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ABSTRACT

The content, scope, and methodology of dissertations on adult mathematics education in North American were examined. The study database consisted of the abstracts of 113 dissertations written between 1980 and 2000. The topics covered in the individual dissertations were as follows: assessment/frameworks/standards (14); contexts (3); instructional approaches (31); parents (2); research into practice (36); teacher knowledge (4); theory (2); understandings (6); and workplace/vocational (7). Fifty-one percent of the dissertations examined adult mathematics education at undergraduate institutions, 19% examined ABE-level mathematics instruction, and 12% examined mathematics instruction in high school equivalency programs. Fifty-eight percent of the dissertation abstracts reviewed for the study identified tests as the vehicle used to conduct the study, whereas 42% used questionnaires or surveys, 23% relied heavily on interviews, 10% relied on analysis of student records, and 9% relied on observations. The most popular major topics examined were as follows: prediction of success; methods that may contribute to success; and math anxiety that may inhibit success if not neutralized or at least decreased. Only two dissertation abstracts indicated standards and the reform movement as their focus, and only three mentioned the theme of mathematics as problem solving. (The bibliography lists three references. A list of mathematics education-related dissertations by theme is appended.) (MN)

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A Review and Summary of Research on Adult Mathematics Education in North America (1980-2000)

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Introduction

Since its inception as a field of study at the turn of the last century, the discipline of mathematics education has matured and become accepted by the North American education community as a credible research area (Kilpatrick, 1992). Over the past twenty years, substantial research has been conducted at all levels of mathematics education, kindergarten through graduate school, and reported in dissertations and journals. The identification of the subset of that research that examines mathematics education for adult or non-traditional students is the subject of this study. In this presentation I will report on the dissertations in mathematics education that are concerned with that population.

Methodology

The databases of Dissertation Abstracts International were searched using the Boolean argument "Adult AND Mathematics AND Education" on the "Subject" key. Two-hundred-and-five dissertations were found, 195 dating from 1980. The abstract for each dissertation was downloaded, printed, and reviewed for applicability. Eighty-two were culled for a variety of reasons. Some did not report research conducted in North America, others, although typified as adult, did not address the teaching of mathematics to adult students. For example, the students tested in one study were junior high school students. Eight abstracts were removed because they addressed interventions with teachers of mathematics and were deemed by this researcher to be concerned more with teacher in-service rather than direct teaching of mathematics to adults. Admittedly, this was a subjective decision and another researcher might choose to include them.

The journalist's questions of "Who, what, when, where, why, and how?" served as the basis of the analysis of the abstracts. The exact questions are indicated later in this report, but one example would be "Who is funding or supporting the research?" A coding template was then superimposed on each abstract printout and the data coded. Again, subjective decisions were made at times and the researcher invites others to duplicate this process in order to validate her findings. Results were then totaled and recorded in a spreadsheet, the contents of which served as input to the creation of the overhead transparencies shown during this presentation.

Who

From its inception, Adults Learning Maths (ALM) has been a forum that promoted dialogue between researchers and practitioners. An integral part of that dialogue is the encouragement for practitioners to undertake research projects in their work and an invitation to researchers to apply theory to practice by working in learning situations. The first "Who?" question, therefore, is "Who is reporting research?" The abstracts did not always provide clear answers to this question. In some cases, personal knowledge allowed me to assign the designation. Otherwise, unless the abstract clearly identified the author as a practitioner, the individual was counted as a researcher. As a result, an overwhelming majority of the dissertations, 88%, were determined to have been written by candidates whose primary role was researcher.

The second question under this heading was "Who funded or supported the research?" Support in many cases was manifest as "permission to conduct" rather than financial support. This was determined to be the case when an abstract indicated that the research was conducted in a particular section or class within an institutional setting. Sixty-three percent (71) of the dissertations fell into this category. Support for 23% (26) could not be determined from the abstract. The remaining 16 dissertations were funded by government agencies (11%) or industry (4%).

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What

In recent years, qualitative research has continued to gain acceptance within the mathematics education research community. Abstracts were therefore examined to determine if the researcher had incorporated one or more qualitative methodologies into the study. Only 17 (15%) dissertations were determined to be purely qualitative studies. An additional 14 (12%) combined qualitative and quantitative methods. A full 82 (73%) were conducted using quantitative methods. The following table shows a breakdown by year of studies that employed each method:

Table 1

Type	80-81	82-83	84-85	86-87	88-89	90-91	92-93	94-95	96-97	98-99
Qual	1	1			1	2	3	2	6	1
Quan	8	7	13	8	10	7	7	10	9	3
Both	1		1	4	1	1	3		2	1
Total	10	8	14	12	12	10	13	12	17	5

It would appear that qualitative methods have gained a foothold, but still represent the method of choice for a minority of doctoral candidates.

The program for ALM-7 was constructed around nine themes that emerged from the proposals submitted. The investigation of "What?" asked the question: "What ALM-7 themes, if any, are represented by the dissertations?" While a few abstracts could not be characterized by the themes, most could. A list of the dissertation authors sorted by ALM-7 themes is contained in the Appendix. While, as stated earlier, it was rarely clear that the researcher was a practitioner, the number of dissertations that could be characterized as "Research into Practice" or "Instructional Approaches" indicates a strong link between researcher and practitioner in adult mathematics research. The following table shows the breakdown by ALM theme:

Table 2

Theme	Number	Percent
Assessment/Frameworks/Standards (AFS)	14	12
Contexts	3	3
Instructional Approaches	31	27
Parents	2	2
Research into Practice	36	32
Teacher Knowledge	4	4
Theory	2	18
Understandings	6	5
Workplace/Vocational	7	6

Other non-ALM themes emerged during the abstract review process. Twenty-six (23%) of the dissertations investigated tests or personal factors that can be used to predict the success of an individual in the adult mathematics classroom. Another 11 (10%) reported findings about classroom methods or teaching styles that contribute to student achievement. Interventions with math-anxious students were discussed in 11 (10%) of the abstracts. Finally, the application of technology to adult learning situations was reported in ten entries, nine of which concerned computer-aided instruction (CAI) and one of which involved television.

When

Adult mathematics instruction occurs at levels comparable to all traditional student settings. Adult basic education starts with the simplest of mathematical concepts. Adult secondary education and General Educational Development (GED) preparation provides the equivalent of high school mathematics content. In 1996, 3,000,000 adults enrolled in ABE classes while over 900,000 pursued ASE instruction. Some 263,000 individuals over the age of 24 took the GED test in 1998. While not all these students engaged in mathematics classes in those years, it is safe to assume that a substantial number did at some point in their studies. Post-

secondary institutions offer mathematics instruction in both remedial and college-credit courses. In 1997, 35% of the undergraduate students at degree-granting institutions were at least 25 years old. If the threshold is lowered to 22 years of age (an additional 15.6% of the undergraduate population), then adult students were in the majority, 6.3 million out of 12.45 million. Now assume that students take mathematics during three of their eight undergraduate semesters. That assumption translates to 2.36,000,000 adult students taking undergraduate mathematics each year. It is probably more likely that the returning student enrolls for two semesters of remedial mathematics followed by two semesters of credit courses, so a less conservative figure would be 3.15 adult students per million per year.

The first "When?" question therefore asked the level of instruction addressed by the research in the dissertation abstracts. The distribution is quite different from the distribution of the students and, in all probability, reflects the academic position of the researcher. Fifty-eight of the dissertations (51%) were conducted at undergraduate institutions. Twenty-one (19%) were ABE level, while 13 (12%) were either ASE or GED. In some ways, the 51% figure is lower than might be expected. In the United States it is becoming increasingly difficult to obtain or maintain a position, get tenure, or achieve promotion at a tertiary institution without a doctoral degree. Candidates for a doctoral degree, therefore, would be likely to come from that educational level and use their classrooms as laboratories. On the other hand, instructors with elementary or secondary certification often supply ABE mathematics instruction. They are frequently part-time faculty and have little financial or career incentive to pursue a doctoral degree. In that light, the 19% rate is surprisingly high, even though the ABE population accounts for a substantial portion of the adults in formal instruction.

The second "When?" question asked, "In what year was the research conducted?" The reader can refer to Table 1 and see that, with the exception of a spurt of dissertations between 1996 and 1997, the rate has been fairly constant. It is interesting to note that the adult-centered degrees issued in that period accounted for 15% of the mathematics education doctorates awarded. It is heartening to note that researchers in adult mathematics education are persisting despite a paucity of research money compared to elementary and secondary funding sources.

Where

"Where" questions had less definitive answers than previous types. Abstracts were often vague about the geographic location where the research was conducted or reported as well as the institutional setting in which it was accomplished. Twenty-four dissertations (21%) gave no clue about the type of institution where the research took place. Sixty-one were situated at a tertiary institution: 31 (27%) at junior or community colleges, 30 (27%) at universities. Adult learning centers harbored 15 researchers (13%), with the remaining split between industry (6%) and government (5%). There was no apparent geographic clustering of either investigative or reporting locale.

How

The quantitative nature of most of the dissertations depended on easily quantified research instruments. Fifty-eight percent of the abstracts identified tests, predominantly normed tests, as the vehicle used to conduct the study. Forty-two percent used questionnaires or surveys. Qualitative components relied heavily on interviews (23%) with analysis of student records of transcripts (10%) and observations (9%) accounting for all but one of the studies. One dissertation was based on a case study. Keep in mind that dissertations often used more than one method, so the percentages reported total more than 100%.

Why

"Why?" was the question with the least clear answer. Obviously, the researchers undertook their task to complete doctoral degree requirements. Some reasons for pursuing the degree have already been suggested. Securing a present post or creating the potential for advancement are likely explanations. The selection of a topic for the project leaves more room for conjecture. It was disappointing to read abstracts that seemed designed as a quick and dirty approach to fulfilling a degree requirement. Far more appealing were those studies whose authors conveyed a passion for testing a theoretical framework or novel methodology as the heart of their studies. Their work provides a basis upon which later studies can be built.

Discussion

The number of dissertations that investigated adults learning mathematics was larger than I had anticipated when I undertook this project. They seem to be clustered around a few major topics: prediction of success, methods that may contribute to success, and math anxiety that may inhibit success if not neutralized or, at the very least, decreased. At first I found the interest in predicting success disappointing, almost a condemnation of teacher effort. Viewed in a positive light, however, the existing research provides a teacher with tools to identify "at risk" students. Their needs can then be addressed with interventions rooted in the research base on good practice and math anxiety programs.

What was discouraging was the paucity of studies that investigate the applicability of the K-12 National Council of Teachers of Mathematics (NCTM) standards for adult populations (NCTM, 1989, 2000). Only two of the abstracts indicated the standards and the reform movement as their focus. Mathematics as problem solving is a key theme of the new elementary and secondary curricula, yet only three abstracts identified that idea as a keystone. Other aspects of mathematics study, such as communication through writing or cooperative activities, were also neglected.

Only one of the dissertations addressed distance learning and the use of the Internet as a focal point, despite the fact that both of these ideas are hot topics in educational circles. It takes several years for dissertation research to reach fruition, so it is possible that these methodologies are currently being investigated and findings will be reported in the next few years. Many adults in the United States are not native speakers of English, yet none of the dissertations investigated the impact of English as a Second Language (ESL) or the implications of childhood mathematics learning outside North America on the study of mathematics in adulthood.

Conclusion

The body of doctoral research in adult mathematics education is small but cohesive. Much is known about the symptoms of student problems and work now needs to be continued or begun to devise and test "treatment plans" to help adult mathematics students gain confidence and to become successful in their studies of mathematics at all levels of the education system. Learning theories and teaching methodologies from traditional system research need to be analyzed and adapted for adult populations and then tested via doctoral studies.

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- Kilpatrick, J. (1992). A History of Research in Mathematics Education. In D. A. Grouws (Ed.), *Handbook of research on mathematics teaching and learning*. New York: Macmillan.
- National Council of Teachers of Mathematics. (1989). *Curriculum and evaluation standards*. Reston, VA: NCTM.
- National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. Reston, VA: NCTM.

Appendix: Dissertations Ordered by ALM-7 Theme

Assessment/Frameworks/Standards

- 1981 Carabin, Robert Jerome
 1983 Robinson, Donna Regina
 1985 Moss, Lester Lavahn
 1986 Puchon, Charles Anthony, Jr.
 1989 Banner, Doris Vance
 Leitsch, Patricia Kearns
 Meeks, Kay Irene
 1990 Carey, Karen Waite
 Wheeler, Elizabeth (B. J.) Johanna
 1992 Oliver, Richard Thomas
 Refsland, Lucie Tuckwiller
 1994 Blair, Judith Dee
 Kestner, Sandra Fey Shelley
 1996 Smith, Joseph Garratt

Parent Education

- 1990 Craig, Elizabeth L.
 1991 Doering, William George

Instructional Approaches

- 1980 Willing, Delight Carter
 1981 Jain, Barbara Jean
 Stark, Jean Peterson
 1982 Beachner, Lynne Anne
 1984 Munyofu, Paul Malima
 1985 Barnett, Thelma L.
 Burnham, Paul Thomas
 Friedman, Susan O.
 Gould, Lillian Joyce Venable
 Ungson-Devito, Maria Teresa
 Wilson, Shirley Anne
 1986 Massey, Frances Ann
 Reid, Margie N. Barron
 Robichaud, Kathleen Kienzle
 1987 Farr, Charlotte Webb
 Wilding, Marcella G.
 1988 Basinski, Ida Rockwood
 Grout, Don Hall
 1990 Pace, John Patrick
 1992 Ellman, June Christine Scholten
 1993 Hsieh, Feng-Jui
 1994 Wilder, Margaret Ramsey
 1995 Burton, Beatrice Spencer
 Greenwood, William Franklyn
 1996 Berry, Andrew Jonathan
 MacLeod, Susan H.
 Newman, Glenn Austin Robert
 1997 Gunasekera, Thilak Wijenayaka
 Ramus, Katherine Safford
 Wardlaw, Roosevelt

Instructional Approaches (continued)

- 1998 Martelly, Diana I.

Contexts

- 1982 Owings, Maria Facchina
 1992 Masingila, Joanna O.
 1997 Millette-McGuire, Beverly

Research into Practice

- 1980 Arnold, Carol Palmer
 Boysen, Vicki Allen
 Czarnecki, Karen Gordon
 Mullinix, Patricia M.
 1982 Ross, Kenneth Scott
 Ehring, Howard A.
 1983 Grady, Donna Katherine
 Miller, Kathleen Noble
 1984 Huntimer, Linda Carol
 Jones, Martha Jane Everman
 1985 Dugan, Patricia Ann
 Lehmann, Christine Elyse Heinecke
 McCarthy, William Francis
 1986 Hoffer, Sharon Marie
 Porter, Albert H.
 Stewart, Barbara Martin
 1987 Altieri, Gaetan
 1988 Borakove, Larry Steven
 Romero, John Edward
 1989 Tobing, Asmara Raphy Uli Lumban
 1990 Cunningham, Donna Davidson
 Mayta, Fabian Esteban
 1991 Russakoff, Marilyn
 1992 Marsh, Joan Czaja
 1993 Bartlett, Lucy
 Fazzari, Alan Joseph
 Skane, Marie Elizabeth
 Sneller, Lowell Lee
 1995 Galloway, Linda Jean Lowrey
 Harper, Linda C.
 Richardson, Samuel
 1996 Johnson, Rayneld Rolak
 1997 Cook, Roberta Parrino
 Dias, Ana Lucia Braz
 Szanto, Gabriella
 1999 Steig, Mary Jo

Teacher Knowledge

- 1980 Richardson, Mikel Freeman
 1993 Arriola, Leslie K.
 1995 Nesbit, Tom
 1998 Brown, Angela Denise Humphrey

Theory

- 1990 Hartman-Abramson, Ilene
1994 Barker, John Lewis

Understandings

- 1988 Ulrich, Mary Beth
1990 Munn, Anne Hodgkins
1992 Bockbrader, Barbara Ellen Berger
1995 Khooury, Hani Qustandi
1996 Beauford, Judith Elaine Mitchell
1997 Le, Xuan

Workplace/Vocational

- 1983 Holloway, G. Yvonne
1984 Hollobaugh, Patricia Susan
1986 Immergut, Brita
1988 Vanis, Mary Irene
Wilson, Odell D.
1994 Stephens, GERALYN Esther
1998 Moussavi, Massoud

No ALM-7 Theme Appropriate

- 1980 Travis, Thomas Riley
1987 Hopkins, Janet Claire
1989 Walsh, Velma Joy
1992 Trutna, Kevin Wayne
1997 Jost, Oliver R.
Parker, Sheila Lateralle Blackston
1998 Bryant, Debra Deon
1999 Zachai, Judith



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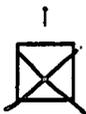
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