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ABSTRACT

The reform of mathematics and science teaching and learning in school classrooms has been underway for the past two decades. A review of the literature performed on the ERIC CD ROM system yielded a selected bibliography of 154 items identifying several areas of current activity that are included in research and development projects focused on reform in science and mathematics. The references encompass papers of a general or theoretical interest on assessment and evaluation, including studies and case studies. Particular attention has been paid to studies of classroom discourse, classroom observation tools, and the beliefs and knowledge of teachers and students. The last section is devoted to studies of assessment of teachers, of students, and of teacher use of assessments. Included is a list of ERIC literature search strategies and the number of ERIC documents located for each search. (MKR)

Selected references for assessment and evaluation of mathematics and science teaching reforms in classrooms
A Bibliography

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SELECTED REFERENCES FOR ASSESSMENT AND EVALUATION OF MATHEMATICS AND SCIENCE TEACHING REFORMS IN CLASSROOMS A BIBLIOGRAPHY

Introduction

The reform of mathematics and science teaching and learning in school classrooms has been underway for the past two decades. These efforts to change teaching practice and learning outcomes have a number of goals, some of which are articulated in standards documents of the National Council of Teachers of Mathematics -- the Curriculum and evaluation standards for school mathematics (1989), the Professional standards for teaching mathematics (1991), and the Assessment standards for school mathematics (1995). Other standards are those of the National Research Council, the National science education standards (1994, November, Draft) Both the science standards and those for mathematics include recommendations about teaching, the professional development of teachers of science and mathematics, and assessment of students

These documents encourage a view of students as active participants in the learning process--problem solving and conducting scientific inquiries, of teachers facilitating student development in a particular subject matter, and of teachers themselves actively developing and reflecting on classroom practice. Other key ideas are those represented by suggestions of communities of learners, with shared agreements between teacher and students about the nature of discourse on mathematical and scientific problems, about evidence, explanation, justification, and so on. Teachers are encouraged to use groups for mathematical problem solving and for "hands-on" science investigations to foster student understanding of mathematics and science

The vision of mathematics and science classrooms embodied in the standards and reform documents provide several challenges: to models of teacher development, to projects such as those funded by federal agencies and foundations, and to evaluators. Little (1993) argues that there is a lack of fit among existing models of teacher professional development and reform visions. That is, there is a lack of fit between the dominant training-and-coaching professional development model--a model focused on "expanding an individual repertoire of well-defined and skillful classroom practice" (p. 129), and the reforms, for example, in subject matter teaching (standards, curriculum and pedagogy).

Federally-funded projects, such as the Urban Systemic Initiatives and Teacher Enhancement Projects of the National Science Foundation (e.g., Stake, et al., 1993), and foundation-funded projects, such as the Urban Mathematics Collaboratives and QUASAR projects of the Ford Foundation, are responding to the challenge to encourage professional development and to develop alternatives to existing in-service teacher education programs and to the isolation of individual teachers in their classrooms.

Similarly, these standards and alternative visions of teachers in interaction with students in classrooms pose challenges to evaluation, both methodologically (e.g., Frechtling, 1995) and substantively (Stake et al., 1993). From an evaluation perspective, an important aspect of the challenge can be defined more specifically: the major challenge is describing and documenting teaching practice that is related to the reform visions for classrooms.

Bibliography

This selected bibliography identifies several areas of current activity that are included in research and development projects focused on reform in science and mathematics. The references encompass papers of a general or theoretical interest, and about evaluation--including studies and case studies. Particular attention has been paid to studies of classroom discourse and classroom observation tools, and to beliefs and knowledge--of teachers and of students. The last section is concerned with studies of assessment--of teachers, of students, and of teacher use of assessments, that is, of teacher assessment practice in classrooms. Table 1 lists the categories of the bibliography and the number of citations in each category.

Table 1 Bibliography categories and numbers of references

Category		Number of References
A.	Theoretical/General Background	
	1. Reform, Standards and Status	14
	2. Constructivist/Inquiry Teaching and Learning	11
	3. Other	7
B.	Evaluation	
	1. General	8
	2. Evaluation Studies	11
	3. Evaluation Case Studies	6
C	Classroom Discourse Analysis	16
D.	Classroom Observational Tools	6
E.	Beliefs and Knowledge	
	1. Teacher Beliefs	19
	2. Student Beliefs	5
F.	Assessment	
	1. Teacher Assessment	19
	2. Student Assessment	24
	3. Teacher Assessment Practices	8

Of particular interest in evaluations of reform classrooms are descriptions of classroom communication, activities, and tasks. The studies identified in analyses of classroom discourse and classroom observation tools in mathematics and science teaching are those which attempt to describe what teaching for understanding means. This meaning is displayed in patterns of teacher-student and student-student communication, characteristic of activities, and in the knowledge and beliefs held about science and mathematics teaching and learning by teachers and students.

The selected bibliography is limited by the terms of the search procedures used and by the decision to emphasize recent work on discourse and knowledge and beliefs in the areas of science and mathematics. The search procedures are described below. These are followed by the bibliography presented in two formats: by category and by author, alphabetically. Presenting a separate listing by author facilitates the location of particular individuals whose works may have been placed in several categories.

Literature Search Procedures

A review of the literature was performed This search was executed on the ERIC CD ROM system and occurred in several stages First, descriptors for science or mathematics activities and programs were combined with those for instructional effectiveness, teacher education, or evaluation. For example, a sample of the searches performed in science include (1) science activities or programs AND instructional or program effectiveness or student development; (2) sciences AND teacher education or inservice teacher education, (3) evaluation AND science education; (4) evaluation AND science instruction or science teachers Second, teacher and student belief descriptors were combined with science and mathematics education. Third, student attitudes in science or mathematics were combined with evaluation descriptors. Fourth, mathematics or science teachers was combined with discourse and interaction analysis Finally, protocol materials and urban programs were entered separately. A listing of searches including search terms and the number of ERIC documents located for each search is given in Table 2

Table 2. List of literature searches and number of references located

1.	[science activities OR science programs] AND [outcomes OR instructional effectiveness OR program effectiveness OR student development]	08
2.	[teacher education OR inservice teacher education] AND [sciences]	09
3.	science attitudes AND science concepts	15
4.	beliefs AND scienc.. education	40
5.	[outcomes OR instructional effectiveness OR program effectiveness OR student development] AND [sciences OR science attitudes OR inquiry OR science concepts]	23
6.	evaluation AND science activities	18
7.	evaluation AND [science OR science instruction OR science teachers]	96
8	evaluation AND [science attitudes OR inquiry]	06
9.	evaluation AND [science concepts OR science programs OR science teach]	33
10.	{evaluation AND [teacher education OR inservice teacher education]} AND [science concepts OR science programs OR science teachers]	14
11.	evaluation AND {[science act OR science education OR science programs] AND [teacher education OR inservice teacher education]}	29
12.	{[outcomes OR instructional effectiveness OR program effectiveness OR student development] AND [science teachers, teacher education OR science education]} AND evaluation	33
13.	evaluation AND [math OR math instruction OR math teachers]	114
14.	[discourse analysis/interaction analysis] AND [science education/science teacher]	14
15	[teacher/student behavior] AND [classroom observation/behavior] AND [science education/teacher]	10

16	[discourse analysis/interaction analysis] AND [math education/math instruction]	09
17	[discourse analysis/interaction analysis] AND [math education] AND [teacher/student behavior]	04
18	[teacher/student behavior] AND [classroom observational tech] AND [math education]	28
19	protocol materials	03
20	USI (in whole ERIC entry)	01
21	(urban systemic initiative) in AB	01
22	urban programs/urban improvement	38
23	[evaluation/instructional material evaluation/educational assess] AND [math/math instruction/math teachers]	269

BIBLIOGRAPHY LISTING BY CATEGORY

Categories A = Theoretical/General, B = Evaluation, C = Classroom Discourse, D = Observation Tools, E = Beliefs & Knowledge, F = Assessment

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