

Appendix B

Description of Composite Variables

Overview of Composites

Definitions of Teacher Composites

Overview of Composites

To facilitate the reporting of large amounts of survey data, and because individual questionnaire items are potentially unreliable, this report includes means for several “composite” variables. HRI used factor analysis of responses from the 2000 National Survey of Science and Mathematics Education that were included in the teacher questionnaire for the *Inside the Classroom* study to identify survey questions that could be combined into composites. Each composite represents an important construct related to mathematics or science education. Composites were calculated for both the science and mathematics versions of the teacher questionnaire.

Each composite is calculated by summing the responses to the items associated with that composite and then dividing by the total points possible. In order for the composites to be on a 100-point scale, the lowest response option on each scale was set to 0 and the others were adjusted accordingly; so for instance, an item with a scale ranging from 1 to 4 was re-coded to have a scale of 0–3. By doing this, someone who marks the lowest point on every item in a composite receives a composite score of 0 rather than some positive number. It also assures that 50 is the true mid-point. The denominator for each composite is determined by computing the maximum possible sum of responses for a series of items and dividing by 100; e.g., a nine-item composite where each item is on a scale of 0–3 would have a denominator of 0.27.

Composite definitions are presented below along with the item numbers. Reliability information is based on responses from the 2000 National Survey of Science and Mathematics Education.

Definitions of Teacher Composites

Composite definitions for the science and mathematics teacher questionnaire are presented below along with the item numbers from the respective questionnaires. Composites that are identical for the two subjects are presented in the same table; composites unique to a subject are presented in separate tables.

Instructional Objectives

These composites estimate the amount of emphasis teachers place on various objectives.

**Table B-1
Nature of Science/Mathematics Objectives**

	Science	Mathematics
Learn to evaluate arguments based on scientific evidence	Q19f	
Understand the logical structure of mathematics		Q19i
Learn about the history and nature of science/mathematics	Q19j	Q19j
Learn how to communicate ideas in science effectively*	Q19g	
Learn how to explain ideas in mathematics effectively*		Q19k
Learn about the applications of science in business and industry*	Q19h	
Learn how to apply mathematics in business and industry*		Q19l
Learn about the relationship between science, technology, and society	Q19i	
Number of Items in Composite	5	4
Reliability (Cronbach's Coefficient Alpha)	0.84	0.73

* The mathematics and science versions of this question are considered equivalent, worded appropriately for that discipline.

**Table B-2
Science Content Objectives**

	Science
Learn basic science concepts	Q19b
Learn important terms and facts of science	Q19c
Learn science process/inquiry skills	Q19d
Prepare for further study in science	Q19e
Number of Items in Composite	4
Reliability (Cronbach's Coefficient Alpha)	0.60

**Table B-3
Basic Mathematics Skills Objectives**

	Mathematics
Develop students' computational skills	Q19d
Learn to perform computations with speed and accuracy	Q19m
Prepare for standardized tests	Q19n
Number of Items in Composite	3
Reliability (Cronbach's Coefficient Alpha)	0.69

**Table B-4
Mathematics Reasoning Objectives**

	Mathematics
Learn mathematical concepts	Q19b
Learn how to solve problems	Q19e
Learn to reason mathematically	Q19f
Learn how mathematics ideas connect with one another	Q19g
Number of Items in Composite	4
Reliability (Cronbach's Coefficient Alpha)	0.75

Teaching Practices

These composites estimate the extent to which teachers use a variety of teaching practices and instructional technologies.

Table B-5
Use of Traditional Teaching Practices

	Science	Mathematics
Introduce content through formal presentations	Q20a	Q20a
Assign science/mathematics homework	Q20i	Q20j
Listen and take notes during presentation by teacher	Q21a	Q21a
Read from a science/mathematics textbook in class	Q21d	Q21c
Practice routine computations/algorithms		Q21f
Review homework/worksheet assignments		Q21g
Answer textbook or worksheet questions	Q21j	Q21k
Number of Items in Composite	5	7
Reliability (Cronbach's Coefficient Alpha)	0.71	0.70

Table B-6
Use of Strategies to Develop Students' Abilities to Communicate Ideas

	Science	Mathematics
Pose open-ended questions	Q20b	Q20b
Engage the whole class in discussions	Q20c	
Require students to supply evidence to support their claims*	Q20d	
Require student to explain their reasoning when giving an answer*		Q20d
Ask students to explain concepts to one another	Q20e	Q20e
Ask students to consider alternative explanations *	Q20f	
Ask students to consider alternative methods for solutions*		Q20f
Ask students to use multiple representations (e.g., numeric, graphic, geometric, etc.)		Q20g
Help students see connections between science/mathematics and other disciplines	Q20h	Q20i
Number of Items in Composite	6	6
Reliability (Cronbach's Coefficient Alpha)	0.79	0.77

* The mathematics and science versions of this question are considered equivalent, worded appropriately for that discipline.

Table B-7
Use of Computers

	Science
Use computers as a tool (e.g., spreadsheets, data analysis)	Q21p
Do drill and practice	Q22a
Demonstrate scientific principles	Q22b
Play science learning games	Q22c
Do laboratory simulations	Q22d
Collect data using sensors or probes	Q22e
Retrieve or exchange data	Q22f
Solve problems using simulations	Q22g
Take a test or quiz	Q22h
Number of Items in Composite	9
Reliability (Cronbach's Coefficient Alpha)	0.91

**Table B-8
Use of Laboratory Activities**

	Science
Work in groups	Q21c
Do hands-on/laboratory science activities or investigations	Q21f
Follow specific instructions in an activity or investigation	Q21g
Record, represent, and/or analyze data	Q21k
Number of Items in Composite	4
Reliability (Cronbach's Coefficient Alpha)	0.80

**Table B-9
Use of Calculators/Computers for Investigations**

	Mathematics
Record, represent, and/or analyze data	Q21l
Use calculators or computers as a tool (e.g., spreadsheets, data analysis)	Q21r
Do simulations	Q22d
Collect data using sensors or probes	Q22e
Retrieve or exchange data	Q22f
Solve problems using simulations	Q22g
Number of Items in Composite	6
Reliability (Cronbach's Coefficient Alpha)	0.85