

AN INQUIRY INTO ELEMENTARY TEACHERS' DISPOSITIONS TOWARD MATHEMATICS INSTRUCTION AND THEIR CHOICES OF TEACHING METHODS

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This study considered elementary teachers' dispositions toward mathematics instruction and their mathematics teaching methods. From 492 teachers (grades K-4) in a Southeastern United States school system, a cluster sample of 90 teachers representing six schools (one inner city, four suburban, one rural/semi-rural) was randomly selected. Participants completed Likert scale questionnaires, one designed to measure dispositions and one designed to measure frequencies of use of particular teaching methods.

Pearson correlation coefficients measured relationships between dispositions (anxiety, confidence, enjoyment, desire for recognition, and pressure to conform) and frequencies of use of particular teaching methods (traditional methods, progressive methods, and methods combining traditional and progressive approaches). While significant ($p < .05$) correlations were found between types of dispositions, there were no significant ($p < .05$) correlations between dispositions and teaching methods, suggesting that teachers' dispositions toward mathematics instruction and their use of particular teaching methods are not straightforwardly connected but are likely affected by multiple factors.

RESEARCH QUESTION

What relationships, if any, exist among elementary teachers' self-expressed dispositions related to mathematics instruction and the frequencies with which they plan and implement particular teaching methods in the classroom setting?

DEFINITION OF TERMS

For the purpose of this study, elementary teachers are defined as teachers who are employed as full-time instructors of students in kindergarten, grade one, grade two, grade three, and grade four.

Dispositions toward mathematics instruction are self-expressed feelings and beliefs regarding levels of positiveness or negativeness toward various aspects of teaching mathematics. Anxiety (Nisbet, 1991) refers to nervousness or uneasiness of mind when teaching mathematics. Confidence (Nisbet, 1991) refers to the feeling that one will be effective when teaching mathematics. Enjoyment (Nisbet, 1991) refers to the pleasure or satisfaction one feels when teaching mathematics. Desire for recognition (Nisbet, 1991) refers to one's wish to be identified by others as an effective or outstanding teacher of mathematics. Pressure to conform (Nisbet, 1991) refers to

outward influences that might cause one to feel uncomfortable about being considered an effective or outstanding teacher of mathematics.

Teaching methods are instructional activities planned and implemented by elementary teachers in the mathematics classroom. Traditional teaching methods are instructional activities that are teacher-led and focus on lectures, paper and pencil activities, recitation, memorization and repetition of basic skills. Progressive teaching methods are instructional activities that are student-oriented or student-centered and focus on critical thinking abilities, real-life problem solving opportunities, cooperative learning, hands-on activities, the use of mathematics manipulatives, and project development. Teaching methods that combine traditional and progressive approaches are instructional activities that are neither completely teacher-led nor completely student-centered and that incorporate traditional teaching methods with progressive teaching methods. Examples of such instructional activities would include activities that allow students creative involvement in lessons but in which the topics of discussion have been pre-selected by the teacher.

POPULATION AND SAMPLE

For this study, the population consisted of 492 elementary teachers teaching in a school system in the Southeastern United States. The elementary teachers who comprise the population vary widely in professional preparation, philosophy, and teaching experience. The sample considered in this study represented a cluster sampling of the population and consisted of 90 elementary teachers from six elementary schools. One inner city school, four suburban schools, and one rural school were randomly selected.

INSTRUMENTATION

Participants were asked to complete two Likert scale questionnaires. One questionnaire presented dispositional statements related to the teaching of mathematics, including statements concerning anxiety associated with teaching mathematics, confidence associated with teaching mathematics, enjoyment associated with teaching mathematics, desire for recognition when teaching mathematics, and pressure to conform when teaching mathematics. This instrument was adapted from a survey instrument developed by Nisbet (1991) and is partially based upon the Fennema Sherman Mathematics Attitudes Scales frequently used in studies involving high school and college students' dispositions toward mathematics as a discipline. Nisbet (1991) used questionnaire responses of 155 student teachers to develop meaningful disposition scales and to refine the instrument.

On the survey instrument, the statements concerning anxiety associated with teaching mathematics are as follows: "Generally I feel secure about the idea of teaching mathematics," "Of all the subjects, mathematics is the one I worry about most in teaching," "I would get a sinking feeling if I came across a hard problem while teaching mathematics," "The thought of teaching mathematics makes me feel

restless, irritable, and impatient,” “Teaching mathematics makes me feel nervous,” “The thought of teaching mathematics makes me feel nervous,” “I am not the type of person who could teach mathematics very well,” and “Mathematics is the subject I am least confident about teaching.”

The statements concerning confidence in teaching mathematics are as follows: “I am confident about the methods of teaching mathematics,” “I have a lot of self confidence when it comes to teaching mathematics,” “I feel at ease when I am teaching mathematics,” and “Teaching mathematics does not scare me at all.”

The statements concerning enjoyment associated with teaching mathematics are as follows: “I enjoy the challenge of teaching a new and difficult concept in mathematics,” “Time passes quickly when I am teaching mathematics,” “Teaching mathematics is enjoyable and stimulating to me,” and “I like teaching mathematics.”

The statements concerning desire for recognition when teaching mathematics are as follows: “It would make me happy to be recognized by other teachers as an excellent teacher of mathematics,” “I would be proud to be the outstanding teacher of mathematics among my peers,” and “I would like the students to recognize me as a good teacher of mathematics.”

The statements concerning pressure to conform when teaching mathematics are as follows: “Being an outstanding teacher of mathematics would make me feel unpleasantly conspicuous,” “My peers would think I was strange if I were an outstanding teacher of mathematics,” and “I would not want to let on that I was good at teaching mathematics.”

The second Likert scale questionnaire consisted of a list of teaching methods accompanied by five possible frequencies from which participants could select a response: “daily” (once or more per school day), “frequently” (more than once per week), “occasionally” (about once per week), “seldom” (less frequently than once per week), and “never” (not at all). This instrument was designed by the author. Mathematics teaching methods included on the survey instrument were divided into three areas for analysis: traditional mathematics teaching methods, progressive mathematics teaching methods, and mathematics teaching methods that combine traditional and progressive approaches.

The traditional mathematics teaching methods included in the survey instrument were as follows: teacher-focused lecture, teacher-focused demonstration on chalk board/dry erase board, teacher-focused demonstration on overhead projector, teacher-led question-and-answer session with students, skills practice with flash cards, skills practice through oral recitation, student completion of professionally produced worksheets/workbook pages, student completion of teacher-produced worksheets, student completion of mathematics problems copied from chalkboard/dry erase board, and student completion of mathematics problems copied from overhead projector.

The progressive mathematics teaching methods included in the survey instrument were as follows: teacher demonstration using teacher-made mathematics manipulatives, teacher demonstration using everyday items (keys, rocks, etc.) as mathematics manipulatives, whole-class use of teacher-made manipulatives, whole-class use of everyday items as mathematics manipulatives, cooperative learning activities in which groups use teacher-produced mathematics manipulatives, cooperative learning activities in which groups use everyday items as mathematics manipulatives, creative activities in which individual students create physical examples of mathematical concepts, creative activities in which groups of students create physical examples of mathematical concepts, activities that use children's literature to teach mathematics, activities that integrate writing and mathematics, computer activities in which students create their own problems, and calculator activities in which students create their own problems.

The mathematics teaching methods that combine traditional and progressive approaches included in the survey instrument were as follows: student-focused demonstration on chalk board/dry erase board, student-focused demonstration on overhead projector, teacher demonstration using professionally-produced manipulatives, whole-class use of professionally-produced mathematics manipulatives, cooperative learning activities in which students complete paper/pencil activities, cooperative learning activities in which students orally discuss mathematics concepts, cooperative learning activities in which groups use professionally-produced manipulatives, computer activities using professionally-produced software, and calculator activities in which students solve given problems.

DATA ANALYSIS

To facilitate statistical calculations for this study, numeric values were assigned to Likert scale responses. The survey pertaining to dispositions toward mathematics instruction contained positively phrased and negatively phrased statements. Because there were multiple responses related to each of the eight variables in the study, a participant's composite score for a particular variable was obtained by totaling the numeric values of the participant's responses to each item related to the variable. For each variable, the maximum possible composite score and the minimum possible composite score depended upon the number of survey items relating to the variable.

The five areas of elementary teachers' dispositions toward mathematics instruction and the three areas of teaching methods resulted in 15 relationships. For each of these relationships, the Pearson correlation coefficient was calculated.

Construct Validity of Dispositions Questionnaire

Each correlation between two types of dispositions was significant at the $p < .05$ level of significance. In addition to showing significant correlations, the types of dispositions were related in the direction one might assume they would be. Table 1 summarizes these findings:

Table 1 Correlations Among Variables in the Study

Variables	Anxiety	Confidence	Enjoyment	Desire for Recognition	Pressure to Conform	Traditional Teaching Methods	Progressive Teaching Methods	Traditional/ Progressive Teaching Methods
Anxiety	1.000	-.765 (<.001)	-.776 (<.001)	-.265 (.011)	.350 (.001)	-.136 (.203)	.045 (.674)	-.056 (.599)
Confidence	-.765 (<.001)	1.000	.734 (<.001)	.332 (.001)	-.326 (.002)	.136 (.202)	-.116 (.275)	.076 (.479)
Enjoyment	-.776 (<.001)	.734 (<.001)	1.000	.488 (<.001)	-.370 (<.001)	.106 (.320)	-.063 (.555)	.063 (.555)
Desire for Recognition	-.265 (.011)	.332 (.001)	.488 (<.001)	1.000	-.544 (<.001)	-.066 (.538)	-.131 (.219)	-.083 (.439)
Pressure to Conform	.350 (.001)	-.326 (.002)	-.370 (<.001)	-.544 (<.001)	1.000	.121 (.257)	.023 (.830)	-.031 (.773)
Traditional Teaching Methods	-.136 (.203)	.136 (.202)	.106 (.320)	-.066 (.538)	.121 (.257)	1.000	-.017 (.877)	.454 (<.001)
Progressive Teaching Methods	.045 (.674)	-.116 (.275)	-.063 (.555)	-.131 (.219)	.023 (.830)	-.017 (.877)	1.000	.490 (<.001)
Traditional / Progressive Teaching Methods	-.056 (.599)	.076 (.479)	.063 (.554)	-.083 (.439)	-.031 (.773)	.454 (<.001)	.490 (<.001)	1.000

Note. Correlations presented with p-values in parentheses.

Relationships Between Dispositions Toward Mathematics Instruction and Mathematics Teaching Methods Used in the Classroom

As summarized in Table 2, none of the correlations between dispositions toward teaching mathematics and the planning and implementation of various teaching methods was significant at the $p < .05$ level of significance. Both positive and negative correlation coefficients were found, with no definite pattern being revealed.

Table 2 Correlations Between Dispositions Toward Mathematics Instruction and Types of Teaching Methods Used

Variables	Traditional Teaching Methods	Progressive Teaching Methods	Traditional/ Progressive Teaching Methods
Anxiety	-.136 (.203)	.045 (.674)	-.056 (.599)
Confidence	.136 (.202)	-.116 (.275)	.076 (.479)
Enjoyment	.106 (.320)	-.063 (.555)	.063 (.554)
Desire for Recognition	-.066 (.538)	-.131 (.219)	-.083 (.439)
Pressure to Conform	.121 (.257)	.023 (.830)	-.031 (.773)

N = 90 Note: Correlations reported with p-values in parentheses

CONCLUSIONS

Results of this study suggest that elementary teachers' dispositions toward mathematics instruction and the teaching methods they plan and implement in the elementary classroom are not related in a straightforward fashion, but are more likely affected by a multitude of factors.

Although intuition could lead one to believe that those teachers who feel positively toward mathematics instruction might make use of more progressive, student-centered teaching methods, and that those teachers with more negative dispositions toward mathematics instruction might rely heavily upon traditional teaching methods, the calculated correlations do not support these assumptions. Feasibly, a teacher who has positive dispositions toward mathematics instruction might make use of traditional teaching methods, perhaps because that is how he or she learned mathematics in school. Similarly, a teacher who does not feel positively about mathematics instruction might employ some progressive teaching methods, perhaps because he or she wishes to instill positive dispositions toward mathematics within students. In short, respondents reported a wide variety of dispositions toward mathematics instruction and the use of many different types of teaching methods, but there were no clear relationships established.

REFERENCE

Nisbet, S. (1991). A new instrument to measure pre-service primary teachers' attitudes to teaching mathematics. *Mathematics Education Research Journal*, 3(2), 34-56.