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ABSTRACT

This study examined the relationship between teachers' beliefs and instructional practices and the mathematics achievement of their students. Data from the Third International Mathematics and Science Study (TIMSS) were used to examine whether behaviorist and constructivist teachers had different beliefs about student learning and whether teachers with behaviorist and constructivist views used different instructional practices in the classroom. Whether there was difference in students' learning based on the beliefs and instructional practices of their teachers was also studied. Questionnaires related to teacher beliefs and practices were completed by 527 mathematics teachers representing 10,970 students. Results indicate that certain teacher beliefs are indicative of a behaviorist pedagogy, and other beliefs are found for teachers who believe in a constructivist pedagogy. A hierarchical linear regression analysis was run on the teachers' beliefs and practices using student scores in mathematics as the dependent variable. The type of community in which a student lived had an effect on student achievement, but the impact of community on student achievement disappeared once behaviorist teachers' beliefs were taken into account. The data also displayed a statistically significant negative relationship between constructivist teachers' beliefs that mathematics is a practical, structured, and formal guide for addressing real world situations and students' achievement. Implications of these findings are discussed. (Contains 5 tables and 15 references.) (SLD)

Relationship Between Constructivist Teacher Beliefs and Instructional Practices to Students' Mathematical Achievement: Evidence from TIMMS

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Relationship between Constructivist Teacher Beliefs and Instructional Practices to Students' Mathematical Achievement: Evidence from TIMMS

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INTRODUCTION

Improving mathematical performance for all students is an important policy issue and educational concern. The purpose of this study is to examine the relationship between teachers' beliefs and instructional practices to the mathematical achievement of their students. This study uses TIMSS data to examine the following questions: (a) Do behaviorist and constructivist teachers hold different beliefs concerning student learning? (b) Do behaviorist and constructivist teachers employ different instructional practices in the classroom? and (c) Is there a difference in students' learning based on the beliefs and instructional practices of their teachers?

Behaviorist Framework

The curriculum that currently exists in many American schools is derived from strong behavioral and task analytic notions about learning. In the behaviorist view, knowing is an organized accumulation of associations and components of skills. Learning is the process in which associations and skills are acquired. Learning is linked to a series of associations or stimulus-response bonds. Once an observable behavior has been assessed, a task analysis is used to break down the components attributable to skill acquisition.

The behaviorist theory in this study is grounded in Robert Gagne's "Cognitive Information Processing Theories." Gagne's theory is based on the premise that within any learning hierarchy, less complex skills transfer positively to more complex skills (Gagne & Briggs, 1979). Learning is cumulative. Skills build on skills to achieve higher levels of learning. Learning itself is developed intellectually by teachers through planned or directed learning. Once skills are taught, these simple skills can be generalized to other situations. Learning is sequential, universal, determinable, countable, and can be objectively defined (Gagne, 1985).

Constructivist Framework

Constructivism, originally developed by Piaget, views learning of mathematics as the construction of meaning and understanding based on the modeling of realty, the analysis of pattern, and the acquisition of a mathematical disposition. Learning is an active and constructive process in which the learner is constantly reviewing what is known, linking new information to prior knowledge, forming and testing hypotheses, and revising concepts as new information requires (Rumelhart, 1980; Spiro, 1980). Students are not likely to change their existing knowledge unless they recognize and are dissatisfied with the fact that it no longer fits with their previous thought processes (Anderson, 1977).

The learner must actively construct new information onto his or her existing mental framework for meaningful learning to occur. The constructivist teacher organizes information around conceptual clusters of problems, questions, and discrepant situations in order to engage the students' interest. Teachers assist the students in developing new insights and connecting these insights with the students' previous learning. Ideas are presented holistically as broad concepts and then broken down into parts. Students develop their own questions, carry out their own experiments, make their own analogies, and come to their own conclusions.

Although learning is self-organization, mathematical activity requires working with others because knowledge is constructed when individuals interact in order to solve shared problems (Driver, Asoko, Motimer, & Scott, 1994; von Glaserfeld, 1984, 1993). Interaction with peers helps children to de-center their thinking and construct more viable constructs because the children are forced to consider other perspectives and reexamine their thinking (Piaget, 1929; von Glasersfeld, 1984). Through this interaction, students develop a regulatory vocabulary that allows them to progress from egocentric language to inner speech, enabling them to direct, to control, and to plan their actions during the problem solving process (Bershon, 1992).

Data Source

The data of the *Third International Mathematics and Science Study* (TIMSS) was used in this study. TIMSS is particularly well suited for this research for several reasons. First, TIMSS is the largest, most comprehensive, and rigorous international study of schools and students ever conducted. Secondly, TIMSS is designed to investigate student learning of mathematics and the way in which educational systems, schools, teachers, and the students themselves influence the learning opportunities and experiences of individual students. Third, TIMSS data offers an excellent opportunity to create reliable and valid measures of instructional practices to answer the questions proposed by this project.

This study examined the instructional experiences of a representative sample of the United States eighth grade students drawn from Population 2 of TIMMS. Five hundred twenty-seven mathematics teachers representing 10,970 students completed questionnaires containing numerous items of primary concern to this study. The specific instructional variables were selected due theoretical interests.

Table 1

Factor Analysis Teacher Beliefs on a Rotated Component Matrix

Beliefs	Factor
BEHAVIORIST TEACHER BELIEFS	
Teacher Beliefs About Student Learning	
* Some students have a natural talent for mathematics and others do not * Mathematics is primarily an abstract subject * Mathematics should be learned as sets of algorithms or rules to cover all possibilities	A factor-weighted, standardized composite score. Factor has an eigenvalue of 1.97 and explains 25% of variance. Alpha=.44
Teacher Beliefs About Class	
* Students who come from a wide range of backgrounds * Students with different academic ability	A factor-weighted, standardized composite score. Factor has an eigenvalue of 1.35 and explains 17% of variance. Alpha=.63
Teacher Beliefs About Content	
* Remember formulas and procedures * Think in a sequential and procedural manner	A factor-weighted, standardized composite score. Factor has an eigenvalue of 1.09 and explains 14% of variance. Alpha=.48
CONSTRUCTIVIST TEACHER BELIEFS	
Teacher Philosophy	
* Be able to think creatively * Understand how mathematics is used in the real world * Be able to provide reasons to support solutions	A factor-weighted, standardized composite score. Factor has an eigenvalue of 1.92 and explains 32% of variance. Alpha=.61
Teacher Beliefs About Mathematics	
* Mathematics is primarily a formal way of representing the real world * Mathematics is a practical and structured guide for addressing real situations	A factor-weighted, standardized composite score. Factor has an eigenvalue of 1.26 and explains 21% of variance. Alpha=.47

Table 2 **Factor Analysis Teacher Instructional Practices on a Rotated Component Matrix**

BEHAVIORIST TEACHER INSTRUCTIONAL PRACTICES	
Teacher Directed Classroom * Explain the reasoning behind an idea * Ask the student another question to help him or her get the correct response * Call on other students to get their responses and then discuss what is correct	A factor-weighted, standardized composite score. Factor has an eigenvalue of 2.07 and explains 26% of variance. Alpha=.57
Individual Work * Work individually with assistance from the teacher * Practice computational skills * Work together as a class with the teachers teaching the whole class	A factor-weighted, standardized composite score. Factor has an eigenvalue of 1.29 and explains 16% of variance. Alpha=.46
Teacher Assigned Work * Call on another student who's likely to give the correct response * Correct the student's error in front of the class	A factor-weighted, standardized composite score. Factor has an eigenvalue of 1.13 and explains 14% of variance. Alpha= .43
CONSTRUCTIVIST TEACHER INSTRUCTIONAL PRACTICES	
Student Work Assignments * Finding one or more uses of the content covered * Keeping a journal * Working individually on long term projects or experiments * Work in pairs or small groups with assistance from the teacher	A factor-weighted, standardized composite score. Factor has an eigenvalue of 2.52 and explains 28% of variance. Alpha=.65
Student Thinking * Work on problems for which there is no immediately obvious method of solution * Write equations to represent relationships * Represent and analyze relationships using tables, charts, or graphs	A factor-weighted, standardized composite score. Factor has an eigenvalue of 1.40 and explains 16% of variance. Alpha=.53
Class Work * Work individually without assistance from the teacher * Work in pairs or small groups without assistance from the teacher	A factor-weighted, standardized composite score. Factor has an eigenvalue of 1.00 and explains 11% of variance. Alpha=.53

Two critical features in the TIMSS data collection were addressed when analyzing the data: sampling weights and design effect. Several sampling weights apply to the TIMSS data, however, since this study is limited to only United States students, only Houseweight (HOUWGT) will be used. This weight is calculated by taking into account the stratification or disproportional sampling of the subgroups, adjustment for non-response, and the selection probability of each student. In order to correct for the design effect, a jackknife repeated replication (JRR) developed through WESVAR will be implemented. The JRR procedure provides an unbiased estimate of the statistic of interest by repeatedly selecting subsets of the sample from which to calculate the statistic.

RESULTS

Descriptive Analysis

Preliminary findings from TIMSS showed that the type of community the students live in play a role in students' mathematical achievement. Seventy-five percent of the teachers reported that they taught in urban or suburban schools. Of the remaining teachers, 21.4 % lived in a village or rural area, while 3.4 % lived in an isolated area. The type of community the students will be taken into consideration.

Teacher's age, number of years of teaching experience, and level of education were included because past studies have indicated that experienced teachers are more inclined to hold behaviorist beliefs by moving through a predetermined set of skills and concepts (Putman & Leinhardt, 1986). Teachers' ages were reported as under 25 years, between 25 to 29, 30 to 39, 40 to 49, 50 to 59, and 60 or over. The data showed that 41 % of the teachers were between 40 and 49 years. The number of years that teachers taught was reported as one to five years, six to 10 years, 11 to 15 years, 16 to 20 years, 21 to 25 years, and more than 26 years. The sample population showed that most teachers, 24 % had one to five years of teaching experience. Ninety-seven percent of the teachers in the sample population had specific training in teaching.

Relationships of Composite Variables

Through the literature review several beliefs were identified as being representative of a behaviorist teacher. In particular these include: (a) The belief that knowledge acquisition is a first stage in a sequence of educational goals; (b) mathematics is stable and independent of the individual; (c) the essential properties of mathematics are knowable and relatively unchangeable; (c) complex ideas are built from the association of simpler ones; (d) mathematics consists of mainly a set of rules and procedures that one has to memorize and use in a mechanical way; and (e) there is only one way to solve a problem (Frank, 1988; Lampert, 1990; Schoenfeld, 1992). The factor analysis of the eight beliefs identified through the conceptual framework as representing a behaviorist pedagogy yielded three distinct factors accounting for 55 % of the total variance with an internal consistency (Cronbach's alpha) of .55. So indeed, certain teacher beliefs are indicators of a behaviorist's pedagogy.

In contrast there are certain beliefs about student learning that are supported by teachers who believe in a constructivist pedagogy. The constructivist teacher finds a major goal of teaching mathematics is to enable students to notice the critical features of a problem situation and to have the students experience the changes in perception and understanding as they view the situation from a new point of view. When factor analysis was applied to the six beliefs identified through the conceptual framework as representing a constructivist pedagogy, two distinct factors accounting for 53 % of the total variance with an internal consistency (Cronbach's alpha) of .53 were established. Teachers, who believe in a constructivist approach to student learning, find it important for students to think creatively, be able to support their answers, and to find real world uses for mathematics.

The second question addressed by this study was to determine if behaviorist teachers employed different instructional practices in the classroom than constructivist teachers. First, was it possible to identify teacher behaviors as indicators of their instructional practices? And if this was possible, can one identify instructional practices that would indicate a behaviorist instructional practice as opposed to a constructivist instructional practice?

According to behaviorist, Gagne (1965), teachers are required to design instruction to meet necessary learning conditions. The routine steps to be followed in arranging the stimulation include: (a) gaining attention, (b) informing the learner of the objective, (c) stimulate recall, (d) present stimulus material, (e) provide learning guidance, (f) elicit the performance, (g) provide feedback, (h) assess performance, and (i) enhance retention and transfer. A factor analysis of the eight beliefs identified through the conceptual framework as representing instructional practices used by a behaviorist teacher yielded three distinct factors accounting for 56 % of the total variance with an internal consistency (Cronbach's alpha) of .58. So indeed, certain teacher instructional practices are consistent with behaviorist teachers.

Constructivist teachers organize information around conceptual clusters of problems, questions, and discrepant situations. The teacher's responsibility is to create educational environments that permit students to assume the responsibility for their learning. Instruction builds on the student's existing knowledge base, extends the individual's repertoire of cognitive and metacognitive strategies, and corrects specific learning problems. A factor analysis of the nine instructional practices identified as representing a constructivist approach to learning yielded three distinct factors accounting for 55% of the total variance with an internal consistency (Cronbach's alpha) of .65. It is concluded that certain teachers' instructional practices are indicators of teachers who support the constructivist philosophy.

Influence of Community and Teacher Characteristics

The final question addressed in this study was the effect teachers' beliefs and instructional practices have on student learning. A hierarchical linear regression analysis was run on the teachers' beliefs and instructional practices using student scores in mathematics as the dependent variable. The type of the community the student lived in and the teacher's age and years of teaching explained two percent of student achievement. The type of community where the student lived had a significantly positive affect. The teacher's level of education and the number of years the teacher taught also had a significantly positive effect on students' achievement.

Influence of Behaviorist Beliefs and Instructional Practices

The impact of the community on student achievement disappeared once behaviorist teachers' beliefs were taken into account. Both the teachers' level of education and years taught continued to have a significant positive affect on student achievement. When the behaviorist teacher beliefs were introduced to the model only one of the three constructs had an impact on student achievement. The data demonstrated that if the teacher believed that diversity in a classroom had a negative impact on student

Table 3

Summary of Hierarchical Linear Regression Analysis Predicting Behaviorist Beliefs and Instructional Practices on Eighth Grade Mathematics Scores Using Plausible Value 1

Variable	B	SE B	B	SE B	B	SE B
Community	5.04***	1.12	1.48	1.28	-1.87	1.32
Teacher characteristics						
Age	2.68	1.38	-1.05	1.53	-.81	1.56
Lev of educ	6.21***	1.09	7.56***	1.20	7.65*	1.23
Female	5.21*	2.16	6.39*	2.41	1.91	2.50
Years taught	2.94**	.89	5.78***	.97	5.95***	1.01
Behavior Beliefs						
Abilities			-26.17***	1.17	-24.41***	1.21
Formulas/Sequence			1.11	1.07	1.12	1.15
Rules/Compute			.91	1.14	1.94	1.17
Behavior Practice						
Teacher directed					-5.33***	1.21
Explain/Discuss					8.97***	1.13
Others correct					-4.51***	1.19
(Constant)	410.12		416.84		428.94	
R^2	.02***		.11***		.12***	

Notes: 1. Regression coefficients (B) and standard errors (SE B) are reported.

2. Significance levels are adjusted for Design Effects (DEFF's).

3. Houseweight applied to all regressions models.

4. $*p < .05$ $**p < .01$ $***p < .001$

Table 4

Summary of Hierarchical Linear Regression Analysis Predicting Constructivist Beliefs and Instructional Practices on Eighth Grade Mathematics Scores Using Plausible Value 1

Variable	B	SE B	B	SE B	B	SE B
Environment Characteristic						
Community	5.04***	1.12	6.39***	1.16	.92	1.34
Teacher characteristics						
Age	2.68	1.38	3.97*	1.45	6.00***	1.54
Lev of educ	6.21***	1.09	5.35***	1.14	8.02***	1.25
Female	5.21*	2.16	8.37***	2.26	15.99***	2.55
Years taught	2.94**	.89	2.64*	.93	3.85***	1.00
Constructivist Beliefs						
Creative/Real world			1.31	1.02	1.31	1.22
Formal/Practical			-6.13***	1.00	-7.63***	1.12
Constructivitist Practice						
Without help					2.81*	1.12
Analyze problems					1.51	1.19
Projects/Find					16.00***	1.23
(Constant)	410.12		407.52		390.00	
R^2	.02***		.03***		.08***	

Notes: 1. Regression coefficients (B) and standard errors (SE B) are reported.

2. Significance levels are adjusted for Design Effects (DEFF's).

3. Houseweight applied to all regressions models.

4. $*p < .05$ $**p < .01$ $***p < .001$

learning, it did. This belief construct produced a strong statistically significant negative explaining eleven percent of the multiple R squared. When the three behaviorists' instructional practices constructs were introduced to the regression model, there was a statistically strong negative relationship between teachers who coached the entire class to give the one correct answer and students' achievement in mathematics. This is consistent with the findings of Driver, Asoko, Leach, Motimer, & Scott (1994) and von Glasersfeld (1984, 1993). Their research reported that mathematical activity requires working with others because knowledge is constructed when individuals interact in order to solve shared problems. The behaviorist teacher-directed instructional practice of having students give the reasoning behind their answers and discussing several answers before determining the correct answer had a positive affect on student learning. This is considered a behaviorist instructional practice because the discussion is teacher directed and the search is for the one correct answer.

Influence of Constructivist Beliefs and Instructional Practices

A hierarchical linear regression model was run with constructivist teachers' beliefs and practices. The two constructivist belief constructs explained only one percent of the student achievement. Interestingly female teachers with a high level of education had a significantly positive affect on student learning. The data displayed a statistically significant negative relationship between constructivist teachers' beliefs that mathematics is a practical, structured, and a formal guide for addressing real world situations and students' achievement. These questions were considered to reflect a constructivist philosophy because they emphasis real world connection. When constructivist instructional practices were introduced to the regression model, two instructional practices proved to have statistically significant positive impact on student achievement explaining eight percent of the difference. Students, who work on projects where there is no immediate correct answer and find real world uses for the content, have higher achievement levels on TIMSS.

LIMITATIONS OF THE STUDY

Several cautions are necessary on interpreting the findings of this study. First, many factors influence cognitive processes and achievement outcomes. These include- social factors such as class, gender, ethnicity, and poverty; psychological factors such as self-confidence, school attitudes, and peer relationships; and organizational factors, such as resources, empowerment, and bureaucratic control (Bracey, 1997, p. 411). Curricular arrangements are another primary determinant to student achievement on international tests. None of these were taken into consideration in this study. This study was restricted to teacher beliefs and instructional practices.

A fundamental principle of constructivism is that learning is built on prior knowledge. Since TIMSS is not a longitudinal study there is no information available on the students previous achievement.

EDUCATIONAL CONSIDERATIONS

Instructional habits and attitudes of United States mathematics teachers are only beginning to change in the direction of implementation of mathematics reform recommendations. Whereas traditional mathematics education focuses on memorization, rote learning, and the application of facts and procedures, the constructivist approach emphasizes the development of conceptual understanding and reasoning. Considerable effort has recently gone into disseminating research related to the learning and instruction of mathematics that suggests a more interactive approach to learning. This approach promotes practices focused on activating and building on students' background knowledge, teaching mathematical terminology, and including authentic real world experiences. However, teachers' implementation of the reform still concentrates on isolated techniques rather than the central message, which is to focus on high-level mathematical thought. Genuine changes will come about when teachers think differently about what is going on in their classrooms, and are provided with the practices to match the different ways of thinking. In order for change to occur three forms of knowledge must be woven together: (a) teachers' background theories, beliefs, and understandings of teaching and the mathematics process; (b) theoretical frameworks and empirical premises as derived from current research; and (c) alternative practices that integrate both teachers' beliefs and research knowledge.

REFERENCES

Anderson, R. C. (1977). The notion of schemata and the educational enterprise. In R. C. Anderson, R. J., Spiro, & W. E. Montague (Eds.), Schooling and the acquisition of knowledge (pp. 415-431). Hillsdale, NJ: Lawrence Erlbaum Associates.

Bershon, B.L. (1992). Cooperative problem solving: A link to inner speech. In R. Hertz-Lazarowitz & N. Miller (Eds.), Interaction in cooperative groups: The theoretical anatomy for group learning (36-48). New York: Cambridge University Press.

Driver, R., Asosko, H., Leach, J., Mortimer, E., & Scott, P. (1994). Constructing scientific knowledge in the classroom. Educational Researcher, 23 (7), 5-12.

Frank, M.L. (1988). Problem solving and mathematical beliefs. Arithmetic Teacher, 35(5), 32-34.

Gagne, R.M. & Briggs, L.J.(1979). Principles of instructional design. (2nd ed.). New York: Holt, Rinehart, and Winston.

Gagne, R.M. (1965). The conditions of learning (1st ed.). New York: Holt, Rinehart, and Winston.

Gagne, R.M. (1985). The conditions of learning. (4th ed.) New York: Holt, Rinehart, and Winston.

Lampert, M. (1990). When the problem is not the question and the solution is not the answer: Mathematical knowing and teaching. American Educational Research Journal, 27, 29-63.

Piaget, J. (1929). The child's conception of the world. (J. & A. Tomlinson, Trans.) New York: Harcourt, Brace & World.

Putnam, R.T. & Leinhardt, G. (1986). Curriculum scripts and the adjustment of content in mathematics lessons. Paper presented at the annual meeting of the Educational Research Association, San Francisco.

Rumelhart, D. E. (1980). Schemata: The building blocks of cognition. In R. J. Spiro, B. C. Bruce, & W. F. Brewer (Eds). Theoretical issues in reading comprehension (pp. 35-38). Hillsdale, NJ: Lawrence Erlbaum Associates.

Schoenfeld, A.H. (1992). Learning to think mathematically: Problem solving, metacognition, and sense-making in mathematics. In D.A. Grouws (Ed.), Handbook of research on mathematics teaching and learning (pp. 334-370). New York: Macmillan.

Spiro, R. J. (1980). Constructive processes in prose comprehension. In R. J. Spiro, B. C. Bruce, & W. F. Brewer (Eds). Theoretical issues in reading comprehension (pp. 245-278). Hillsdale, NJ: Lawrence Erlbaum Associates.

von Glasersfeld, E. (1984). An introduction to radical constructivism. In P. Watzlawick (Ed.), The invented reality (17-40). New York: W.W. Norton & Co.

von Glasersfeld, E. (1993). Questions and answers about radical constructivism. In K. Tobin (Ed.), The practice of constructivism in science education (23-38). Hillsdale, NJ: Lawrence Erlbaum.

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