive codes and information that index the subject (topic) focus and name of dissertation researcher and advisor. In addition, the abstracts of each dissertation offer information about the grade level, research methods used, and any stated recommendations. Of secondary interest are the gender of doctoral candidates and their advisors. This information was extrapolated based on common naming conventions for male and female.

The dissertation abstract was chosen for analysis because it provides readers with the critical information they need in order to a) complete a literature review for their own research studies and b) determine whether to review the entire text of a given dissertation. Also, the abstract contains many keywords to help readers find dissertations on specific topics.

Limitations

This categorical analysis introduces a measure of subjectivity that, although present in the annual and trend reports described earlier, may be over-

interpreted. As for the earlier research, results from this study are limited by a number of issues. First, Digital Dissertations is an active archive and not all dissertations may be included in this database. Second, it is possible that some doctoral degrees in mathematics education are awarded to institutions that are not listed by RUME. In such cases, the abstract is not included among the data reviewed. Third, a review of one year (2004) of dissertations limits our ability to generalize or estimate changes in the characteristics of dissertations and doctoral candidates awarded over time. Fourth, changes in institutional programs or policies may influence the numbers of mathematics education doctoral candidates and the programs that support these candidates. Fifth, candidates self-report the subject (topic) codes that appear in the data. Finally, some of the abstracts (2004) do not provide all of the information needed for the categorical analysis (i.e., topics, levels, methods, and recommendations).

Results

What trends appear in the numbers of mathematics education dissertations produced between 1991 and 2005 in the UMI archive of Digital Dissertations?

The data provide a good estimate of the number of doctoral degrees awarded with a focus on mathematics education in the past 15 years (1991-2005). The results are presented in Table 1.

<Insert Table 1 here.>

Table 1 illustrates that there were 301 doctoral dissertations archived in 2004 at the time of the 3/7/07 search. Although the 331 archived in 2005 may be

under-reported due to the time of the search, the numbers of doctoral awards between 1991 and 2004 appears relatively stable while reflecting a decline from the 1996 high of 341 and recent annual increases of 301 and 331 (2004 and 2005, respectively). For the 15 years, 1991-2005, the mean average annual number of dissertations with a "mathematics education" focus is nearly 300. Figure 1 provides a graphical representation of the data contained in Table 1.

<Insert Figure 1 here.>

While the data in Table 1 and Figure 1 illustrate the 301 "mathematics education" doctoral dissertations awarded in 2004, only 115 were awarded by the 46 institutions posted by RUME. This number (115) is similar to the numbers reported by Glasgow (2000) for 1993-1995. In this study, Glasgow estimated that there were between 120-147 degrees awarded annually from 1993-1995 by institutions with doctoral programs in mathematics. Although Glasgow's estimates are higher than those presented in this analysis, a more accurate comparison of data gathered for this study and for Glasgow is difficult due to the limitations in the data available. Based on this study of 2004 doctoral awards and the research of Glasgow, it appears that the numbers of doctoral degrees awarded in mathematics education has remained stable and may even be declining. The production of doctorates in science and mathematics education, as viewed from 1972-1982, appears to have fluctuated. For example, the Survey of Earned Doctorates (Science Resources Studies Highlights, 1983) reports that "although doctorates with specialization in science/mathematics education peaked at 364 in 1972, they declined to only 136 in 1982" (abstract).

What useful information will researchers find contained in abstracts that have been archived in the UMI Digital Dissertations for 2004? Specifically, what is the ratio of male to female dissertation researchers and what is the ratio of male to female dissertation advisors, at what level is the research being conducted, what research methods are being used, and what are the major topics being researched? Did the researcher offer any recommendations?

Abstracts of the 115 mathematics education doctoral degrees awarded by RUME-identified institutions in 2004 were downloaded for review. This is the number (n=115) of dissertations of the 2004 doctorates awarded to candidates who attended institutions posted on RUME (2004). RUME lists the U.S. Doctoral Programs in Mathematics Education and notes which programs are supported by a school or department of mathematics (n=21), and which are housed in a school or college of or department of curriculum and instruction (n=31). Of the 46 institutions listed, 6 institutions offer a focus on research in undergraduate (collegiate) mathematics education. Two programs are listed as "joint" programs, reducing the number of programs to 44.

Of the 44 institutions, 10 (23%) institutions did not have 2004 dissertations archived in UMI. The UMI archived five or greater digital dissertations for eight institutions. See Table 2. Illinois State University reported ten dissertations, the greatest number, for 2004. The mean average number of dissertations per institution was 2.6 (115/44). See Appendix A for a list of all RUME institutions and the numbers of dissertations found in *UMI Digital Dissertations*.

<Insert Table 2 here.>

As indicated earlier, 115 dissertations were found as a result of searching Digital Dissertations using the keywords “mathematics education.” Based on commonly used names for males and females and where it is possible to determine, the ratio of male to female dissertation authors appears to be approximately 1 to 2, respectively. In contrast, the ratio of male to female dissertation advisors was nearly equal. Because this data is based on estimates, it is not practical to identify any trends.

When using the abstract as the source of information to index the level the research focused on, it was found that the research focused on college, high school and middle school mathematics levels in approximately equal proportions (24%, 28%, and 23%, respectively). Fewer studies focused on the preschool (4%) or elementary school level 15%, and 12% of the studies did not report the level in the text of the abstract. (Because some studies focused on more than one level, this total does not sum to 100%.)

Table 3 illustrates the number and percentage of topics researchers named as the main focus for research. As shown below, 20%, 11%, 10%, and 4% focused on secondary, higher education, elementary, and community college education, respectively. Topics that appear in 10 or greater percent of the dissertations include curriculum and instruction (15%), teacher training (14%), educational psychology (11%), and education technology (11%). These topics reflect the UMI codes assigned by each dissertation candidate. Based on these

assignments, secondary education appears to be the most commonly researched topic, followed by postsecondary education.

<Insert Table 3 here.>

Of the 115 dissertation abstracts reviewed, approximately 75% clearly report the size of the research population and approximately 21% offer recommendations based on the outcome of the research. Approximately 20% appear to be quantitative, 65% qualitative, and 15% mixed-method. The length of the dissertations averaged slightly over 200 pages each.

Discussion

There are three interesting features of the data described above. First, it appears that policymakers who wish to index the growth of doctoral-level mathematics educators are dependent upon estimates to identify trends in the numbers of doctorates completing dissertations with a focus on mathematics education, and the research focus (i.e., topic, level, research methods used, and recommendations). Trends may be shaped by changes at the university level, program level, or other available resources. Doctoral candidates who are preparing to become mathematics educators may be completing their research as a part of programs external to those designed to produce doctorates in mathematics education.

Secondly, the codes attached to dissertations and keywords found in abstracts offer a limited view of the focus of dissertations. For example, many abstracts do not offer clearly written problem statements; descriptions of data

used, sources, unit of analysis, or methods; findings; or recommendations that provide the links that researchers may need to expand upon or initiate under-researched areas.

Attempts to describe the content of the dissertation (i.e., topic, level, methods, recommendations) using either the content of dissertation abstracts or UMI subject codes are limited and attempting a categorical analysis introduces subjectivity. Although it does appear from this research using abstracts from dissertations produced in 2004, that a smaller proportion of research focuses on the elementary school level than upon college or high school levels and that a) the greatest proportion of the research is qualitative (approximately 66%), b) approximately 80% of the abstracts report the size of the population, c) few abstracts (20%) offer recommendations based on the outcome of the research, and that the ratio of male to females authoring dissertations is about 1 to 2, respectively.

Using UMI dissertation data from 1991-2005, the production of mathematics education doctorates appears to be increasing to meet the 1996 annual number of 341. However, the data used for this study may not include all doctorates included in the 15-years of abstracts listed in the UMI database, This leads to third interesting feature of this report, Reys, et al. (2008) report that the number of mathematics education doctorates awarded in the 90's, a period of ten years, was 843. This number represents a rough estimate of 84 per year, a contrast to the estimated 300 annually noted in this study! However, when the dissertations with "mathematics education" are selected based on an institution

providing a doctoral program such as those listed in RUME (2004), this study's accounts of 115 graduates in 2004 appears to be similar to Reys, et al.'s mean of 84 for each year of the 90's, and Glasgow's (2000) 120-147 graduates per year between 1993-1995. Reys et al. acknowledge the following, "Identifying current doctoral programs in mathematics education is not an easy task, and the reasons are varied (Glasgow, 2000)…individuals receiving doctorates with an emphasis in mathematics education are difficult to track" (p. 3).

Recommendations

Based on the literature reviewed and the information contained in the abstracts of all of the dissertations completed by 2004 doctoral candidates who were affiliated with RUME institutions, the following recommendations are made to public and private agencies, institutions of higher education, and researchers who wish to strengthen the strand of research that focuses on mathematics education.

- Develop a common language to describe methods and research designs used to research mathematics education issues. Also, suggested, by Reys (2000).
- Develop and apply an expanded taxonomy or coding scheme to document research on mathematics education.
- Craft abstracts that clearly address all of the major components of a research study.
- Identify under-researched topics.

As stated earlier, the abstracts and full text of doctoral dissertations are now available to scholars who have access to library resources. Given this access, it becomes possible to create links between related research, to expand on existing research, and initiate meaningful research on under-researched topics. While it may be difficult to immediately change the preparation of future graduates of doctoral programs in mathematics, it appears that carefully crafted abstracts of dissertation research may offer some initial advancement.

In summary, this paper presents the findings of a review and analysis of the dissertations archived in *Digital Dissertations,* http://proquest.umi.com. Mathematics education faculty with appointments as dissertation or thesis advisors, undergraduate faculty who teach pre-service teachers and undergraduate mathematics instructors, practitioners and policy-makers, and researchers who hope to build a ladder of meaningful research or develop an agenda for future research need to be able to use the information found in the dissertation work of others. And this descriptive, categorical analysis suggests that the discipline may be supported by the development of measures and reporting practices that will help index, track, and trace the research contained in dissertations.

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Table 1:

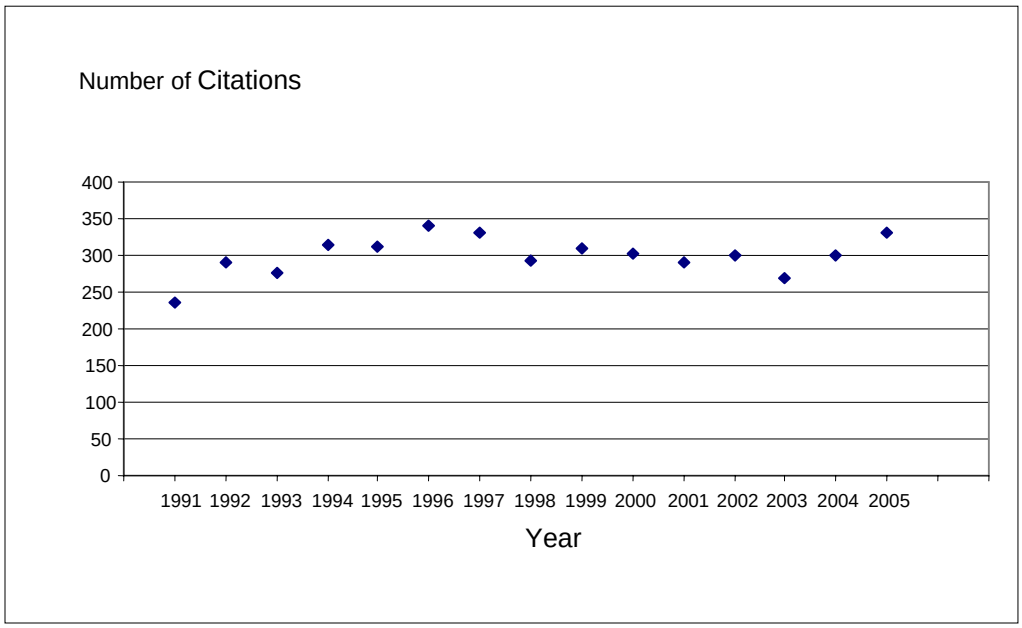
Number of Doctoral Degrees with a Focus on Mathematics Education

Degree Date	Number of Citations
1991	235
1992	290
1993	277
1994	314
1995	312
1996	341
1997	331
1998	294
1999	310
2000	302
2001	290
2002	299
2003	268
2004	301
2005	331

Source: Digital Dissertations, 8/1/2006
Note: Data validated for 10-year period from 1991-2000 on 8/4/08 using http://proquest.umi.com. 3006 documents were found for:
SU(Mathematics education) AND PDN(>1/1/1991) AND PDN(<12/31/2000) AND NOT DISVOL(mai)

Figure 1:

Number of Dissertations with “Mathematics Education” Focus,1991-2005



Source: UMI Digital Dissertations, March 7, 2007

Table 2:

Universities with Greatest Number of Doctoral Dissertations with a Focus on Mathematics Education in 2004

Rank	University Name	Number of Dissertations
1	Illinois State University	10
2	Pennsylvania State University	7
3	Arizona State	6
4	North Carolina State University	5
4	Ohio State University	5
4	Oregon State University	5
4	University of Illinois	5
4	University of Wisconsin	5

Source: merged data from MAA-SIGMAA RUME Web (6/29/2006) & UMI Digital Dissertations (6/30/06)

Table 3:
UMI Digital Dissertation Subject (Topic) Codes

Code	Name	Number	%
0280	Ed mathematics	115	100
0533	Secondary Ed	23	20
0727	Curriculum & Inst	17	15
0530	teacher training	16	14
0525	Ed. Psychology	13	11
0745	Higher Ed	13	11
0710	Ed Technology	13	11
0524	Elementary Ed	12	10
0529	Special Ed	7	6
0714	Ed Sciences	7	6
0275	Community College	5	4
0514	Ed Admin	5	4
0633	Psychology Cognitive	5	4
0340	Ed Sociology	3	3
0325	Black Studies	3	3
0288	Tests & Measure	3	3
0405	Mathematics	2	2
0518	Early Childhood	2	2
0453	Women's Studies	2	2
0984	Computer Science	2	2
0535	Reading	2	2
0291	Modern Languages	1	1
0463	Statistics	1	1
0519	Guidance & Counsel	1	1
0537	Engineering-Gen	1	1
0516	Adult & Continuing	1	1
0413	Music	1	1
0631	Soc Ethnic & Racial Studies	1	1
0459	Speech Communication	1	1
0617	Political Sci & Pub Adm	1	1

Source: merged data from MAA-SIGMAA RUME Web (6/29/2006) & UMI Digital Dissertations (6/30/06)

Appendix A: U.S. Doctoral Programs in Mathematics Education Listed on MAA - SIGMAA RUMI Web (6/29/2006) and Number of Dissertations Dated 2004 Archived in UMI Digital Dissertations (June 30, 2006) (N=44)

Record	University Name	Number Dissertations	UMI University Code
1	Arizona State	6	0010
2	Auburn University	2	0012
3	Boston University	3	0017
4	Central Michigan University	0	6006
5	Teachers College of Columbia University	3	0055
6	Florida State University	3	0071
7	George Mason University	0	0883
8	Georgia State University	4	0079
9	Idaho State University	0	0320
10	Illinois State University	10	0092
11	Indiana University, Bloomington	0	0093
12	Michigan State University	2	0128
13	Montana State University	2	0137
14	New York University	1	0146
15	North Carolina State University	5	0155
16	Northern Illinois University	0	0162
17	Ohio State University	5	0168
18	Oregon State University	5	0172
19	Pennsylvania State University	7	0176
20	Portland State University	0	0857
21	Purdue, Calumet, Indiana - Joint with Indiana University	3	0183
22	Rutgers University	3	0190
23	San Diego State University - Joint with U. CA., San Diego	0	0220
24	Stanford U	2	0212
25	Syracuse University	0	0659
26	Texas A & M University	4	0803
27	University of Arizona	2	0009
28	U. of California, Berkeley	0	0028
29	U. of California, San Diego - Joint with San Diego State U.	0	0033
30	University of Georgia	2	0077
31	University of Illinois (Chicago & Urbana Champaign)	5	0799/0090
32	University of Iowa	2	0096
33	University of Maryland, College Park	1	0117
34	University of Michigan	2	0127
35	University of Minnesota	2	0130
36	University of Missouri	2	0133
37	University of Montana	0	0136
38	University of New Hampshire	2	0141
39	University of Northern Colorado	1	0161
40	University of Oklahoma	1	0169
41	University of Pittsburgh	4	0178
42	University of South Florida* (n=5)	4	0206
43	University of Texas, Austin	3	0227
44	University of Tennessee	4	0226
45	University of Wisconsin, Madison	5	0262
46	Western Michigan University	3	0257

Source: http://www.rume.org/phd.html