APPENDIX U:
SCIENCE ALIGNMENT STUDY TECHNICAL REPORT

REPORT

Alignment Analysis of Science Standards and Assessments

Michigan
Grades 5 and 8

Norman L. Webb

November 18, 2005

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This study is one of the three alignment studies conducted for the State of Michigan. The Alignment Analysis Institute was held September 21–23, 2005, in Lansing, Michigan. The report consists of a description of the four criteria used to judge the alignment between Michigan Science Academic Content Standards for grades 5 and 8 and three assessments for each grade. This report includes tables listing the results of nine reviewers' coding of the assessments.

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Table of Contents

Executive Summary iii

Introduction 1

Alignment Criteria Used for This Analysis 3
- Categorical Concurrence 3
- Depth-of-Knowledge Consistency 4
- Range-of-Knowledge Correspondence 6
- Balance of Representation 7
- Source of Challenge 7

Findings 8
- Standards 8
- Alignment of Curriculum Standards and Assessments 9
- Action Needed for Each Assessment Form and Standards To Be Fully Aligned 13
- Source of Challenge 14
- Notes 14
- General Comments Made by Reviewers 14
- Reliability Among Reviewers 23
- Cross-Form Analysis 24

Summary 34

References 34

Appendix U.1
Group Consensus Values for Michigan Science Standards and Objectives

Appendix U.2
Tables

Executive Summary

This is a report of the results from a three-day Alignment Analysis Institute that was conducted September 21, 22, and 23, 2005, in Lansing, Michigan. Nine reviewers, including science content experts, the state science coordinator, district science supervisors, and science teachers met to analyze the agreement between the state's science standards and Michigan Educational Assessment Program assessments for grades 5 and 8. Five reviewers were from Michigan, and four were experts brought in from other states. Nine reviewers analyzed four of the six assessments, while four analyzed the grade 8 2004 assessment and six reviewers analyzed the grade 8 2005 assessment. Because of time constraints, the reviewers were divided into two groups to analyze these two assessments. All of the reviewers participated in analyzing the depth-of-knowledge levels of the standards.

The Michigan science standards and assessments for grades 5 and 8 lack full alignment because one standard is not assessed. Reviewers at most only coded three items to Standard II (*Reflecting on Scientific Knowledge*) on any of the six forms analyzed. On most forms, reviewers found no items that they judged to correspond to objectives under this standard. Many of the objectives under this standard seek to have students develop an awareness of the nature of science or an application of science, which are more difficult to measure on an on-demand assessment. Considering the assessments and the other four standards for both grade levels, the alignment is reasonable, with only a few changes needed to achieve full alignment. If the three forms at each grade level are considered in aggregate, then the combined test is fully aligned with the four standards.

If each assessment form is thought of as a separate assessment, then only a few changes to each form are needed to achieve acceptable alignment between the assessment and the science standards. Each grade 5 form would need to have only one or two items replaced or added to meet the minimal acceptable levels on all four alignment criteria. The grade 8 forms would require from three to five additional items, or replaced items, to achieve an acceptable alignment on the four alignment criteria; in each case, for each of the six forms, it would be possible to retain the total number of items and have full alignment if existing items were replaced by new items.

Alignment Analysis of Science Standards and Assessments

Michigan
Grades 5 and 8

Norman L. Webb

Introduction

The alignment of expectations for student learning with assessments for measuring students' attainment of these expectations is an essential attribute for an effective standards-based education system. Alignment is defined as the degree to which expectations and assessments are in agreement and serve in conjunction with one another to guide an education system toward students learning what they are expected to know and do. As such, alignment is a quality of the relationship between expectations and assessments and not an attribute of any one of these two system components. Alignment describes the match between expectations and assessment that can be legitimately improved by changing either student expectations or the assessments. As a relationship between two or more system components, alignment is determined by using the multiple criteria described in detail in a National Institute for Science Education (NISE) research monograph, *Criteria for Alignment of Expectations and Assessments in Mathematics and Science Education* (Webb, 1997).

A three-day Alignment Analysis Institute was conducted September 21, 22, and 23, 2005, in Lansing, Michigan. Nine reviewers, including science content experts, state science coordinators, district science supervisors, and science teachers, met to analyze the agreement between the state's science standards and Michigan Educational Assessment Program assessments for grades 5 and 8. Five reviewers were from Michigan, and four were experts brought in from other states. Three forms of the elementary (grade 5) science assessment (Winter 2004, Fall 2005, and Winter 2005) and three forms of the middle school (grade 8) science assessment (Winter 2004, Fall 2005, and Winter 2005) were analyzed. Nine of the reviewers coded the four of the assessments. Because of time constraints and the coding speed of some reviewers, the reviewers were divided into two groups to code two of the grade 8 assessments, Winter 2004 and Winter 2005. One reviewer was able to code both of these assessments. As a result, four reviewers coded the grade 8 form for Winter 2004 and six reviewers coded the grade 8 form for Winter 2005.

For the purposes of this analysis, we have employed the convention of standards, goals, and objectives to describe three levels of expectations for what students are to know and do. Standard is used here as the most general (for instance, *Using Life Science Knowledge*). There are five such standards for each grade level. Each standard is comprised of one to six goals (e.g., *Cells*), each of which is comprised of up to six objectives. These objectives are intended to span the content of the goals and standards

under which they fall. The standards, goals, and objectives are reproduced in Appendix A.

The number of items on the science assessments varied some by grade. The grade5 assessments had 43 items and the grade 8 assessments had 50 items. All of the items were multiple choice, each counting as one point. Thus, the number of points for each assessment was the same as the number of items.

Reviewers were trained to identify the depth of knowledge of objectives and assessment items. This training included reviewing the definitions of the four depth-of-knowledge (DOK) levels and then reviewing examples of each. Then the reviewers participated in 1) a consensus process to determine the depth-of-knowledge levels of the Michigan objectives and 2) individual analyses of the assessment items on each of the assessments. Following individual analyses of the items, reviewers participated in a debriefing discussion in which they gave their overall impressions of the alignment between the assessment and the Michigan high school curriculum standards.

To derive the results on the degree of agreement between the Michigan science standards and each assessment, the reviewers' responses are averaged. Any variance among reviewers is considered legitimate, with the true depth-of-knowledge level for the item falling somewhere between two or more assigned values. Such variation could signify a lack of clarity in how the objectives were written, the robustness of an item that can legitimately correspond to more than one objective, and/or a depth of knowledge that falls between two of the four defined levels. Reviewers were allowed to identify one assessment item as corresponding to up to three objectives—one primary hit (objective) and up to two secondary hits. However, reviewers could only code one depth-of-knowledge level to each assessment item, even if the item corresponded to more than one objective. Finally, in addition to learning the process, reviewers were asked to provide suggestions for improving the process.

Reviewers were instructed to focus primarily on the alignment between the state standards and the various assessments. However, they were encouraged to offer their opinions on the quality of the standards, or of the assessment activities/items, by writing a note about the item. Reviewers could also indicate whether there was a source-of-challenge issue with the item—i.e., a problem with the item that might cause a student who knows the material to give a wrong answer, or enable someone who does not have the knowledge being tested to answer the item correctly. For example, a science item that involves an excessive amount of mathematical computation may represent a source-of-challenge issue because the skill required to answer is more a mathematics skill than a science skill.

The results produced from the institute pertain only to the issue of agreement between the Michigan state standards and the assessment instruments. Note that this alignment analysis does not serve as external verification of the general quality of the state's standards or assessments. Rather, only the degree of alignment is discussed in these results. The averages of the reviewers' coding were used to determine whether the

alignment criteria were met. When reviewers did vary in their judgments, the averages lessened the error that might result from any one reviewer's finding. Standard deviations are reported, which give one indication of the variance among reviewers.

To report on the results of an alignment study of Michigan's curriculum standards and six assessments, the study addressed specific criteria related to the content agreement between the state standards and grade-level assessments. Four alignment criteria received major attention: categorical concurrence, depth-of-knowledge consistency, range-of-knowledge correspondence, and balance of representation.

Alignment Criteria Used for This Analysis

This analysis, which judged the alignment between standards and assessments on the basis of four criteria, also reported on the quality of items by identifying items with sources of challenge and other issues. For each alignment criterion, an acceptable level was defined by what would be required to assure that a student had met the standards.

Categorical Concurrence

An important aspect of alignment between standards and assessments is whether both address the same content categories. The categorical-concurrence criterion provides a very general indication of alignment if both documents incorporate the same content. *The criterion of categorical concurrence between standards and assessment is met if the same or consistent categories of content appear in both documents.* This criterion was judged by determining whether the assessment included items measuring content from each standard. The analysis assumed that the assessment had to have at least six items measuring content from a standard in order for an acceptable level of categorical concurrence to exist between the standard and the assessment. The number of items, six, is based on estimating the number of items that could produce a reasonably reliable subscale for estimating students' mastery of content on that subscale. Of course, many factors have to be considered in determining what a reasonable number is, including the reliability of the subscale, the mean score, and cutoff score for determining mastery. Using a procedure developed by Subkoviak (1988) and assuming that the cutoff score is the mean and that the reliability of one item is .1, it was estimated that six items would produce an agreement coefficient of at least .63. This indicates that about 63% of the group would be consistently classified as masters or nonmasters if two equivalent test administrations were employed. The agreement coefficient would increase if the cutoff score is increased to one standard deviation from the mean to .77 and, with a cutoff score of 1.5 standard deviations from the mean, to .88. Usually states do not report student results by standards, or require students to achieve a specified cutoff score on subscales related to a standard. If a state did do this, then the state would seek a higher agreement coefficient than .63. Six items were assumed to be a minimum for an assessment measuring content knowledge related to a standard and as a basis for making some decisions about students' knowledge of that standard. If the mean for six items is 3 and one standard deviation is one item, then a cutoff score set at 4 would produce an agreement coefficient of .77. Any fewer items with a mean of one-half of the items would

require a cutoff that would only allow a student to miss one item. This would be a very stringent requirement, considering a reasonable standard error of measurement on the subscale.

Depth-of-Knowledge Consistency

Standards and assessments can be aligned not only on the category of content covered by each, but also on the basis of the complexity of knowledge required by each. *Depth-of-knowledge consistency between standards and assessment indicates alignment if what is elicited from students on the assessment is as demanding cognitively as what students are expected to know and do as stated in the standards.* For consistency to exist between the assessment and the standard, as judged in this analysis, at least 50% of the items corresponding to an objective had to be at or above the level of knowledge of the objective: 50%, a conservative cutoff point, is based on the assumption that a minimal passing score for any one standard of 50% or higher would require the student to successfully answer at least some items at or above the depth-of-knowledge level of the corresponding objectives. For example, assume that an assessment included six items related to one standard and that students were required to answer correctly four of those items to be judged proficient—i.e., 67% of the items. If three, 50%, of the six items were at or above the depth-of-knowledge (DOK) level of the corresponding objectives, then for a student to achieve a proficient score would require the student to answer correctly at least one item at or above the DOK level of one objective. Some leeway was used in this analysis on this criterion. If a standard had between 40% to 50% of items at or above the depth-of-knowledge levels of the objectives, then it was reported that the criterion was "weakly" met.

Interpreting and assigning depth-of-knowledge levels to standards and assessment items is an essential requirement of alignment analysis. The following definitions of DOK levels were used in this science analysis:

Level 1 (Recall and Reproduction) is the recall of information such as a fact, definition, term, or a simple procedure, as well as performing a simple science process or procedure. Level 1 only requires students to demonstrate a rote response, use a well-known formula, follow a set procedure (like a recipe), or perform a clearly defined series of steps. A "simple" procedure is well defined and typically involves only one step. Verbs such as "identify," "recall," "recognize," "use," "calculate," and "measure" generally represent cognitive work at the Recall and Reproduction level. Simple word problems that can be directly translated into and solved by a formula are considered Level 1. Verbs such as "describe" and "explain" could be classified at different DOK levels, depending on the complexity of what is to be described and explained.

A student answering a Level 1 item either knows the answer or does not: that is, the answer does not need to be "figured out," or "solved." In other words, if the knowledge necessary to answer an item automatically provides the answer to the item, then the item is at Level 1. If the knowledge necessary to answer the item does not

automatically provide the answer, the item is at least at Level 2. Some examples that represent, but do not constitute all of, Level 1 performance are:

- Recall or recognize a fact, term, or property.
- Represent in words or diagrams a scientific concept or relationship.
- Provide or recognize a standard scientific representation for simple phenomenon.
- Perform a routine procedure, such as measuring length.

Level 2 (Skills and Concepts) includes the engagement of some mental processing beyond recalling or reproducing a response. The content knowledge or process involved is **more complex** than in Level 1. Items require students to make some decisions as to how to approach the question or problem. Keywords that generally distinguish a Level 2 item include "classify," "organize," "estimate," "make observations," "collect and display data," and "compare data." These actions imply **more than one step**. For example, to compare data requires first identifying characteristics of the objects or phenomenon and then grouping or ordering the objects. Level 2 activities include making observations and collecting data; classifying, organizing, and comparing data; and organizing and displaying data in tables, graphs, and charts. Some action verbs, such as "explain," "describe," or "interpret," could be classified at different DOK levels, depending on the complexity of the action. For example, interpreting information from a simple graph, requiring reading information from the graph, is a Level 2. An item that requires interpretation from a complex graph, such as making decisions regarding features of the graph that need to be considered and how information from the graph can be aggregated, is at Level 3. Some examples that represent, but do not constitute all of, Level 2 performance, are:

- Specify and explain the relationship between facts, terms, properties, or variables.
- Describe and explain examples and non-examples of science concepts.
- Select a procedure according to specified criteria and perform it.
- Formulate a routine problem, given data and conditions.
- Organize, represent, and interpret data.

Level 3 (Strategic Thinking) requires reasoning, planning, using evidence, and a higher level of thinking than the previous two levels. The cognitive demands at Level 3 are complex and abstract. The complexity does not result only from the fact that there could be multiple answers, a possibility for both Levels 1 and 2, but because the multi-step task requires more demanding reasoning. In most instances, requiring students to explain their thinking is at Level 3; requiring a very simple explanation or a word or two should be at Level 2. An activity that has more than one possible answer and requires students to justify the response they give would most likely be at Level 3. Experimental designs in Level 3 typically involve more than one dependent variable. Other Level 3 activities include drawing conclusions from observations; citing evidence, and developing a logical argument for concepts; explaining phenomena in terms of concepts; and using concepts to solve non-routine problems. Some examples that represent, but do not constitute all of, Level 3 performance, are:

- Identify research questions and design investigations for a scientific problem.
- Solve non-routine problems.
- Develop a scientific model for a complex situation.
- Form conclusions from experimental data.

Level 4 (Extended Thinking) involves high cognitive demands and complexity. Students are required to make several connections—relate ideas within the content area or among content areas—and to select or devise one approach among many alternatives on how the situation can be solved. Many on-demand assessment instruments will not include any assessment activities that could be classified as Level 4. However, standards, goals, and objectives can be stated in such a way as to expect students to perform extended thinking. "Develop generalizations of the results obtained and the strategies used and apply them to new problem situations," is an example of a grade 8 objective that is at Level 4. Many, but not all, performance assessments and open-ended assessment activities requiring significant thought will be Level 4.

Level 4 requires complex reasoning, experimental design and planning, and probably will require an extended period of time either for the science investigation required by an objective, or for carrying out the multiple steps of an assessment item. However, the extended time period is not a distinguishing factor if the required work is only repetitive and does not require applying significant conceptual understanding and higher-order thinking. For example, if a student has to take the water temperature from a river each day for a month and then construct a graph, this would be classified as a Level 2 activity. However, if the student conducts a river study that requires taking into consideration a number of variables, this would be at Level 4. Some examples that represent but do not constitute all of a Level 4 performance are:

- Based on data provided from a complex experiment that is novel to the student, deduct the fundamental relationship between several controlled variables.
- Conduct an investigation, from specifying a problem to designing and carrying out an experiment, to analyzing its data and forming conclusions.

Range-of-Knowledge Correspondence

For standards and assessments to be aligned, the breadth of knowledge required on both should be comparable. *The range-of-knowledge criterion is used to judge whether a comparable span of knowledge expected of students by a standard is the same as, or corresponds to, the span of knowledge that students need in order to correctly answer the assessment items/activities.* The criterion for correspondence between span of knowledge for a standard and an assessment considers the number of objectives within the standard with one related assessment item/activity. Fifty percent of the objectives for a standard have to have at least one related assessment item in order for the alignment on this criterion to be judged acceptable. This level is based on the assumption that students' knowledge should be tested on content from over half of the domain of knowledge for a standard. This assumes that each objective for a standard should be given equal weight. Depending on the balance in the distribution of items and the necessity for having a low

number of items related to any one objective, the requirement that assessment items need to be related to more than 50% of the objectives for a standard increases the likelihood that students will have to demonstrate knowledge on more than one objective per standard to achieve a minimal passing score. As with the other criteria, a state may choose to make the acceptable level on this criterion more rigorous by requiring an assessment to include items related to a greater number of the objectives. However, any restriction on the number of items included on the test will place an upper limit on the number of objectives that can be assessed. Range-of-knowledge correspondence is more difficult to attain if the content expectations are partitioned among a greater number of standards and a large number of objectives. If 50% or more of the objectives for a standard had a corresponding assessment item, then the range-of-knowledge criterion was met. If between 40% to 50% of the objectives for a standard had a corresponding assessment item, the criterion was "weakly" met.

Balance of Representation

In addition to comparable depth and breadth of knowledge, aligned standards and assessments require an equal distribution of knowledge in both. The range-of-knowledge criterion only considers the number of objectives within a standard hit (a standard with a corresponding item); it does not take into consideration how the hits (or assessment items/activities) are distributed among these objectives. *The balance-of-representation criterion is used to indicate the degree to which one objective is given more emphasis on the assessment than another.* An index is used to judge the distribution of assessment items. This index only considers the objectives for a standard that have at least one hit—i.e., one related assessment item per objective. The index is computed by considering the difference in the proportion of objectives and the proportion of hits assigned to the objective. An index value of 1 signifies perfect balance and is obtained if the hits (corresponding items) related to a standard are equally distributed among the objectives for the given standard. Index values that approach 0 signify that a large proportion of the hits are on only one or two of all of the objectives hit. Depending on the number of objectives and the number of hits, a unimodal distribution (most items related to one objective and only one item related to each of the remaining objectives) has an index value of less than .5. A bimodal distribution has an index value of around .55 or .6. Index values of .7 or higher indicate that items/activities are distributed among all of the objectives at least to some degree (e.g., every objective has at least two items) and is used as the acceptable level on this criterion. Index values between .6 and .7 indicate the balance-of-representation criterion has only been "weakly" met.

Source of Challenge

The source-of-challenge criterion is only used to identify items on which the major cognitive demand is inadvertently placed and is other than the targeted mathematics skill, concept, or application. Cultural bias or specialized knowledge could be reasons for an item to have a source-of-challenge problem. Such item characteristics may result in some students not answering an assessment item, or answering an

assessment item incorrectly, or at a lower level, even though they possess the understanding and skills being assessed.

Findings

Standards

Nine reviewers participated in the depth-of-knowledge (DOK) level consensus process for the standards and objectives for the Michigan science standards. A summary of their deliberations is presented in Table 1. The complete group consensus values for each competency and objective can be found in Appendix A.

Table 1
Percent of Objectives by Depth-of-Knowledge (DOK) Levels for Grades 5 and 8 Standards, Michigan Alignment Analysis for Science

Grade	Total number of objectives	DOK Level	# of objs by Level	% within std by Level
5	54	1	27	50
		2	25	46
		3	2	3
8	65	1	27	41
		2	36	55
		3	2	3

Nearly all of the objectives were judged by the reviewers to have a DOK Level of 1 (Recall) and Level 2 (Skill/Concept). Some increased sophistication is expected across grades, as identified by a slight increase in the percentage of objectives judged to be at DOK Level 2, from 46% at grade 5 to 55% at grade 8. The complexity of the objectives indicate that the standards expect students to gain a conceptual understanding and routine use of scientific ideas, but not scientific reasoning or analysis.

The reviewers were told that within each standard the goals were intended to fully span the content of that standard and, in turn, each goal is spanned by the objectives that fall under it. For this reason, the reviewers only coded items to a goal if there were no objectives targeted by the item. Likewise, the reviewers only coded an item to a standard if there were no objectives or goals that the item targeted. Such items are considered to target a generic objective. A large number of items coded to generic objectives may indicate that a standard's content is not fully spanned or described by its goals or objectives. This may also simply indicate that these items are not as precise as the objectives. Table 2 shows the items on each of the six assessments that were coded to the generic objective by more than one reviewer.

Reviewers were also given the option of coding an item as "uncodable" if it did not fit under any of the standards. No items were considered uncodable by more than one

reviewer. This indicates that all of the items on the assessments were judged to relate to some Michigan science standard.

Science reviewers only rarely assigned items to a generic objective. Two or more reviewers coded two items to a generic objective on one grade 5 form and one grade 8 form and one item on two of the grade 5 forms. This indicates that the statements of objectives were sufficiently clear and included statements of expectations that covered the content measured on the assessments, relating at least one item on each of the six assessments to a generic objective.

Table 2
Items Coded to Generic Objectives by More Than One Reviewer for the Michigan Alignment Analysis, Science Grades 5 and 8, Three Forms Each

Grade Level	Assessment Item	Generic Objective (Number of Reviewers)
5, Winter 2004	41	CS5.1 (4)
5, Fall 2005	45	CS5.3 (3)
	8	CS5.4 (2)
5, Winter 2005	8	CS5.4 (2)
8, Winter 2004	None	
8, Fall 2005	8	CS3.5 (2)
	16	CS5.2 (2)
8, Winter 2005	None	

Alignment of Curriculum Standards and Assessments

The Michigan science assessments are designed to assess the full range of content in the grade 5 and grade 8 standards over multiple assessment forms. In this study, reviewers analyzed three assessment forms given successively in winter, fall, and then winter for each grade. By design, the science tests forms are not intended to assess all of the objectives under a standard, but should assess a sufficient number of the objectives over three forms.

At grade 5, the alignment was found to be acceptable for four of the five assessment standards across the three forms (Table 3a). Reviewers only coded items on one form (winter 2004) as corresponding to content under Standard II (*Reflecting on Scientific Knowledge*). On the other two forms, nearly all reviewers failed to find any items that measured content related to Standard II. Thus, the grade 5 assessments are not considered to be aligned to Standard II, considering the individual assessment forms and the set of three forms.

Table 3a

Summary of Acceptable Levels on the Four Alignment Criteria for Elementary Science Assessments—Grade 5 Forms, Winter 2004, Fall 2005, and Winter 2005—for Michigan Alignment Analysis

Standards	Alignment Criteria			
	Categorical Concurrence	Depth-of-Knowledge Consistency	Range of Knowledge	Balance of Representation
Grade 5 Winter 2004				
I - Constructing New Scientific Knowledge	YES	YES	YES	YES
II - Reflecting on Scientific Knowledge	NO	WEAK	NO	YES
III - Using Life Science Knowledge	YES	YES	YES	YES
IV - Using Physical Science Knowledge	YES	YES	WEAK	YES
V - Using Earth Science Knowledge	YES	YES	YES	YES
Grade 5 Fall 2005				
I - Constructing New Scientific Knowledge	NO	YES	WEAK	YES
II - Reflecting on Scientific Knowledge	NO	YES	NO	NO
III - Using Life Science Knowledge	YES	YES	YES	YES
IV - Using Physical Science Knowledge	YES	YES	WEAK	YES
V - Using Earth Science Knowledge	YES	YES	YES	YES
Grade 5 Winter 2005				
I - Constructing New Scientific Knowledge	NO	YES	YES	YES
II - Reflecting on Scientific Knowledge	NO	NA	NA	NA
III - Using Life Science Knowledge	YES	YES	YES	YES
IV - Using Physical Science Knowledge	YES	YES	YES	YES
V - Using Earth Science Knowledge	YES	YES	WEAK	YES

On four of the five science standards, the alignment is generally good, with only a few shortfalls. The average number of items coded by reviewers to Standard I was just short of the required six items to meet the Categorical Concurrence criterion for grade 5 forms, Fall 2005 (5.56) and Winter 2005 (5.44). This is not considered a serious alignment issue. All three grade 5 forms had an acceptable proportion of items with depth-of-knowledge levels that compared to those of the corresponding objectives under the standards. Each form only weakly met the Range-of-Knowledge Correspondence criterion for one or two standards. For all three forms, only one or two objectives under any one standard needed a corresponding item in order to meet an acceptable level on the Range criterion. Considering the set of three forms, a proportion of objectives under each standard, except Standard II, was assessed to have sufficient breadth of content. Table 6 shows the items coded by at least three reviewers on each grade 5 form for each objective. Across the three forms, reviewers coded items to 67% of the objectives under Standard I, 84% of the objectives under Standard III, 81% of the objectives under Standard IV, and 78% of the objectives under Standard V. All three forms met an acceptable level on the Balance-of-Representation criterion.

As was the case for grade 5, the three assessment forms and grade 8 science are generally aligned, except for Standard II (*Reflecting on Scientific Knowledge*) (Table 3b). Reviewers only coded, on the average, one item on each form as measuring content related to Standard II. This number of items is insufficient to make any judgment of students' knowledge related to Standard II, even by aggregating the three test forms. For the other four grade 8 standards, there is alignment if all three forms are considered. An acceptable level on the Range-of-Knowledge Correspondence criterion was obtained for each of the four standards by aggregating all three test forms. As can be seen in Table 7, across the three forms, the proportions of objectives with corresponding items are 83% of the objectives under Standard I, 75% of the objectives under Standard III, 76% of the objectives under Standard IV, and 88% of the objectives under Standard V.

Each of the three grade 8 science assessment forms presented too many issues to be considered fully aligned, in addition to having few items measuring content related to Standard II. The grade 8 Winter 2004 form only weakly met an acceptable level on the Depth-of-Knowledge Consistency criterion for Standard IV because 52% of the corresponding items were under the DOK level of the corresponding objective. Also, the Winter 2004 form only had items that corresponded to about one-third of the objectives under Standard IV, to low a proportion to meet an acceptable level for the Range-of-Knowledge Correspondence criterion.

The Fall 2005 form for grade 8 science and the grade 8 standards presented the greatest number of alignment problems of the three forms. Reviewers' analyses indicated that there were only about four items that measured content related to Standard I, below the minimal number of six required to have an acceptable level on the Categorical Concurrence criterion. These items only weakly met an acceptable level on the Depth-of-Knowledge Consistency criterion, with more than half of the items on the average being judged to have a lower DOK level than the corresponding objective. Also, the four items only measured content related to about one-third of the objectives under Standard I.

Table 3b

Summary of Acceptable Levels on the Four Alignment Criteria for Middle School Science Assessments—Grade 8 Forms Winter 2004, Fall 2005, and Winter 2005—for Michigan Alignment Analysis

Standards	Alignment Criteria			
	Categorical Concurrence	Depth-of-Knowledge Consistency	Range of Knowledge	Balance of Representation
Grade 8 Winter 2004				
I - Constructing New Scientific Knowledge	YES	YES	YES	YES
II - Reflecting on Scientific Knowledge	NO	NO	NO	YES
III - Using Life Science Knowledge	YES	YES	YES	YES
IV - Using Physical Science Knowledge	YES	WEAK	NO	YES
V - Using Earth Science Knowledge	YES	YES	YES	YES
Grade 8 Fall 2005				
I - Constructing New Scientific Knowledge	NO	WEAK	NO	YES
II - Reflecting on Scientific Knowledge	NO	NO	NO	NO
III - Using Life Science Knowledge	YES	YES	WEAK	YES
IV - Using Physical Science Knowledge	YES	YES	WEAK	YES
V - Using Earth Science Knowledge	YES	YES	YES	YES
Grade 8 Winter 2005				
I - Constructing New Scientific Knowledge	YES	YES	YES	WEAK
II - Reflecting on Scientific Knowledge	NO	NO	NO	WEAK
III - Using Life Science Knowledge	YES	YES	YES	YES
IV - Using Physical Science Knowledge	YES	YES	YES	YES
V - Using Earth Science Knowledge	YES	YES	WEAK	YES

Standards III and IV only weakly met an acceptable level on the Range-of-Knowledge Correspondence criterion because the items corresponded to less than 50% of the objectives, about 7 of 16 objectives under Standard III and 9 of 22 objectives under Standard IV.

Alignment between the Winter 2005 form for grade 8 science and the grade 8 standards was nearly acceptable for all of the standards, except for Standard II. The assessment only had items that measured about 7 of the 16 objectives under Standard V. Therefore, an acceptable level on the Range-of-Knowledge Correspondence criterion was only weakly met. The assessment only weakly met the Balance-of-Representation criterion for Standard I because of the 8 items that reviewers on average coded to objectives under this standard; about five items were coded to one objectives (CS1.5), while each of the other items corresponded to one objective.

Action Needed for Each Assessment Form and the Standards To Be Fully Aligned

In summary, from three to six items would need to be added to each science form for grade 5 and grade 8 to meet the acceptable level on the Categorical Concurrence criterion for Standard II. After that, very few changes are needed. These items would need to be selected with adequate DOK levels and corresponding to at least three of the objectives under the standard:

Grade 5s Winter 2004 form needs to have two items replaced by items that measure objectives under Standard IV, which is not currently assessed.

Grade 5s Fall 2005 form would need to have two items replaced. One of these items should be replaced by an item that measures an objective under Standard I. The other item should be replaced by an item that measures an objective under Standard IV, not currently assessed.

The grade 5 Fall 2005 form only needs one item replaced with one that measures content related to an objective under Standard V, not currently assessed.

Grade 8s Winter2004 form would require three items to be replaced to achieve full alignment with four of the standards. One item measuring content related to Standard IV needs to be replaced by an item with a higher DOK level. Two additional items need to be replaced by items that measure objectives under Standard IV, not currently being assessed.

Grade 8's Fall 2005 form would need a total of five items to be replaced. Two items need to be added that measure content related to Standard I. If these items have a sufficiently high DOK level and measure content related to objectives not currently assessed, then this would solve the issues on the three criteria not currently met. In addition, one item needs to be replaced with an item measuring an objective under Standard IV that is not

currently assessed and two items need to be replaced with items measuring objectives under Standard V, not currently assessed.

The grade 8 Winter 2005 form only needs two items to be replaced with items that measure objectives under Standard V, which are not currently assessed. One of these items could be one that currently measures Objective CS1.5. This then would remove the Balance issue.

Source of Challenge

Reviewers were asked to indicate whether there was a source-of-challenge issue on any of the items. The concerns expressed by the reviewers are given in the fifth table for each grade (Tables (grade).5) in Appendix B. The most common issue reviewers have identified are items where there is more than one correct choice (e.g., Items 3, grade 5 Winter 2004, and 46 grade 5 Winter 2005). Reviewers also indicated that a couple of grade 5 items corresponded better to middle school objectives. When more than one reviewer has noted a source-of-challenge issue for an item, then the item should be given evaluated for improvement or elimination. However, it is possible that one reviewer observed a valid concern missed by the other reviewers.

Notes

Some reviewers made other comments about the items, which they recorded as notes. These notes are presented in the seventh table for each grade (Tables (grade).7) in Appendix B. The notes of some reviewers correspond to the source of challenge noted by other reviewers. The authors of these notes added at times to the number of reviewers who had a concern about a specific item. Reviewers' notes sometimes clarify the match between the item and the objective as being weak. The notes also indicate issues that a reviewer might have found with an item and his/her suggestion regarding how the item could be improved.

General Comments Made By Reviewers

After coding each assessment, each reviewer was asked to complete a sheet with four questions on it about their opinion of the general alignment between the standards and the assessments:

A. For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?
B. For each standard, did the items cover the most important performance (DOK levels) you expected of the standard? If not, what performance was not assessed?
C. Was there any content you expected to be assessed, but found no items assessing that content? What was that content?

D. What is your general opinion of the alignment between the standards and assessment:
   i. Perfect alignment
   ii. Acceptable alignment
   iii. Needs slight improvement
   iv. Needs major improvement
   v. Not aligned in any way.

E. Other Comments.

These responses indicate the reflections of reviewers at the time of coding. They complement and inform the more rigorous analysis, but should not be interpreted as definitive, only impressionistic. The responses by the science reviewers are presented below. First, we begin with overall comments made by all reviewers as a group at the end of the institute. Then, we make some generalizations about the reviewer comments. Finally, we present all of their responses, word for word.

Science Grade 5 Winter 2004

A. For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?

- Yes.
- Yes.
- No. CS1.3, 3.5.2, 4.1.4, 4.1.5, 4.2.1, 5.3.1.2, 5.4.2.
- Electricity, separating mixtures.
- I did not feel the water or weather standards were well covered.
- Hydrosphere: 3 states of matter 521. Waves vibration: Prisms & filer CS443.
- Most: Forms of energy 4.1.3, changes in matter 4.2.1, magnets 4.3?
- Minimal on hydrosphere, seasons, and weather.
- Forms of energy ass. with common phenomena. Construct simple elec. circuits. Electrical hazards.
- Friction was not covered.

B. For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?

- Yes.
- Overall, the test questions are heavily weighted toward Level 1, leaving Levels 2 and 3 under-represented.
- I would like to have seen a couple of 3s.
- Mostly 1s and 2s.
- For the most part the questions were at or below the DOK for the standard.
- I feel the DOK of the questions matched the DOK of the standards.
- Yes, for the most part. There should have been more analytical graph reading.
- DOK was appropriate.

- No, for the most part the standards were reduced to single step/factual questions (DOK 1).

C. *Was there any content you expected to be assessed, but found no items assessing that content? What was that content?*

- CS1.1 → 1.3, 1.5. CS2.1 → 2.5.
- Generating questions, technology, contributions to science from people from diverse backgrounds, basic requirements of living things, electrical circuits, weather.
- No.
- GED, Solar System.
- Water. Weather.
- Simple circuits 414. Forms of energy 413. Manipulate devices 435.
- See A (Most: Forms of energy 4.1.3, changes in matter 4.2.1, magnets 4.3?. Minimal on hydrosphere, seasons and weather.)
- Forms of energy associated with common phenomena. Construct simple elec. circuits. Electrical hazards. Shadows.
- Life cycles, light prisms, energy.

D. *What is your general opinion of the alignment between the standards and assessment?*

- Needs slight improvement
- Needs slight improvement
- Acceptable alignment
- Needs slight improvement
- Acceptable alignment
- Needs slight improvement
- Needs slight improvement
- Acceptable alignment
- Needs major improvement

E. *Other comments.*

- There is confusion between CS3.4.1 and CS5.1.4.
- Certain benchmarks had too many questions connected.
- Science reading needs to be addressed as benchmark.

Science Grade 5 Fall 2005

A. *For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?*

- Yes.
- Yes.

- No. CS1.3, 1.4, 3.2.2, 3.5.2, 4.2.1.
- Most—A bit light on hydrosphere; it seemed most standards acceptably covered.
- Yes.
- Of the standards covered, the benchmarks assessed were among the most
- important.
- Most forms of energy 4.1.3. Changes in matter 4.2.1. Magnets 4.3.2. Minimal on hydrosphere, seasons, and weather.
- Very few reflecting standards.

B. *For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?*

- Yes.
- Level 2 to some extent, and level 3 to a greater extent were both under-represented.
- I would like to have seen a couple of 3s.
- Mostly 1s and 2s.
- Again, I felt the DOK of the question was at or below the DOK of the standard.
- The DOK of the questions aligned well with the DOK of the question.
- Yes, for the most part. There should have been more analytical graph reading.
- No. The standards were generally reduced to DOK1.

C. *Was there any content you expected to be assessed, but found no items assessing that content? What was that content?*

- Reflecting on Science knowledge.
- Generating questions, scientific reasoning, contributions to science from diverse people.
- No.
- Most—A bit light on hydrosphere, it seemed most standards acceptably covered.
- Very few constructing questions (CS2). Matter & energy (CS4.1) was lacking as well. Atmosphere & weather (CS5.3) had minimal coverage.
- See part A. (Most forms of energy 4.1.3. Changes in matter 4.2.1. Magnets 4.3.2.
- Minimal on hydrosphere, seasons and weather.)
- No magnetism, energy.
- No energy phenomena. No properties/attributes. Prisms & filters.

D. *What is your general opinion of the alignment between the standards and assessment?*

- Needs slight improvement
- Needs slight improvement.
- Acceptable alignment
- Acceptable alignment/Needs slight improvement
- Acceptable alignment

- Needs slight improvement
- Needs slight improvement
- Needs major improvement
- Acceptable alignment

E. *Other comments.*

- Life science-evolution stand. is easily confused with using fossils and rocks to interpret earth history.
- Certain benchmarks seemed to be aligned to too many questions.

Science Grade 5 Winter 2005

A. *For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?*

- No. 3.4, 4.1, 5.3.
- Yes.
- Very heavy on life cycles 3.2.3, while failing to address other 3.2 objectives.
- There was hardly any information on hydrosphere and weather and atmosphere and heredity. Little on fossils and matter.
- No fossils, no prisms/light, no water cycle
- Yes.
- Construct/reflecting seen to be lightly covered.
- For the most part—yes, but too heavy on LS4

B. *For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?*

- I would like to have seen a couple of 3s.
- Level 2 to some extent, and level 3 to a greater extent were both under represented.
- Level 2 and 3 were not assessed enough.
- Yes.
- Some items were very simplistic. .
- Yes.
- Yes.
- The alignment of DOK of question was at or below the DOK of the standard
- Mostly 1s & 2s again.

C. *Was there any content you expected to be assessed, but found no items assessing that content? What was that content?*

- 4.1 (matter and energy)
- Generating scientific questions, contributions of diverse scientists. Body parts of animals. Motion of earth, sun, and moon.

- Atmosphere and weather. Organization of living things. 3.2.1, 3.2.2, 3.2.4.
- Awareness of contributions made to science by people. Describe technology used. Generate questions about the word. Classify objects and substances. Changes in matter.
- See part A. (There was hardly any information on hydrosphere and weather and atmosphere and heredity. Little on fossils and matter.)
- Scientific reading.
- Constructing scientific knowledge. Reflecting sci. knowledge.
- Water, weather, and space were not covered.
- Not much hydrosphere, weather, or space.

D. *What is your general opinion of the alignment between the standards and assessment?*

- Acceptable alignment
- Needs slight improvement.
- Needs slight improvement
- Acceptable alignment
- Needs slight improvement
- Needs major improvement
- Needs slight improvement
- Acceptable alignment
- Needs slight improvement

E. *Other comments.*

- There is overkill on life cycles! Forces/simple machines/astronomy are very thorough.

Science Grade 8 Winter 2004

A. *For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?*

- Yes
- Yes

B. *For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?*

- Yes
- Level 1 & 2 were represented heavily. Level 3 was essentially absent.

C. *Was there any content you expected to be assessed, but found no items assessing that content? What was that content?*

- Advantages/risks of technologies. Scientific theory tracing evolut. relationships.
- Arrangement and motion of molecules. Construct. simple circuits. Compare motions in 2 dimensions. Echoes.
- Light and sound were missing. No electromagnetism.
- Contributions from individuals from diverse backgrounds, classification, simple circuits, energy transformations.

D. *What is your general opinion of the alignment between the standards and assessment?*

- Acceptable alignment
- Needs major improvement.
- Needs slight improvement

E. *Other comments.*

- Terrible constructed content. All lists and all environment.

Science Grade 8 Fall 2005

A. *For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?*

- Yes.
- Yes.
- There were minimal questions dealing with graph reading and any constructing and reflecting benchmarks. None on cells/plants or chemical/physical changes and energy transfer. Very little on electricity/magnetism and weather.
- Not a broad array of Phys. Sci. benchmarks. Seemed heavily weighted to Ecosystems, and repetitive to the same Geo & Hydro benchmarks.
- Yes.
- Very little attention to 3.1, 3.2, 5.4. Nothing on 3.5.2, 4.1.5 or 4.1.6.
- The items were very difficult to align to a single benchmark because they were too general.

B. *For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?*

- Yes.
- Yes.
- There was a lot of real basic fact/definition regurgitation and not enough higher level thinking.
- Light on constr. & reflecting benchmarks—not assessed.
- Yes.
- Yes, but I would like to have seen one or two level 3s.
- DOK for question at or below DOK for standard.

- The test was heavily weighted towards level 1 and to some extent level 2. Level 3 was absent.

C. *Was there any content you expected to be assessed, but found no items assessing that content? What was that content?*

- Evaluate claims. Adv/risks of new tech. Contributions made in science. Selected systems in science. Physical changes in matter. Echoes.
- Reflecting standards—only 1 question. Cells—only 2 questions. Motion of objects—only 2 questions.
- Very little about solar system. No electromagnetic. Little chemical change.
- See A. (There were minimal questions dealing with graph reading and any constructing and reflecting benchmarks. None on cells/plants or chemical/physical changes and energy transfer.
  Very little on electricity/magnetism and weather.
- Not a broad array of Phys. Sci. benchmarks. Seemed heavily weighted to Ecosystems, and repetitive to the same Geo & Hydro benchmarks. Not much planetary stuff. No magnetism?
- I found nothing for II.
- Too heavy on one particular type of mapping.

D. *What is your general opinion of the alignment between the standards and assessment?*

- Acceptable alignment
- Needs slight improvement.
- Needs slight improvement
- Needs slight improvement/Needs major improvement
- Acceptable alignment
- Needs slight improvement
- Needs slight improvement
- Needs slight improvement
- Needs major improvement

E. *Other comments.*

- This test seemed weighted heavily on ecosystems, geosphere and matter/energy
- Way too much ecosystems!
- Some items were better matched to elementary Standards.
- Several questions based on topomaps. Accounted for more than 10% of the total points.
- Many items were difficult to align to MS Standards, as they seemed to align better to elementary standards.

Science Grade 8 – Winter 2005

A. *For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?*

- Yes
- Yes
- None on cells. Little on physical/chemical changes. Very little on sound and light and weather.
- Too many items were difficult to align with specific benchmarks.
- Very little space, very light on constructing and reflecting benchmarks.

B. *For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?*

- Yes
- Yes
- There was a lot of factual regurgitation. It would be nice to see more analytical and higher level thinking.
- DOK for question at or below DOK for standard.
- Seemed to focus on 1 or 2 benchmarks within the strand more than a broad range.

C. *Was there any content you expected to be assessed, but found no items assessing that content? What was that content?*

- Atmosphere and weather – 0 questions.
- Reflecting on science
- See A (None on cells. Little on physical/chemical changes. Very little on sound and light and weather.)
- Very little focus on benchmarks 5.2, 5.3, 5.4
- Too much ecosystem, not enough phys. sci.

D. *What is your general opinion of the alignment between the standards and assessment?*

- Needs slight improvement
- Needs slight improvement
- Needs slight improvement
- Needs slight improvement
- Needs slight improvement

E. *Other comments.*

- Depth of knowledge for this test seems lower than others.
- High on coverage of ecology.

Results from reviewers' opinions of the overall alignment for each assessment by grade are given in Table 4. In general, reviewers felt that the alignment of the assessments and standards needed slight improvement.

Table 4
Average Reviewer Opinion on Overall Alignment of Assessments for Grades 5 and 8, Three Forms, with the Michigan Science Curriculum Standards for Grades 5 and 8 (Question D)

Assessment	Avg. Response	Number of Reviewers
Grade 5 Winter 2004	2.8	9
Grade 5 Fall 2005	2.7	9
Grade 5 Winter 2005	2.8	9
Grade 8 Winter 2004	3.0	3
Grade 8 Fall 2005	2.9	9
Grade 8 Winter 2005	3.0	5

(The ratings are (1) Perfect alignment, (2) Acceptable alignment, (3) Needs slight improvement, (4) Needs major improvement, and (5) Not aligned in any way.)

Reliability Among Reviewers

The intraclass correlation among the science reviewers' assignment of DOK levels to items corresponded to the number of reviewers. With nine reviewers, the intraclass correlation ranged from .83 to .88, all very acceptable (Table 5). When the number of reviewers was reduced because of time constraints, the reliability dropped some to .75 and .61. The pairwise comparison of .61 is a little low, but is reasonable for four reviewers. Reliabilities of over .80 are considered very good. The reliabilities .70 or higher are considered reasonable. Thus, the reviewers had good consistency in assigning the DOK levels to items.

Table 5
Intraclass Correlation Among Reviewers in Assigning Item Depth-of-Knowledge Level for Science

Grade	Intraclass Correlation	Number of Items	Number of Reviewers
Grade 5 Winter 2004	.85	43	9
Grade 5 Fall 2005	.83	43	9
Grade 5 Winter 2005	.88	43	9
Grade 8 Winter 2004	.61*	50	4
Grade 8 Fall 2005	.86	50	9
Grade 8 Winter 2005	.75	50	6

* Pairwise correlation.

Cross-Form Analysis

Tables 6 and 7 show the coding of the items by objective for each of the three forms of the science assessments. In general, the distribution of items among the objectives was similar among the three forms. Forms did different enough that some objectives not assessed on a form were assessed on another form. As a consequence, considering the three forms in total, a high proportion of the objectives (67% or higher, except for Standard II) had at least one corresponding item.

Table 6

Items Assigned to the Michigan Grade 5 Science Standards Objectives for the Three Assessment Forms (Number of Reviewers Who Coded the Item to The Objective)

Objective	Group Consensus	MEAP Science Elementary Winter 2005					MEAP Science Elementary Winter 2004					MEAP Science Elementary Fall 2005				
I	2															
CS1.1.	2															
CS1.2.	3	30-(3)					13-(3)	50-(3)				13-(4)	27-(3)			
CS1.3.	1															
CS1.4.	1	6-(9)	24-(8)				10-(9)	11-(9)	12-(7)			2-(9)	24-(8)			
CS1.5.	2	16-(3)	23-(6)				26-(5)	29-(3)				13-(3)	23-(3)	32-(9)		
CS1.6	2	1-(9)	12-(8)				14-(8)	18-(6)	29-(6)							
II	2															
CS2.1.	2						17-(4)	49-(7)								
CS2.2.	2															
CS2.3.	1															
CS2.4.	2						50-(3)									
CS2.5.	1															
III	2															
CS3.1.	1															
CS3.2.	1															
CS3.2.1.	1						45-(4)	47-(3)				21-(5)	29-(5)	31-(4)		
CS3.2.2.	2															
CS3.2.3.	1	14-(3)	17-(8)	23-(3)	29-(9)	31-(4)	31-(3)					17-(9)	21-(4)	23-(5)	28-(4)	
CS3.2.4.	2	19-(6)														
CS3.2.5.	1	13-(5)	14-(6)	18-(9)	20-(9)		30-(5)	31-(6)								
CS3.3.	2															

Table 6 (continued)

Items Assigned to the Michigan Grade 5 Science Standards Objectives for the Three Assessment Forms
(Number of Reviewers Who Coded the Item to The Objective)

Objective	Group Consensus	MEAP Science Elementary Winter 2005					MEAP Science Elementary Winter 2004					MEAP Science Elementary Fall 2005				
CS3.3.1.	2						51-(9)					14-(7)				
CS3.4.	2															
CS3.4.1.	2	5-(7)					23-(8)	36-(7)	49-(3)			31-(4)				
CS3.4.2.	1	13-(3)					30-(4)	45-(5)	47-(7)	48-(5)		16-(8)	29-(4)	34-(7)		
CS3.5.	2															
CS3.5.1.	2	25-(8)	31-(4)	37-(7)			44-(9)	46-(9)				15-(9)	19-(8)	25-(7)	28-(3)	
CS3.5.2.	1	16-(4)														
CS3.5.3.	3											22-(4)				
CS3.5.4.	2	38-(9)					42-(9)	50-(5)				20-(7)	22-(4)			
IV	2															
CS4.1.	1															
CS4.1.1.	2						6-(9)	7-(5)								
CS4.1.2.	2						7-(4)	24-(3)								
CS4.1.3.	1	27-(9)														
CS4.1.4.	1	30-(6)										27-(7)				
CS4.1.5.	1															
CS4.2	2															
CS4.2.1.	1											45-(3)				
CS4.2.2.	2						4-(6)					46-(9)				
CS4.3.	2															
CS4.3.1.	2															
CS4.3.2.	2	40-(7)	42-(8)	43-(9)			40-(6)					39-(9)	40-(9)	41-(7)	42-(9)	50-(8)

Table 6 (continued)

Items Assigned to the Michigan Grade 5 Science Standards Objectives for the Three Assessment Forms
(Number of Reviewers Who Coded the Item to The Objective)

Objective	Group Consensus	MEAP Science Elementary Winter 2005					MEAP Science Elementary Winter 2004					MEAP Science Elementary Fall 2005				
CS4.3.3.	1	45-(7)					2-(7)	8-(8)								
CS4.3.4.	2	41-(9)	44-(9)				1-(9)	37-(8)				51-(9)				
CS4.3.5.	2															
CS4.4.	1															
CS4.4.1.	1	46-(8)	50-(6)				3-(7)									
CS4.4.2.	1	50-(4)	51-(9)									44-(8)				
CS4.4.3.	1	49-(9)										47-(8)				
CS4.4.4.	2	48-(9)										43-(9)	48-(9)			
V	1															
CS5.1.	2						41-(4)									
CS5.1.1.	1	4-(8)					22-(8)	41-(3)				3-(3)				
CS5.1.2.	2															
CS5.1.3.	1	3-(9)					19-(9)	21-(9)				3-(6)	4-(7)	33-(5)		
CS5.1.4.	2	2-(6)					39-(6)					12-(7)				
CS5.1.5.	1						24-(6)									
CS5.1.6.	2	15-(9)	36-(9)	39-(8)			25-(6)	26-(3)	27-(6)			7-(9)	30-(7)			
CS5.2.	1															
CS5.2.1.	1	28-(8)										1-(7)				
CS5.2.2.	1						15-(8)									
CS5.2.3.	1						38-(8)									
CS5.3.	1											45-(3)				
CS5.3.1.1	1						9-(6)					5-(5)				

Table 6 (continued)

Items Assigned to the Michigan Grade 5 Science Standards Objectives for the Three Assessment Forms
(Number of Reviewers Who Coded the Item to The Objective)

Objective	Group Consensus	MEAP Science Elementary Winter 2005					MEAP Science Elementary Winter 2004					MEAP Science Elementary Fall 2005				
CS5.3.1.2.	1															
CS5.3.1.3.	1															
CS5.4.	2															
CS5.4.1.	2	11-(7)					20-(8)					8-(3)	11-(9)			
CS5.4.2	2	9-(6)	10-(7)									9-(7)	10-(8)			

Table 7

Items Assigned to the Michigan Grade 8 Science Standards Objectives for the Three Assessment Forms
(Number of Reviewers Who Coded the Item to The Objective)

Objective	Group Consensus	MEAP Science Middle Winter 2005					MEAP Science Middle Winter 2004					MEAP Science Middle Fall 2005				
I	2															
CS1.1.	2	58-(3)					3-(3)									
CS1.2.	3	20-(4)					20-(4)	56-(3)				32-(3)	55-(7)			
CS1.3.	1	28-(3)					46-(3)	49-(3)								
CS1.4.	1	35-(5)					48-(3)									
		10-(3)	37-(4)	49-(6)	51-(6)	57-(6)	9-(3)	30-(3)	58-(4)			3-(8)	5-(6)	32-(4)		
CS1.5.	2	58-(3)														
CS1.6.	2															
II	2															
CS2.1.	3						31-(4)									
CS2.2.	2															
CS2.3.	2															
CS2.4.	1															
CS2.5.	2	52-(3)										6-(4)				
CS2.6.	1															
III	2															
CS3.1.	2															
CS3.1.1.	1															
CS3.1.2.	2															
CS3.2.	2															
CS3.2.1.	2	50-(5)														
CS3.2.2.	1	43-(6)					8-(4)									
CS3.2.3.	1	44-(3)														

Table 7 (continued)

Items Assigned to the Michigan Grade 8 Science Standards Objectives for the Three Assessment Forms
(Number of Reviewers Who Coded the Item to The Objective)

Objective	Group Consensus	MEAP Science Middle Winter 2005					MEAP Science Middle Winter 2004					MEAP Science Middle Fall 2005				
CS3.2.4.	2						1-(3)									
CS3.3.	2															
CS3.3.1	2	25-(5)										29-(7)	34-(4)			
CS3.3.2.	2											34-(4)				
CS3.4.	2															
CS3.4.1.	2															
CS3.4.2.	2	47-(4)														
CS3.5.	1															
		27-(3)	42-(6)	46-(6)	53-(3)		5-(4)	12-(3)	23-(4)			2-(8)	5-(3)	7-(3)	12-(7)	30-(3)
CS3.5.1.	1											31-(5)	39-(7)	41-(7)		
CS3.5.2.	1	30-(4)	44-(3)	55-(6)			6-(3)	14-(4)				31-(3)	40-(4)			
CS3.5.3.	2	56-(3)					11-(3)					1-(3)	10-(7)	13-(3)	38-(5)	
CS3.5.4.	1															
CS3.5.5.	1	53-(3)										7-(6)				
CS3.5.6.	1	29-(3)	45-(4)	52-(4)			15-(4)	33-(4)				6-(3)	15-(4)	22-(4)	33-(6)	
IV	2															
CS4.1.	2															
CS4.1.1	2	14-(6)					51-(3)					4-(8)	36-(5)			
CS4.1.2.	1															
CS4.1.3.	2	13-(5)					50-(4)					47-(8)				
CS4.1.4.	1	21-(5)	23-(4)									56-(9)	58-(7)			
CS4.1.5.	2	32-(5)										46-(3)				
CS4.1.6.	2						57-(3)					46-(4)				

Table 7 (continued)

Items Assigned to the Michigan Grade 8 Science Standards Objectives for the Three Assessment Forms
(Number of Reviewers Who Coded the Item to The Objective)

Objective	Group Consensus	MEAP Science Middle Winter 2005					MEAP Science Middle Winter 2004					MEAP Science Middle Fall 2005				
CS4.2.	2															
CS4.2.1.	1	12-(4)														
CS4.2.2.	2						54-(4)									
CS4.2.3.	2	17-(3)														
CS4.2.4.	1															
CS4.3.	2															
CS4.3.1.	2	34-(6)					36-(3)									
CS4.3.2.	2	19-(5)	22-(3)									48-(8)	57-(5)			
CS4.3.3.	1											50-(3)				
CS4.3.4.	2	16-(3)														
CS4.3.5.	2											51-(7)				
CS4.4.	1															
CS4.4.1.	1	18-(6)														
CS4.4.2.	1											53-(8)				
CS4.4.3.	1															
CS4.4.4.	2	15-(6)										19-(8)	49-(7)	52-(9)		
CS4.4.5.	1															
CS4.4.6.	2															
V	2															
CS5.1.	2															
CS5.1.1.	2											25-(8)	26-(8)	27-(7)	28-(6)	
CS5.1.2.	2	3-(5)										20-(9)				
CS5.1.3.	2	4-(5)	6-(5)				25-(3)	27-(3)				23-(9)	28-(9)			

Table 7 (continued)

Items Assigned to the Michigan Grade 8 Science Standards Objectives for the Three Assessment Forms
(Number of Reviewers Who Coded the Item to The Objective)

Objective	Group Consensus	MEAP Science Middle Winter 2005					MEAP Science Middle Winter 2004					MEAP Science Middle Fall 2005				
CS5.1.4.	2											14-(7)				
CS5.1.5.	1											15-(3)	22-(6)	33-(5)		
CS5.2.	1															
CS5.2.1.	2															
CS5.2.2.	1	5-(4)	31-(5)				26-(3)	42-(3)				35-(7)				
CS5.2.3.	1	1-(4)	2-(5)									16-(4)				
CS5.2.4.	1															
CS5.3.	2															
CS5.3.1.	2						37-(3)	43-(3)				17-(6)				
CS5.3.2.	1											17-(3)				
CS5.3.3.	2											21-(9)				
CS5.3.4.	1						45-(3)									
CS5.4.	2															
CS5.4.1.	2	8-(5)					22-(4)					50-(4)				
CS5.4.2.	2	7-(5)	9-(3)	10-(4)								18-(8)				
CS5.4.3.	2	9-(3)					16-(3)									

Summary

The Michigan science standards and assessments for grades 5 and 8 lack full alignment because one standard is not assessed. Reviewers at most only coded three items to Standard II (*Reflecting on Scientific Knowledge*) on any of the six forms analyzed. On most forms reviewers found no items that they judged to correspond to objectives under this standard. Many of the objectives under this standard seek to have students develop an awareness of the nature of science or an application of science which are more difficult to measure on an on-demand assessment. Considering the assessments and the other four standards for both grade levels, the alignment is reasonable with only a few changes needed to achieve full alignment. If the three forms at each grade level are considered in aggregate, then the combined test is fully aligned with the four standards.

If each assessment form is thought of as a separate assessment, then only a few changes to each form is needed to have an acceptable alignment between the assessment and the science standards. Each grade 5 form would need to have only one or two items replaced or added to meet the minimal acceptable levels on all four alignment criteria. The grade 8 forms would require from three to five additional items or replaced item to achieve an acceptable alignment on the four alignment criteria. In each case for each of the six forms, it would be possible to retain the total number of items and have full alignment by replacing existing items.

References

Subkoviak, M. J. (1988). A practitioner's guide to computation and interpretation of reliability indices for mastery tests. *Journal of Educational Measurement, 25*(1), 47-55.

Webb, N. L. (1997). *Criteria for alignment of expectations and assessments in mathematics and science education*. Council of Chief State School Officers and National Institute for Science Education Research Monograph No. 6. Madison: University of Wisconsin, Wisconsin Center for Education Research.

Appendix U.1

Michigan Grades 5 and 8 Science Standards and Group Consensus DOK Values

Table 5.12
Group Consensus
MI Science Elementary, Science, Grade 5

Level	Description	DOK
I	Constructing New Scientific Knowledge	2
CS1.1.	Generate questions about the world based on observation.	2
CS1.2.	Develop solutions to problems through reasoning, observation, and investigations.	3
CS1.3.	Manipulate simple devices that aid observation and data collection.	1
CS1.4.	Use simple measurement devices to make measurements in scientific investigations.	1
CS1.5.	Develop strategies and skills for information gathering and problem solving.	2
CS1.6	Construct charts and graphs and prepare summaries of observations.	2
II	Reflecting on Scientific Knowledge	2
CS2.1.	Develop an awareness of the need for evidence in making decisions scientifically.	2
CS2.2.	Show how science concepts can be illustrated through creative expression such as language arts and fine arts.	2
CS2.3.	Describe ways in which technology is used in everyday life.	1
CS2.4.	Develop an awareness of and sensitivity to the natural world.	2
CS2.5.	Develop an awareness of contributions made to science by people of diverse backgrounds and cultures.	1
III	Using Life Science Knowledge	2
CS3.1.	Cells	1
CS3.2.	Organization of Living Things	1
CS3.2.1.	Explain characteristics and functions of observable body parts in a variety of animals.	1
CS3.2.2.	Compare and contrast (K-2) or classify (3-5) familiar organisms on the basis of observable physical characteristics.	2
CS3.2.3.	Describe life cycles of familiar organisms.	1
CS3.2.4.	Compare and contrast food, energy, and environmental needs of selected organisms.	2
CS3.2.5.	Explain functions of selected seed plant parts.	1
CS3.3.	Heredity	2
CS3.3.1.	Give evidence that characteristics are passed from parents to young.	2
CS3.4.	Evolution	2
CS3.4.1.	Explain how fossils provide evidence about the nature of ancient life.	2
CS3.4.2.	Explain how physical and behavioral characteristics of animals help them to survive in their environments.	1
CS3.5.	Ecosystems	2
CS3.5.1.	Identify familiar organisms as part of a food chain or food web and describe their feeding relationships within the web.	2
CS3.5.2.	Describe the basic requirements for all living things to maintain their existence.	1
CS3.5.3.	Design systems that encourage growing of particular plants or animals.	3
CS3.5.4.	Describe positive and negative effects of humans on the environment.	2
IV	Using Physical Science Knowledge	2
CS4.1.	Matter and Energy	1
CS4.1.1.	Classify common objects and substances according to observable attributes/properties.	2
CS4.1.2.	Identify properties of materials which make them useful.	2

Table 5.12
Group Consensus
MI Science Elementary, Science, Grade 5

CS4.1.3.	Identify forms of energy associated with common phenomena.	1
CS4.1.4.	Construct simple, useful electrical circuits. (3-5)	1
CS4.1.5.	Describe possible electrical hazards to be avoided at home and at school. (K-2)	1
CS4.2	Changes in Matter	2
CS4.2.1.	Describe common physical changes in matter—size, shape; melting, freezing (K-2); dissolving, evaporating (3-5).	1
CS4.2.2.	Prepare mixtures and separate them into their component parts.	2
CS4.3.	Motion of Objects	2
CS4.3.1.	Describe or compare motions of common objects in terms of speed and direction.	2
CS4.3.2.	Explain how forces (pushes or pulls) are needed to speed up, slow down, stop, or change the direction of a moving object.	2
CS4.3.3.	Describe patterns of interaction of magnetic materials with other magnetic and non-magnetic materials.	1
CS4.3.4.	Identify and use simple machines and describe how they change effort.	2
CS4.3.5.	Manipulate simple mechanical devices and explain how their parts work together.	2
CS4.4.	Waves and Vibrations	1
CS4.4.1.	Describe sounds in terms of their properties.	1
CS4.4.2.	Explain how sounds are made.	1
CS4.4.3.	Use prisms and filters with light sources to produce various colors of light.	1
CS4.4.4.	Explain how shadows are made.	2
V	Using Earth Science Knowledge	1
CS5.1.	Geosphere	2
CS5.1.1.	Describe major features of the earth's surface.	1
CS5.1.2.	Recognize and describe different types of earth materials.	2
CS5.1.3.	Describe natural changes in the earth's surface.	1
CS5.1.4.	Explain how rocks and fossils are used to understand the history of the earth.	2
CS5.1.5.	Describe uses of materials taken from the earth.	1
CS5.1.6.	Demonstrate ways to conserve natural resources and reduce pollution through reduction, reuse, and recycling of manufactured materials.	2
CS5.2.	Hydrosphere	1
CS5.2.1.	Describe how water exists on earth in three states.	1
CS5.2.2.	Trace the path that rain water follows after it falls.	1
CS5.2.3.	Identify sources of water and its uses.	1
CS5.3.	Atmosphere and Weather	1
CS5.3.1.1	Describe weather conditions.	1
CS5.3.1.2.	Describe seasonal changes in Michigan's weather.	1
CS5.3.1.3.	Explain appropriate safety precautions during severe weather.	1
CS5.4.	Solar System, Galaxy and Universe	2
CS5.4.1.	Compare and contrast characteristics of the sun, moon and earth.	2
CS5.4.2	Describe the motion of the earth around the sun and the moon around the earth.	2

Table 8.12
Group Consensus
MI Science Elementary, Science, Grade 8

Level	Description	DOK
I	Constructing New Scientific Knowledge	2
CS1.1.	Generate scientific questions about the world based on observation.	2
CS1.2.	Design and conduct scientific investigations.	3
CS1.3.	Use tools and equipment appropriate to scientific investigations.	1
CS1.4.	Use metric measurement devices to provide consistency in an investigation.	1
CS1.5.	Use sources of information in support of scientific investigations.	2
CS1.6.	Write and follow procedures in the form of step-by-step instructions, formulas, flow diagrams, and sketches.	2
II	Reflecting on Scientific Knowledge	2
CS2.1.	Evaluate the strengths and weaknesses of claims, arguments, or data.	3
CS2.2.	Describe limitations in personal knowledge.	2
CS2.3.	Show how common themes of science, mathematics, and technology apply in real-world contexts.	2
CS2.4.	Describe the advantages and risks of new technologies.	1
CS2.5.	Develop an awareness of and sensitivity to the natural world.	2
CS2.6.	Recognize the contributions made in science by cultures and individuals of diverse backgrounds.	1
III	Using Life Science Knowledge	2
CS3.1.	Cells	2
CS3.1.1.	Demonstrate evidence that all parts of living things are made of cells.	1
CS3.1.2.	Explain why and how selected specialized cells are needed by plants and animals.	2
CS3.2.	Organization of Living Things	2
CS3.2.1.	Compare and classify organisms into major groups on the basis of their structure.	2
CS3.2.2.	Describe the life cycle of a flowering plant.	1
CS3.2.3.	Describe evidence that plants make and store food.	1
CS3.2.4.	Explain how selected systems and processes work together in animals.	2
CS3.3.	Heredity	2
CS3.3.1	Describe how the characteristics of living things are passed on through generations.	2
CS3.3.2.	Describe how heredity and environment may influence/determine characteristics of an organism.	2
CS3.4.	Evolution	2
CS3.4.1.	Describe how scientific theory traces possible evolutionary relationships among present and past life forms.	2
CS3.4.2.	Explain how new traits might become established in a population and how species become extinct.	2
CS3.5.	Ecosystems	1
CS3.5.1.	Describe common patterns of relationships among populations.	1
CS3.5.2.	Describe how organisms acquire energy directly or indirectly from sunlight.	1
CS3.5.3.	Predict the effects of changes in one population in a food web on other populations.	2
CS3.5.4.	Describe the likely succession of a given ecosystem over time.	1
CS3.5.5.	Explain how humans use and benefit from plant and animal materials.	1

Table 8.12
Group Consensus
MI Science Elementary, Science, Grade 8

CS3.5.6.	Describe ways in which humans alter the environment.	1
IV	Using Physical Science Knowledge	2
CS4.1.	Matter and Energy	2
CS4.1.1	Describe and compare objects in terms of mass, volume, and density.	2
CS4.1.2.	Explain when length, mass, weight, density, area, volume or temperature are appropriate to describe the properties of an object or substance.	1
CS4.1.3.	Classify substances as elements, compounds, or mixtures and justify classifications in terms of atoms and molecules.	2
CS4.1.4.	Describe the arrangement and motion of molecules in solids, liquids, and gases.	1
CS4.1.5.	Construct simple circuits and explain how they work in terms of the flow of current.	2
CS4.1.6.	Investigate electrical devices and explain how they work, using instructions and appropriate safety precautions.	2
CS4.2.	Changes in Matter	2
CS4.2.1.	Describe common physical changes in matter: evaporation, condensation, sublimation, thermal expansion and contraction.	1
CS4.2.2.	Describe common chemical changes in terms of properties of reactants and products.	2
CS4.2.3.	Explain physical changes in terms of the arrangement and motion of atoms and molecules.	2
CS4.2.4.	Describe common energy transformations in everyday situations.	1
CS4.3.	Motion of Objects	2
CS4.3.1.	Qualitatively describe and compare motion in two dimensions.	2
CS4.3.2.	Relate motion of objects to unbalanced forces in two dimensions.	2
CS4.3.3.	Describe the non-contact forces exerted by magnets, electrically charged objects, and gravity.	1
CS4.3.4.	Use electric currents to create magnetic fields, and explain applications of this principle.	2
CS4.3.5.	Design strategies for moving objects by application of forces, including the use of simple machines.	2
CS4.4.	Waves and Vibrations	1
CS4.4.1.	Explain how sound travels through different media.	1
CS4.4.2.	Explain how echoes occur and how they are used.	1
CS4.4.3.	Explain how light is required to see objects.	1
CS4.4.4.	Describe ways in which light interacts with matter.	2
CS4.4.5.	Describe the motion of vibrating objects.	1
CS4.4.6.	Explain how mechanical waves transfer energy.	2
V	Using Earth Science Knowledge	2
CS5.1.	Geosphere	2
CS5.1.1.	Describe and identify surface features using maps.	2
CS5.1.2.	Explain how rocks are formed.	2
CS5.1.3.	Explain how rocks are broken down, how soil is formed and how surface features change.	2
CS5.1.4.	Explain how rocks and fossils are used to understand the age and geological history of the earth.	2
CS5.1.5.	Explain how technology changes the surface of the earth.	1
CS5.2.	Hydrosphere	1

Table 8.12
Group Consensus
MI Science Elementary, Science, Grade 8

CS5.2.1.	Use maps of the earth to locate water in its various forms and describe conditions under which they exist.	2
CS5.2.2.	Describe how surface water in Michigan reaches the ocean and returns.	1
CS5.2.3.	Explain how water exists below the earth's surface and how it is replenished.	1
CS5.2.4.	Describe the origins of pollution in the hydrosphere.	1
CS5.3.	Atmosphere and Weather	2
CS5.3.1.	Explain patterns of changing weather and how they are measured.	2
CS5.3.2.	Describe the composition and characteristics of the atmosphere.	1
CS5.3.3.	Explain the behavior of water in the atmosphere.	2
CS5.3.4.	Describe health effects of polluted air.	1
CS5.4.	Solar System, Galaxy and Universe	2
CS5.4.1.	Compare the earth to other planets and moons in terms of supporting life.	2
CS5.4.2.	Describe, compare, and explain the motions of solar system objects.	2
CS5.4.3.	Describe and explain common observations of the night skies.	2

Appendix U.2

Data Analysis Tables

Science

Grade 5
Forms Winter 2004, Fall 2005, Winter 2005

Grade 8
Forms Winter 2004, Fall 2005, Winter 2005

Brief Explanation of Data in the Alignment Tables by Column

Tables (Grade.1

Goals #	Number of objectives plus one for a generic objective for each standard.
Objectives #	Average number of objectives for reviewers. If the number is greater than the actual number in the standard, then at least one reviewer coded an item for the goal/objective but did not find any objective in the goal that corresponded to the item.
Level	The Depth-of-Knowledge level coded by the reviewers for the objectives for each standard.
# of objectives by Level	The number of objectives coded at each level
% w/in std by Level	The percent of objectives coded at each level
Hits Mean & SD	Mean and standard deviation number of items reviewers coded as corresponding to standard. The total is the total number of coded hits.
Cat. Conc. Accept.	"Yes" indicates that the standard met the acceptable level for criterion. "Yes" if mean is six or more. "Weak" if mean is five to six. "No" if mean is less than five.

Tables (Grade).2

	First five columns repeat columns from Table 1.
Level of Item w.r.t. Stand	Mean percent and standard deviation of items coded as "under" the Depth-of-Knowledge level of the corresponding objective, as "at" (the same) the Depth-of-Knowledge level of the corresponding objective, and as "above" the Depth-of-Knowledge level of the corresponding objective.
Depth-of-Know. Consistency Accept.	"Yes" indicates that 50% or more of the items were rated as "at" or "above" the Depth-of-Knowledge level of the corresponding objectives. "Weak" indicates that 40% to 50% of the items were rated as "at" or "above" the Depth-of-Knowledge level of the corresponding objectives. "No" indicates that less than 40% items were rated as "at" or "above" the Depth-of-Knowledge level of the corresponding objectives.

Tables (Grade).3

First five columns repeat columns from Table 1 and 2.

Range of Objectives

Objectives Hit

Average number and standard deviation of the objectives hit coded by reviewers.

% of Total — Average percent and standard deviation of the total objectives that had at least one item coded.

Range of Know. Accept.

"Yes" indicates that 50% or more of the objectives had at least one coded objective.

"Weak" indicates that 40% to 50% of the objectives had at least one coded objective.

"No" indicates that 40% or less of the objectives had at least one coded objective.

Balance Index

% Hits in Std/Ttl Hits — Average and standard deviation of the percent of the items hit for a standard of total number of hits (see total under the Hits column).

Index — Average and standard deviation of the Balance Index.

Note: BALANCE INDEX $1 - (\sum_{k=1} \left| 1/(O) - I_{(k)}/(H) \right|)/2$

Where O = Total number of objectives hit for the standard

$I_{(k)}$ = Number of items hit corresponding to objective (k)

H = Total number of items hit for the standard

Bal. of Rep Accept.

"Yes" indicates that the Balance Index was .7 or above (items evenly distributed among objectives).

"Weak" indicates that the Balance Index was .6 to .7 (a high percentage of items coded as corresponding to two or three objectives).

"No" indicates that the Balance Index was .6 or less (a high percentage of items coded as corresponding to one objective.)

Tables (Grade).4

Summary if standard met the acceptable level for the four criteria by each standard.

Tables (Grade). 5

Comments made by reviewers on items identified as having a source of challenge issue by item number.

Tables (Grade).6

The DOK value for each assessment item given by each reviewer. The intraclass correlation for the group of reviewers is given on the last row.

Tables (Grade).7

All notes made by reviewers on items by item number.

Tables (Grade).8

The DOK level and objective code assigned by each reviewer for each item.

Tables (Grade).9

This list all of the objectives coded to each item by the reviewers as corresponding to the item. Repeat of an objective indicates the number of reviewers who coded that objective as corresponding to the item.

Tables (Grade).10

This lists for each objective all of the items coded by the reviewers as corresponding to the objective. Repeat of an item indicates the number of reviewers who coded the item as corresponding to the objective.

Tables (Grade).11

This table summarizes the number of reviewers who coded an item as corresponding to an objective. It contains the same information as in Table 10.

Tables (Grade).12

This table does not appear here, but in Appendix A. It shows the DOK levels determined by the consensus process assigned to each objective.

Tables (Grade).13

This table can be used to compare the DOK level of an objective to the average DOK level of the items reviewers assigned to the objective. This table is helpful to identify items with a lower DOK level that should be replaced by an item with a higher DOK level to improve the Depth-of-Knowledge Consistency.

Table 5.1
Categorical Concurrence Between Standards and Assessment as Rated by Nine Reviewers
Michigan Grade 5 Science, Form Winter 2004
Number of Assessment Items - 43

Standards			Level by Objective			Hits		Cat. Concurr.
Title	Goals #	Objs #	Level	# of objs by Level	% w/in std by Level	Mean	S.D.	
I - Constructing New Scientific Knowledge	6	6	1 2 3	2 3 1	33 50 16	8.11	0.99	YES
II - Reflecting on Scientific Knowledge	5	5	1 2	2 3	40 60	2.44	1.57	NO
III - Using Life Science Knowledge	5	13.11	1 2 3	6 6 1	46 46 7	12	1.33	YES
IV - Using Physical Science Knowledge	4	16.22	1 2	8 8	50 50	9.78	0.92	YES
V - Using Earth Science Knowledge	4	14.56	1 2	9 5	64 35	11.89	2.13	YES
Total	24	54.89	1 2 3	27 25 2	50 46 3	44.22	2.44	

Table 5.2

Depth-of-Knowledge Consistency Between Standards and Assessment as Rated by Nine Reviewers

Michigan Grade 5 Science, Form Winter 2004

Number of Assessment Items - 43

Standards			Hits		Level of Item w.r.t. Standard						DOK Consistency
					% Under		% At		% Above		
Title	Goals #	Objs #	M	S.D.	M	S.D.	M	S.D.	M	S.D.	
I - Constructing New Scientific Knowledge	6	6	8.11	0.99	44	42	45	39	11	22	YES
II - Reflecting on Scientific Knowledge	5	5	2.44	1.57	60	47	26	42	14	35	WEAK
III - Using Life Science Knowledge	5	13.11	12	1.33	42	46	41	44	17	35	YES
IV - Using Physical Science Knowledge	4	16.22	9.78	0.92	39	47	51	48	11	30	YES
V - Using Earth Science Knowledge	4	14.56	11.89	2.13	12	30	76	38	11	29	YES
Total	24	54.89	44.22	2.44	33	44	54	46	13	31	

Table 5.3

Range-of-Knowledge Correspondence and Balance of Representation Between Standards and Assessment as Rated by Nine Reviewers
Michigan Grade 5 Science, Form Winter 2004
Number of Assessment Items - 43

Standards			Hits		Range of Objectives				Rng. of Know.	Balance Index				Bal. of Represent.
					# Objs Hit		% of Total			% Hits in Std/Ttl Hits		Index		
Title	Goals #	Objs #	Mean	S.D.	Mean	S.D.	Mean	S.D.		Mean	S.D.	Mean	S.D.	
I - Constructing New Scientific Knowledge	6	6	8.11	0.99	3.56	0.50	59	8	YES	18	2	0.85	0.08	YES
II - Reflecting on Scientific Knowledge	5	5	2.44	1.57	1.56	0.68	31	14	NO	6	4	0.95	0.09	YES
III - Using Life Science Knowledge	5	13.11	12	1.33	6.56	0.83	50	6	YES	27	2	0.84	0.03	YES
IV - Using Physical Science Knowledge	4	16.22	9.78	0.92	6.78	0.92	42	5	WEAK	22	2	0.82	0.03	YES
V - Using Earth Science Knowledge	4	14.56	11.89	2.13	8.33	1.05	57	6	YES	27	4	0.81	0.05	YES
Total	24	54.89	44.22	2.44	5.36	2.58	48	13		20	8	0.86	0.08	

Table 5.4
Summary of Attainment of Acceptable Alignment Level on Four Content Focus Criteria as Rated by Nine Reviewers
Michigan Grade 5 Science, Form Winter 2004
Number of Assessment Items - 43

Standards	Alignment Criteria			
	Categorical Concurrence	Depth-of-Knowledge Consistency	Range of Knowledge	Balance of Representation
I - Constructing New Scientific Knowledge	YES	YES	YES	YES
II - Reflecting on Scientific Knowledge	NO	WEAK	NO	YES
III - Using Life Science Knowledge	YES	YES	WEAK	YES
IV - Using Physical Science Knowledge	YES	YES	WEAK	YES
V - Using Earth Science Knowledge	YES	YES	YES	YES

Table 5.5
Source-of-Challenge Issues by Reviewer
Michigan Grade 5 Science, Form Winter 2004

Item Number	Comments by Reviewer
3	"A" is a correct response. Consider a slide whistle producing a lower pitch you lengthen the slide.
3	Either A or B can be correct--the size of the whistle affects its pitch.
3	You can have a whistle, for example a slide whistle, that by changing its length will change the pitch. Can be A or B.
3	The question is confusing. It asks "why", searching for a cause of the difference in sound, but the answer refers to the effect or property, the pitch. As a result, students could answer either A or B and be correct.
3	Since the question asks "why", a knowledgeable student will correctly answer "A".
4	C and D have so much more information the answer becomes fairly obvious without much prior knowledge.
6	The question asks which property has been used to classify objects. This would assume that the same property is also used to classify the 2nd group. Shape would NOT work for group 2. This could cause confusion for kids to think shape could not be the correct answer.
12	In this investigation Samantha is measuring height and volume. She is not measuring temperature or pressure. Therefore, a thermometer is not more useful than a barometer for this set up.
12	As neither barometric pressure nor temperature are variables considered in Samantha's investigation, both the thermometer and barometer are equally unuseful.
19	The implication that wind ALWAYS works more slowly than the other 3 choices is incorrect. Many times, wind (tornadoes, hurricanes) causes much faster change than volcanoes, and sometimes earthquakes.
19	Rate of Change is unpredictable. It is impossible to say wind is the correct answer.
31	"A" is a correct response, it is important that birds have food.
36	Answer is easily guessed with no content knowledge needed. Other answers are ridiculously wrong.
49	A, B, and C are ALL reasonable answers for an elementary student to give--could be reworded to 'paleontologists" or--which is the MOST likely.....
49	Answers B and C could be right. Scientists could use information from other sources to help them create a model.

Table 5.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 5 Science, Form Winter 2004

Item	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6	Rater 7	Rater 8	Rater 9
1	1	1	1	1	1	1	1	1	1
2	2	1	1	1	1	1	1	1	1
3	1	1	2	1	2	2	1	2	1
4	1	2	2	2	1	2	2	2	1
5									
6	2	2	1	2	2	2	2	2	2
7	1	2	1	2	1	2	2	2	1
8	1	1	1	2	1	2	1	1	1
9	2	1	2	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1	1
12	1	2	1	2	1	2	2	2	2
13	2	2	2	2	2	2	2	2	2
14	2	2	2	2	3	3	2	3	2
15	1	1	1	1	1	1	1	1	1
16									
17	1	2	1	1	1	1	1	1	2
18	1	1	1	1	1	1	1	2	1
19	2	2	1	1	2	2	1	2	2
20	2	2	2	2	1	2	2	2	1
21	1	2	2	2	1	2	1	2	2
22	1	1	1	1	1	1	1	1	1
23	2	2	1	2	1	2	1	1	2
24	1	1	1	1	1	1	1	2	1
25	1	1	1	1	1	2	1	1	1
26	1	1	1	1	1	2	1	2	1
27	1	2	1	2	1	1	1	1	2
28									
29	2	1	1	1	2	1	2	2	2
30	1	2	1	2	1	1	1	2	1
31	1	1	1	2	1	1	1	1	1
32									
33									
34									
35									
36	1	2	1	1	1	1	1	1	1
37	1	1	1	1	1	1	1	1	1
38	1	1	1	1	1	1	1	1	1
39	1	2	1	2	2	2	2	2	2
40	1	2	1	1	1	2	1	1	1
41	1	2	2	2	1	2	1	2	2
42	1	2	2	2	2	2	1	1	2
43									
44	1	2	1	1	1	1	1	1	1
45	1	2	1	2	1	1	2	1	2
46	1	2	1	2	1	1	1	1	1
47	2	2	1	2	2	2	2	2	2
48	1	2	1	2	1	2	2	2	2

Table 5.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 5 Science, Form Winter 2004

49	1	2	1	1	1	1	1	1	1
50	1	2	1	2	1	2	1	2	1
51	2	1	1	1	1	1	1	1	1

Intraclass Correlation: 0.8535
Pairwise Comparison: 0.677

Table 5.7
Notes by Reviewer
Michigan Grade 5 Science, Form Winter 2004

Item Number	Comments by Reviewer
3	This is a poor question. The size will cause the pitch/vibration to be different. Differing frequency would be more correct than pitch.
3	all answers could be very possible. this could confuse students
12	The word instruments in the question implies more than one answer. This could be confusing for students.
14	The conclusion can be drawn and was assessed in #13.
14	The "conclusion" asked for is the answer to #13 above.
21	Picture is unhelpful and misleading. If it is meant to give information, then that should be clearly stated.
21	This question can be answered using the process of elimination. So is it really addressing science content?
23	(A) should read "the age of the animal when it died"
24	The river is only "mentioned" in the picture. It should be stated in the stem.
25	This question is actually measuring reading comprehension.
25	This information is only extracted from the reading. There is no scientific benchmark assessed here.
25	The answer is right there in the passage. Are we assessing reading skills or science?
26	this item is actually measuring reading comprehension
26	See note for #25.
26	Reading skills vs Science content knowledge. the answer is right there.
27	other answers could be right.
27	This is reading skills again. The answer is right there in the text.
30	Not really based on the information given above.
31	Question should read "importance of these seeds to the plant."
31	Not based on the information given above.
40	Bad question. It leads kids to think about forces dealing with the earth rather than forces of motion
41	I don't believe that this content is addressed in the elementary benchmarks.
41	Not based on the information given above.
46	Food Chains should always start with the sun!
46	Repetitive of question 44
47	Part of answer could be taken from question 45
49	While answer A is the best answer, B and C are also valid responses.
49	"Museum workers" might not be "good" scientists and might not be scientists at all, so they might use B or C.
51	The question stem is irrelevant and is not needed to answer the item.

Table 5.8

DOK Levels and Objectives Coded by Each Reviewer

Michigan Grade 5 Science, Form Winter 2004

Item	DOK 0	PObj0	DOK 1	PObj1	DOK 2	PObj2	DOK 3	PObj3	S1Obj3	DOK 4	PObj4	DOK 5	PObj5	S1Obj5	DOK 6	PObj6	S1Obj6	DOK 7	PObj7	S1Obj7	DOK 8	PObj8
1	1	CS4.3.4.	1	CS4.3.4.	1	CS4.3.4.	1	CS4.3.4.		1	CS4.3.4.	1	CS4.3.4.		1	CS4.3.4.		1	CS4.3.4.		1	CS4.3.4.
2	2	CS4.1.1.	1	CS4.3.3.	1	CS4.3.3.	1	CS4.3.3.		1	CS4.3.3.	1	CS4.1.1.		1	CS4.3.3.		1	CS4.3.3.		1	CS4.3.3.
3	1	CS4.4.2.	1	CS4.4.1.	2	CS4.1.1.	1	CS4.4.1.		2	CS4.4.1.	2	CS4.4.1.		1	CS4.4.1.		2	CS4.4.1.		1	CS4.4.1.
4	1	CS4.2.2.	2	CS4.2.2.	2	CS4.2.2.	2	CS4.2.2.		1	CS4.4.4.	2	CS4.2.2.		2	CS4.3.		2	CS4.2.2.		1	CS4.4.2.
5																						
6	2	CS4.1.1.	2	CS4.1.1.	1	CS4.1.1.	2	CS4.1.1.		2	CS4.1.1.	2	CS4.1.1.		2	CS4.1.1.		2	CS4.1.1.		2	CS4.1.1.
7	1	CS4.1.1.	2	CS4.1.1.	1	CS4.1.2.	2	CS4.1.1.	CS4.1.4.	1	CS4.1.2.	2	CS4.1.1.		2	CS4.1.2.		2	CS4.1.1.	CS4.1.2.	1	CS4.1.
8	1	CS4.1.2.	1	CS4.3.3.	1	CS4.3.3.	2	CS4.3.3.		1	CS4.3.3.	2	CS4.3.3.		1	CS4.3.3.		1	CS4.3.3.		1	CS4.3.3.
9	2	CS2.3.	1	CS5.3.1.1	2	CS4.2.1.	1	CS5.3.1.1		1	CS5.3.1.1	1	CS5.3.1.1		1	CS4.2.1.		1	CS5.3.1.1		1	CS5.3.1.1
10	1	CS1.4.	1	CS1.4.	1	CS1.4.	1	CS1.4.		1	CS1.4.	1	CS1.4.		1	CS1.4.		1	CS1.4.		1	CS1.4.
11	1	CS1.4.	1	CS1.4.	1	CS1.4.	1	CS1.4.		1	CS1.4.	1	CS1.4.		1	CS1.4.		1	CS1.4.		1	CS1.4.
12	1	CS1.4.	2	CS1.4.	1	CS4.1.2.	2	CS1.4.		1	CS1.4.	2	CS1.4.		2	CS1.4.		2	CS1.3.		2	CS1.4.
13	2	CS1.6	2	CS1.5.	2	CS3.5.2.	2	CS1.2.		2	CS1.2.	2	CS1.5.		2	CS2.1.		2	CS3.2.4.		2	CS1.2.
14	2	CS1.6	2	CS1.6	2	CS1.6	2	CS1.6		3	CS1.6	3	CS1.6		2	CS1.6	CS2.1.	3	CS1.2.		2	CS1.6
15	1	CS5.2.2.	1	CS5.2.2.	1	CS5.2.2.	1	CS5.2.2.		1	CS5.2.2.	1	CS5.2.2.		1	CS5.2.2.		1	CS5.2.		1	CS5.2.2.
16																						
17	1	CS1.5.	2	CS5.4.1.	1	CS2.1.	1	CS2.1.		1	CS2.1.	1	CS2.1.		1	CS1.2.		1	CS1.2.		2	CS5.4.1.
18	1	CS1.6	1	CS1.6	1	CS1.6	1	CS1.5.		1	CS1.6	1	CS1.6		1	CS1.6		2	CS5.1.6.		1	CS1.2.
19	2	CS5.1.3.	2	CS5.1.3.	1	CS5.1.3.	1	CS5.1.3.		2	CS5.1.3.	2	CS5.1.3.		1	CS5.1.3.		2	CS5.1.3.		2	CS5.1.3.
20	2	CS5.4.1.	2	CS5.4.1.	2	CS5.4.1.	2	CS5.4.1.		1	CS5.4.1.	2	CS5.4.1.		2	CS5.4.1.		2	CS5.4.1.		1	CS5.1.4.
21	1	CS5.1.3.	2	CS5.1.3.	2	CS5.1.3.	2	CS5.1.3.		1	CS5.1.3.	2	CS5.1.3.		1	CS5.1.3.		2	CS5.1.3.		2	CS5.1.3.
22	1	CS5.1.1.	1	CS5.1.1.	1	CS5.1.1.	1	CS5.1.1.		1	CS5.1.1.	1	CS5.1.1.		1	CS5.1.1.		1	CS5.1.2.		1	CS5.1.1.
23	2	CS3.4.1.	2	CS3.4.1.	1	CS5.1.4.	2	CS3.4.1.		1	CS3.4.1.	2	CS3.4.1.		1	CS3.4.1.		1	CS3.4.1.		2	CS3.4.1.
24	1	CS5.1.5.	1	CS4.1.2.	1	CS5.1.5.	1	CS4.1.2.		1	CS4.1.2.	1	CS5.1.5.		1	CS5.1.5.		2	CS5.1.5.		1	CS5.1.5.
25	1	CS5.1.6.	1	CS5.1.6.	1	CS5.1.6.	1	CS1.5.		1	CS5.1.6.	2	CS2.4.		1	CS1.5.		1	CS5.1.6.		1	CS5.1.6.
26	1	CS5.1.6.	1	CS1.5.	1	CS1.5.	1	CS1.5.		1	CS1.5.	2	CS2.3.		1	CS1.5.		2	CS1.2.	CS5.1.6.	1	CS5.1.6.
27	1	CS5.1.6.	2	CS5.1.6.	1	CS5.1.6.	2	CS5.1.6.		1	CS4.1.1.	1	CS2.1.		1	CS1.5.		1	CS5.1.6.		2	CS5.1.6.
28																						
29	2	CS1.6	1	CS1.5.	1	CS1.5.	1	CS1.6		2	CS1.5.	1	CS1.6		2	CS1.6		2	CS1.6	CS3.2.4.	2	CS1.6
30	1	CS3.2.5.	2	CS3.4.2.	1	CS3.4.2.	2	CS3.4.2.		1	CS3.4.2.	1	CS3.2.5.		1	CS3.2.5.		2	CS3.2.5.		1	CS3.2.5.
31	1	CS3.2.5.	1	CS3.2.5.	1	CS3.2.3.	2	CS3.2.5.		1	CS3.2.3.	1	CS3.2.3.		1	CS3.2.5.		1	CS3.2.5.		1	CS3.2.5.
32																						
33																						
34																						
35																						
36	1	CS3.4.1.	2	CS3.4.1.	1	CS2.1.	1	CS3.4.1.		1	CS2.1.	1	CS3.4.1.		1	CS3.4.1.		1	CS5.1.4.	CS3.4.1.	1	CS3.4.1.
37	1	CS4.3.4.	1	CS4.3.4.	1	CS4.3.4.	1	CS4.3.4.		1	CS4.3.5.	1	CS4.3.4.		1	CS4.3.4.		1	CS4.3.4.		1	CS4.3.4.
38	1	CS5.2.3.	1	CS5.2.3.	1	CS5.2.3.	1	CS5.2.3.		1	CS5.1.1.	1	CS5.2.3.		1	CS5.2.3.		1	CS5.2.3.		1	CS5.2.3.
39	1	CS3.4.1.	2	CS4.1.1.	1	CS5.1.4.	2	CS5.1.4.		2	CS5.1.4.	2	CS3.4.1.		2	CS5.1.4.		2	CS5.1.4.		2	CS5.1.4.
40	1	CS5.1.1.	2	CS5.1.3.	1	CS4.3.2.	1	CS4.3.2.		1	CS5.1.3.	2	CS4.3.2.		1	CS4.3.2.		1	CS4.3.2.		1	CS4.3.2.
41	1	CS5.1.1.	2	CS5.1.	2	CS5.1.	2	CS5.1.3.		1	CS5.1.1.	2	CS5.1.2.		1	CS5.1.		2	CS5.1.1.	CS5.1.2.	2	CS5.1.

Table 5.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 5 Science, Form Winter 2004

42	1	CS3.5.4.	2	CS3.5.4.	2	CS3.5.4.	2	CS3.5.4.		2	CS3.5.4.	2	CS3.5.4.		1	CS3.5.4.		1	CS3.5.4.		2	CS3.5.4.
43																						
44	1	CS3.5.1.	2	CS3.5.1.	1	CS3.5.1.	1	CS3.5.1.		1	CS3.5.1.	1	CS3.5.1.		1	CS3.5.1.		1	CS3.5.1.		1	CS3.5.1.
45	1	CS3.2.1.	2	CS3.4.2.	1	CS3.4.2.	2	CS3.4.2.		1	CS3.4.2.	1	CS3.2.1.		2	CS3.2.1.		1	CS3.2.1.		2	CS3.4.2.
46	1	CS3.5.1.	2	CS3.5.1.	1	CS3.5.1.	2	CS3.5.1.		1	CS3.5.1.	1	CS3.5.1.		1	CS3.5.1.		1	CS3.5.1.		1	CS3.5.1.
47	2	CS3.2.1.	2	CS3.4.2.	1	CS3.4.2.	2	CS3.4.2.		2	CS3.4.2.	2	CS3.2.1.		2	CS3.4.2.		2	CS3.4.2.	CS3.2.1.	2	CS3.4.2.
48	1	CS3.2.1.	2	CS3.4.2.	1	CS5.1.1.	2	CS5.1.1.		1	CS3.4.2.	2	CS3.5.		2	CS3.4.2.		2	CS3.4.2.		2	CS3.4.2.
49	1	CS2.1.	2	CS2.1.	1	CS2.1.	1	CS3.4.1.		1	CS3.4.1.	1	CS2.1.		1	CS2.1.		1	CS2.1.	CS3.4.1.	1	CS2.1.
50	1	CS3.5.4.	2	CS3.5.4.	1	CS3.5.4.	2	CS3.5.4.		1	CS3.5.4.	2	CS1.2.	CS2.4.	1	CS2.4.		2	CS1.2.	CS2.4.	1	CS1.2.
51	2	CS3.3.1.	1	CS3.3.1.	1	CS3.3.1.	1	CS3.3.1.		1	CS3.3.1.	1	CS3.3.1.		1	CS3.3.1.		1	CS3.3.1.		1	CS3.3.1.

Pairwise Comparison: 0.6224
Standard Pairwise Comparison: 0.8149

Table 5.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 5 Science, Form Winter 2004

Low		Medium		High
0		7.803922		11

1	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	
2	CS4.1.1.	CS4.1.1.	CS4.3.3.	CS4.3.3.	CS4.3.3.	CS4.3.3.	CS4.3.3.	CS4.3.3.	CS4.3.3.	
3	CS4.1.1.	CS4.4.1.	CS4.4.1.	CS4.4.1.	CS4.4.1.	CS4.4.1.	CS4.4.1.	CS4.4.1.	CS4.4.2.	
4	CS4.2.2.	CS4.2.2.	CS4.2.2.	CS4.2.2.	CS4.2.2.	CS4.2.2.	CS4.3.	CS4.4.2.	CS4.4.4.	
5										
6	CS4.1.1.	CS4.1.1.	CS4.1.1.	CS4.1.1.	CS4.1.1.	CS4.1.1.	CS4.1.1.	CS4.1.1.	CS4.1.1.	
7	CS4.1.	CS4.1.1.	CS4.1.1.	CS4.1.1.	CS4.1.1.	CS4.1.1.	CS4.1.2.	CS4.1.2.	CS4.1.2.	CS4.1.2.
	CS4.1.4.									
8	CS4.1.2.	CS4.3.3.	CS4.3.3.	CS4.3.3.	CS4.3.3.	CS4.3.3.	CS4.3.3.	CS4.3.3.	CS4.3.3.	
9	CS2.3.	CS4.2.1.	CS4.2.1.	CS5.3.1.1	CS5.3.1.1	CS5.3.1.1	CS5.3.1.1	CS5.3.1.1	CS5.3.1.1	
10	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	
11	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	
12	CS1.3.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS4.1.2.	
13	CS1.2.	CS1.2.	CS1.2.	CS1.5.	CS1.5.	CS1.6	CS2.1.	CS3.2.4.	CS3.5.2.	
14	CS1.2.	CS1.6	CS1.6	CS1.6	CS1.6	CS1.6	CS1.6	CS1.6	CS1.6	CS2.1.
15	CS5.2.	CS5.2.2.	CS5.2.2.	CS5.2.2.	CS5.2.2.	CS5.2.2.	CS5.2.2.	CS5.2.2.	CS5.2.2.	
16										
17	CS1.2.	CS1.2.	CS1.5.	CS2.1.	CS2.1.	CS2.1.	CS2.1.	CS5.4.1.	CS5.4.1.	
18	CS1.2.	CS1.5.	CS1.6	CS1.6	CS1.6	CS1.6	CS1.6	CS1.6	CS5.1.6.	
19	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	

Table 5.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 5 Science, Form Winter 2004

20	CS5.1.4.	CS5.4.1.	CS5.4.1.	CS5.4.1.	CS5.4.1.	CS5.4.1.	CS5.4.1.	CS5.4.1.	CS5.4.1.	
21	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	
22	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.2.	
23	CS3.4.1.	CS3.4.1.	CS3.4.1.	CS3.4.1.	CS3.4.1.	CS3.4.1.	CS3.4.1.	CS3.4.1.	CS5.1.4.	
24	CS4.1.2.	CS4.1.2.	CS4.1.2.	CS5.1.5.	CS5.1.5.	CS5.1.5.	CS5.1.5.	CS5.1.5.	CS5.1.5.	
25	CS1.5.	CS1.5.	CS2.4.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	
26	CS1.2.	CS1.5.	CS1.5.	CS1.5.	CS1.5.	CS1.5.	CS2.3.	CS5.1.6.	CS5.1.6.	CS5.1.6.
27	CS1.5.	CS2.1.	CS4.1.1.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	
28										
29	CS1.5.	CS1.5.	CS1.5.	CS1.6	CS1.6	CS1.6	CS1.6	CS1.6	CS1.6	CS3.2.4.
30	CS3.2.5.	CS3.2.5.	CS3.2.5.	CS3.2.5.	CS3.2.5.	CS3.4.2.	CS3.4.2.	CS3.4.2.	CS3.4.2.	
31	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.5.	CS3.2.5.	CS3.2.5.	CS3.2.5.	CS3.2.5.	CS3.2.5.	
32										
33										
34										
35										
36	CS2.1.	CS2.1.	CS3.4.1.	CS3.4.1.	CS3.4.1.	CS3.4.1.	CS3.4.1.	CS3.4.1.	CS3.4.1.	CS5.1.4.
37	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.5.	
38	CS5.1.1.	CS5.2.3.	CS5.2.3.	CS5.2.3.	CS5.2.3.	CS5.2.3.	CS5.2.3.	CS5.2.3.	CS5.2.3.	
39	CS3.4.1.	CS3.4.1.	CS4.1.1.	CS5.1.4.	CS5.1.4.	CS5.1.4.	CS5.1.4.	CS5.1.4.	CS5.1.4.	
40	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS5.1.1.	CS5.1.3.	CS5.1.3.	
41	CS5.1.	CS5.1.	CS5.1.	CS5.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.2.	CS5.1.2.	CS5.1.3.

Table 5.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 5 Science, Form Winter 2004

42	CS3.5.4.	CS3.5.4.	CS3.5.4.	CS3.5.4.	CS3.5.4.	CS3.5.4.	CS3.5.4.	CS3.5.4.	CS3.5.4.	
43										
44	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	
45	CS3.2.1.	CS3.2.1.	CS3.2.1.	CS3.2.1.	CS3.4.2.	CS3.4.2.	CS3.4.2.	CS3.4.2.	CS3.4.2.	
46	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	
47	CS3.2.1.	CS3.2.1.	CS3.2.1.	CS3.4.2.	CS3.4.2.	CS3.4.2.	CS3.4.2.	CS3.4.2.	CS3.4.2.	CS3.4.2.
48	CS3.2.1.	CS3.4.2.	CS3.4.2.	CS3.4.2.	CS3.4.2.	CS3.4.2.	CS3.5.	CS5.1.1.	CS5.1.1.	
49	CS2.1.	CS2.1.	CS2.1.	CS2.1.	CS2.1.	CS2.1.	CS2.1.	CS3.4.1.	CS3.4.1.	CS3.4.1.
50	CS1.2.	CS1.2.	CS1.2.	CS2.4.	CS2.4.	CS2.4.	CS3.5.4.	CS3.5.4.	CS3.5.4.	CS3.5.4.
	CS3.5.4.									
51	CS3.3.1.	CS3.3.1.	CS3.3.1.	CS3.3.1.	CS3.3.1.	CS3.3.1.	CS3.3.1.	CS3.3.1.	CS3.3.1.	

Table 5.10
Items Coded by Reviewers to Each Objective
Michigan Grade 5 Science, Form Winter 2004

Low		Medium		High
0		5.527778		25

I																				
CS1.1.																				
CS1.2.	13	13	13	14	17	17	18	26	50	50	50									
CS1.3.	12																			
CS1.4.	10	10	10	10	10	10	10	10	10	11	11	11	11	11	11	11	11	11	12	12
	12	12	12	12	12															
CS1.5.	13	13	17	18	25	25	26	26	26	26	26	27	29	29	29					
CS1.6	13	14	14	14	14	14	14	14	14	18	18	18	18	18	18	29	29	29	29	29
	29																			
II																				
CS2.1.	13	14	17	17	17	17	27	36	36	49	49	49	49	49	49	49				
CS2.2.																				
CS2.3.	9	26																		
CS2.4.	25	50	50	50																
CS2.5.																				
III																				
CS3.1.																				
CS3.2.																				
CS3.2.1.	45	45	45	45	47	47	47	48												
CS3.2.2.																				
CS3.2.3.	31	31	31																	
CS3.2.4.	13	29																		

Table 5.10
Items Coded by Reviewers to Each Objective
Michigan Grade 5 Science, Form Winter 2004

CS3.2.5.	30	30	30	30	30	31	31	31	31	31	31									
CS3.3.																				
CS3.3.1.	51	51	51	51	51	51	51	51	51											
CS3.4.																				
CS3.4.1.	23	23	23	23	23	23	23	23	36	36	36	36	36	36	36	39	39	49	49	49
CS3.4.2.	30	30	30	30	45	45	45	45	45	47	47	47	47	47	47	47	48	48	48	48
	48																			
CS3.5.	48																			
CS3.5.1.	44	44	44	44	44	44	44	44	44	46	46	46	46	46	46	46	46	46		
CS3.5.2.	13																			
CS3.5.3.																				
CS3.5.4.	42	42	42	42	42	42	42	42	42	50	50	50	50	50						
IV																				
CS4.1.	7																			
CS4.1.1.	2	2	3	6	6	6	6	6	6	6	6	6	7	7	7	7	7	27	39	
CS4.1.2.	7	7	7	7	8	12	24	24	24											
CS4.1.3.																				
CS4.1.4.	7																			
CS4.1.5.																				
CS4.2																				
CS4.2.1.	9	9																		
CS4.2.2.	4	4	4	4	4	4														

Table 5.10
Items Coded by Reviewers to Each Objective
Michigan Grade 5 Science, Form Winter 2004

CS4.3.	4																			
CS4.3.1.																				
CS4.3.2.	40	40	40	40	40	40														
CS4.3.3.	2	2	2	2	2	2	2	8	8	8	8	8	8	8	8					
CS4.3.4.	1	1	1	1	1	1	1	1	1	37	37	37	37	37	37	37	37			
CS4.3.5.	37																			
CS4.4.																				
CS4.4.1.	3	3	3	3	3	3	3													
CS4.4.2.	3	4																		
CS4.4.3.																				
CS4.4.4.	4																			
V																				
CS5.1.	41	41	41	41																
CS5.1.1.	22	22	22	22	22	22	22	22	38	40	41	41	41	48	48					
CS5.1.2.	22	41	41																	
CS5.1.3.	19	19	19	19	19	19	19	19	19	21	21	21	21	21	21	21	21	21	40	40
	41																			
CS5.1.4.	20	23	36	39	39	39	39	39	39											
CS5.1.5.	24	24	24	24	24	24														
CS5.1.6.	18	25	25	25	25	25	25	26	26	26	27	27	27	27	27	27				
CS5.2.	15																			
CS5.2.1.																				
CS5.	15	15	15	15	15	15	15	15												

Table 5.10
Items Coded by Reviewers to Each Objective
Michigan Grade 5 Science, Form Winter 2004

2.2.										
CS5.2.3.	38	38	38	38	38	38	38	38		
CS5.3.										
CS5.3.1.1	9	9	9	9	9	9				
CS5.3.1.2.										
CS5.3.1.3.										
CS5.4.										
CS5.4.1.	17	17	20	20	20	20	20	20	20	20
CS5.4.2										

Table 5.11

Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)

Michigan Grade 5 Science, Form Winter 2004

Low		Medium		High
1		4		9

I							
CS1.1.							
CS1.2.	13:3	14:1	17:2	18:1	26:1	50:3	
CS1.3.	12:1						
CS1.4.	10:9	11:9	12:7				
CS1.5.	13:2	17:1	18:1	25:2	26:5	27:1	29:3
CS1.6	13:1	14:8	18:6	29:6			
II							
CS2.1.	13:1	14:1	17:4	27:1	36:2	49:7	
CS2.2.							
CS2.3.	9:1	26:1					
CS2.4.	25:1	50:3					
CS2.5.							
III							
CS3.1.							
CS3.2.							
CS3.2.1.	45:4	47:3	48:1				
CS3.2.2.							
CS3.2.3.	31:3						
CS3.2.4.	13:1	29:1					
CS3.2.5.	30:5	31:6					

Table 5.11

Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)

Michigan Grade 5 Science, Form Winter 2004

CS3.3.						
CS3.3.1.	51:9					
CS3.4.						
CS3.4.1.	23:8	36:7	39:2	49:3		
CS3.4.2.	30:4	45:5	47:7	48:5		
CS3.5.	48:1					
CS3.5.1.	44:9	46:9				
CS3.5.2.	13:1					
CS3.5.3.						
CS3.5.4.	42:9	50:5				
IV						
CS4.1.	7:1					
CS4.1.1.	2:2	3:1	6:9	7:5	27:1	39:1
CS4.1.2.	7:4	8:1	12:1	24:3		
CS4.1.3.						
CS4.1.4.	7:1					
CS4.1.5.						
CS4.2						
CS4.2.1.	9:2					
CS4.2.2.	4:6					
CS4.3.	4:1					
CS4.3.1.						

Table 5.11

Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 5 Science, Form Winter 2004

CS4.3.2.	40:6				
CS4.3.3.	2:7	8:8			
CS4.3.4.	1:9	37:8			
CS4.3.5.	37:1				
CS4.4.					
CS4.4.1.	3:7				
CS4.4.2.	3:1	4:1			
CS4.4.3.					
CS4.4.4.	4:1				
V					
CS5.1.	41:4				
CS5.1.1.	22:8	38:1	40:1	41:3	48:2
CS5.1.2.	22:1	41:2			
CS5.1.3.	19:9	21:9	40:2	41:1	
CS5.1.4.	20:1	23:1	36:1	39:6	
CS5.1.5.	24:6				
CS5.1.6.	18:1	25:6	26:3	27:6	
CS5.2.	15:1				
CS5.2.1.					
CS5.2.2.	15:8				
CS5.2.3.	38:8				
CS5.3.					

Table 5.11

Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 5 Science, Form Winter 2004

CS5.3.1.1	9:6	
CS5.3.1.2.		
CS5.3.1.3.		
CS5.4.		
CS5.4.1.	17:2	20:8
CS5.4.2		

Table 5.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 5 Science, Form Winter 2004

Low DOK		Matched DOK		High DOK
1		4		9

I [2]:							
CS1.1. [2]:							
CS1.2. [3]:	13:3 [2]	14:1 [3]	17:2 [1]	18:1 [1]	26:1 [2]	50:3 [1.67]	
CS1.3. [1]:	12:1 [2]						
CS1.4. [1]:	10:9 [1]	11:9 [1]	12:7 [1.71]				
CS1.5. [2]:	13:2 [2]	17:1 [1]	18:1 [1]	25:2 [1]	26:5 [1]	27:1 [1]	29:3 [1.33]
CS1.6 [2]:	13:1 [2]	14:8 [2.25]	18:6 [1]	29:6 [1.67]			
II [2]:							
CS2.1. [2]:	13:1 [2]	14:1 [2]	17:4 [1]	27:1 [1]	36:2 [1]	49:7 [1.14]	
CS2.2. [2]:							
CS2.3. [1]:	9:1[2]	26:1 [2]					
CS2.4. [2]:	25:1 [2]	50:3 [1.67]					
CS2.5. [1]:							
III							

Table 5.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 5 Science, Form Winter 2004

[2]:				
CS3.1.[1]:				
CS3.2.[1]:				
CS3.2.1.[1]:	45:4 [1.25]	47:3 [2]	48:1 [1]	
CS3.2.2.[2]:				
CS3.2.3.[1]:	31:3 [1]			
CS3.2.4.[2]:	13:1 [2]	29:1 [2]		
CS3.2.5.[1]:	30:5 [1.2]	31:6 [1.17]		
CS3.3.[2]:				
CS3.3.1.[2]:	51:9 [1.11]			
CS3.4.[2]:				
CS3.4.1.[2]:	23:8 [1.62]	36:7 [1.14]	39:2 [1.5]	49:3 [1]
CS3.4.2.[1]:	30:4 [1.5]	45:5 [1.6]	47:7 [1.86]	48:5 [1.8]
CS3.5.[2]:	48:1 [2]			
CS3.5.1.[2]:	44:9 [1.11]	46:9 [1.22]		

Table 5.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 5 Science, Form Winter 2004

CS3.5.2.[1]:	13:1[2]					
CS3.5.3.[3]:						
CS3.5.4.[2]:	42:9[1.67]	50:5[1.4]				
IV[2]:						
CS4.1.[1]:	7:1[1]					
CS4.1.1.[2]:	2:2[1.5]	3:1[2]	6:9[1.89]	7:5[1.8]	27:1[1]	39:1[2]
CS4.1.2.[2]:	7:4[1.5]	8:1[1]	12:1[1]	24:3[1]		
CS4.1.3.[1]:						
CS4.1.4.[1]:	7:1[2]					
CS4.1.5.[1]:						
CS4.2[2]:						
CS4.2.1.[1]:	9:2[1.5]					
CS4.2.2.[2]:	4:6[1.83]					
CS4.3.[2]:	4:1[2]					
CS4.3.1.						

Table 5.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 5 Science, Form Winter 2004

[2]:					
CS4.3.2.[2]:	40:6 [1.17]				
CS4.3.3.[1]:	2:7[1]	8:8[1.25]			
CS4.3.4.[2]:	1:9[1]	37:8 [1]			
CS4.3.5.[2]:	37:1 [1]				
CS4.4.[1]:					
CS4.4.1.[1]:	3:7[1.43]				
CS4.4.2.[1]:	3:1[1]	4:1[1]			
CS4.4.3.[1]:					
CS4.4.4.[2]:	4:1[1]				
V [1]:					
CS5.1.[2]:	41:4 [1.75]				
CS5.1.1.[1]:	22:8 [1]	38:1 [1]	40:1 [1]	41:3 [1.33]	48:2 [1.5]
CS5.1.2.[2]:	22:1 [1]	41:2 [2]			
CS5.1.3.[1]:	19:9 [1.67]	21:9 [1.67]	40:2 [1.5]	41:1 [2]	
CS5.	20:1	23:1	36:1	39:6	

Table 5.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 5 Science, Form Winter 2004

1.4. [2]:	[1]	[1]	[1]	[1.83]
CS5.1.5. [1]:	24:6 [1.17]			
CS5.1.6. [2]:	18:1 [2]	25:6 [1]	26:3 [1.33]	27:6 [1.5]
CS5.2. [1]:	15:1 [1]			
CS5.2.1. [1]:				
CS5.2.2. [1]:	15:8 [1]			
CS5.2.3. [1]:	38:8 [1]			
CS5.3. [1]:				
CS5.3.1.1 [1]:	9:6[1]			
CS5.3.1.2. [1]:				
CS5.3.1.3. [1]:				
CS5.4. [2]:				
CS5.4.1. [2]:	17:2 [2]	20:8 [1.88]		
CS5.4.2 [2]:				

Table 5.1
Categorical Concurrence Between Standards and Assessment as Rated by Nine Reviewers
Michigan Grade 5 Science, Form Fall 2005
Number of Assessment Items - 43

Standards			Level by Objective			Hits		Cat. Concurr.
Title	Goals #	Objs #	Level	# of objs by Level	% w/in std by Level	Mean	S.D.	
I - Constructing New Scientific Knowledge	6	6	1 2 3	2 3 1	33 50 16	5.56	1.26	NO
II - Reflecting on Scientific Knowledge	5	5	1 2	2 3	40 60	0.44	1.01	NO
III - Using Life Science Knowledge	5	13.22	1 2 3	6 6 1	46 46 7	13.89	0.99	YES
IV - Using Physical Science Knowledge	4	16	1 2	8 8	50 50	12	0.94	YES
V - Using Earth Science Knowledge	4	14.67	1 2	9 5	64 35	12	0.94	YES
Total	24	54.89	1 2 3	27 25 2	50 46 3	43.89	0.99	

Table 5.2

Depth-of-Knowledge Consistency Between Standards and Assessment as Rated by Nine Reviewers

Michigan Grade 5 Science, Form Fall 2005

Number of Assessment Items - 43

Standards			Hits		Level of Item w.r.t. Standard						DOK Consistency
					% Under		% At		% Above		
Title	Goals #	Objs #	M	S.D.	M	S.D.	M	S.D.	M	S.D.	
I - Constructing New Scientific Knowledge	6	6	5.56	1.26	30	43	68	43	2	10	YES
II - Reflecting on Scientific Knowledge	5	5	0.44	1.01	0	0	100	0	0	0	YES
III - Using Life Science Knowledge	5	13.22	13.89	0.99	35	46	47	44	18	33	YES
IV - Using Physical Science Knowledge	4	16	12	0.94	35	42	48	45	17	37	YES
V - Using Earth Science Knowledge	4	14.67	12	0.94	19	33	67	39	14	31	YES
Total	24	54.89	43.89	0.99	29	41	56	44	14	32	

Table 5.3

Range-of-Knowledge Correspondence and Balance of Representation Between Standards and Assessment as Rated by Nine Reviewers
Michigan Grade 5 Science, Form Fall 2005
Number of Assessment Items - 43

Standards			Hits		Range of Objectives				Rng. of Know.	Balance Index				Bal. of Represent.
					# Objs Hit		% of Total			% Hits in Std/Ttl Hits		Index		
Title	Goals #	Objs #	Mean	S.D.	Mean	S.D.	Mean	S.D.		Mean	S.D.	Mean	S.D.	
I - Constructing New Scientific Knowledge	6	6	5.56	1.26	2.89	0.57	48	9	WEAK	13	3	0.85	0.07	YES
II - Reflecting on Scientific Knowledge	5	5	0.44	1.01	0.44	1.01	9	20	NO	1	2	0.33	0.67	NO
III - Using Life Science Knowledge	5	13.22	13.89	0.99	7.78	1.31	59	9	YES	32	2	0.79	0.03	YES
IV - Using Physical Science Knowledge	4	16	12	0.94	7.33	1.15	46	7	WEAK	27	2	0.72	0.03	YES
V - Using Earth Science Knowledge	4	14.67	12	0.94	7.44	0.96	51	6	YES	27	2	0.84	0.05	YES
Total	24	54.89	43.89	0.99	5.18	2.56	42	11		20	9	0.71	0.09	

Table 5.4
Summary of Attainment of Acceptable Alignment Level on Four Content Focus Criteria as Rated by Nine Reviewers
Michigan Grade 5 Science, Form Fall 2005
Number of Assessment Items - 43

Standards	Alignment Criteria			
	Categorical Concurrence	Depth-of-Knowledge Consistency	Range of Knowledge	Balance of Representation
I - Constructing New Scientific Knowledge	NO	YES	WEAK	YES
II - Reflecting on Scientific Knowledge	NO	YES	NO	NO
III - Using Life Science Knowledge	YES	YES	YES	YES
IV - Using Physical Science Knowledge	YES	YES	WEAK	YES
V - Using Earth Science Knowledge	YES	YES	YES	YES

Table 5.5
Source-of-Challenge Issues by Reviewer
Michigan Grade 5 Science, Form Fall 2005

Item Number	Comments by Reviewer
8	Two answers (a & c) can be thrown out immediately.
10	Could get the right answer merely because the diagram shows Washington, DC as closer to the light rays.
12	This item asks about habitat preference and the correct answer C is the only choice which contains the word environment. No other choices deal with habitats.
12	Two answers (a & c) can be thrown out immediately
13	Although all students could logically figure this out, students that live on or near farms may know this answer due to their location in the state
22	A careful reader will be tipped off by Question #20. It suggests one answer.
25	Two answers (A & B)can be eliminated immediately, as they have nothing to do with food webs.
27	Dis the correct answer and it is also considerably longer than the other three choices.
42	If the test taker correctly answers #39,#40 then both force and effect are given.
45	Answer choices are developmentally above the scope of this benchmark. The choices are middle school concepts and beyond the range of the elementary benchmark.
45	Knowing that pressure and temperature changes with altitude is a middle school atmosphere and weather benchmark
47	Two answers (B & D) refer to prisms as opposed to filters and can therefore be eliminated.
50	2 answers (B & D) can be readily eliminated as the dog is not pushing the rope.

Table 5.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 5 Science, Form Fall 2005

Item	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6	Rater 7	Rater 8	Rater 9
1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	1	1	2	1	1
3	1	1	1	1	1	1	1	1	1
4	1	1	1	1	1	1	1	2	1
5	2	2	2	1	2	1	2	2	2
6									
7	2	2	1	2	2	2	2	2	2
8	1	1	1	2	2	2	2	2	2
9	1	2	1	1	1	1	1	1	1
10	2	2	1	1	2	1	1	2	1
11	2	2	2	1	2	1	2	1	2
12	2	2	2	2	2	2	2	2	2
13	2	2	2	1	2	2	1	2	2
14	1	2	1	1	1	1	1	1	1
15	2	2	1	1	1	2	2	1	2
16	2	2	1	1	1	2	2	1	1
17	1	1	1	1	1	1	1	1	1
18									
19	2	1	1	1	1	1	1	2	1
20	2	3	1	1	1	2	2	2	2
21	2	2	1	1	1	1	1	1	1
22	1	2	2	2	2	2	2	2	2
23	2	1	1	1	2	2	1	1	2
24	1	1	1	1	1	1	1	1	1
25	1	1	1	1	1	1	1	1	1
26									
27	1	2	2	1	2	2	1	1	1
28	2	2	2	1	1	2	2	2	1
29	1	2	1	2	1	1	2	2	2
30	1	2	1	1	2	2	2	1	1
31	1	2	2	1	1	1	1	2	2
32	2	2	2	2	2	2	2	2	2
33	1	2	1	2	1	2	2	2	2
34	2	2	2	1	2	3	2	2	2
35									
36									
37									
38									
39	1	2	1	1	1	1	1	1	1
40	1	2	1	1	1	1	1	1	1
41	1	2	2	2	2	2	1	2	1
42	2	2	2	2	2	2	2	2	2
43	2	1	1	2	2	2	2	2	1
44	1	1	1	1	1	1	1	1	1
45	1	2	1	2	2	2	2	2	1
46	2	2	1	1	1	2	2	1	1
47	1	1	2	2	2	2	3	2	1
48	1	2	1	1	1	2	2	1	2

Table 5.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 5 Science, Form Fall 2005

49									
50	2	2	1	1	1	2	1	1	1
51	1	1	1	1	1	1	1	1	1

Intraclass Correlation: 0.8344
Pairwise Comparison: 0.6609

Table 5.7
Notes by Reviewer
Michigan Grade 5 Science, Form Fall 2005

Item Number	Comments by Reviewer
8	A and B can be easily eliminated. Diagram is not necessary for question
10	Students may simply guess correct answer because it is closest to sun in diagram
14	In choice D the offspring is a picture of a kitten, not a lion cub
15	Energy flows from the sun--and should be the start of any valid food chain--starting in the middle of a chain is an unfair premise.
23	Reading question--not science.
24	Difficulty aligning with any benchmarks
32	Sentences should be rearranged in paragraph to put 1st sentence in the middle so answer is less of a give away.
41	Multiple answers could be inferred as being right...
44	This is a BAD question given that vibrations can lead to both sound and light.

Table 5.8

DOK Levels and Objectives Coded by Each Reviewer

Michigan Grade 5 Science, Form Fall 2005

Item	DOK 0	PObj0	DOK 1	PObj1	DOK 2	PObj2	DOK 3	PObj3	S1Obj3	DOK 4	PObj4	DOK 5	PObj5	S1Obj5	DOK 6	PObj6	S1Obj6	DOK 7	PObj7	S1Obj7	DOK 8	PObj8	S1Obj8
1	1	CS4.2.1.	1	CS5.2.1.	1	CS5.2.3.	1	CS5.2.1.		1	CS5.2.1.	1	CS5.2.1.		1	CS5.2.1.		1	CS5.2.1.		1	CS5.2.1.	
2	1	CS1.4.	1	CS1.4.	1	CS1.4.	1	CS1.4.		1	CS1.4.	1	CS1.4.		2	CS1.4.		1	CS1.4.		1	CS1.4.	
3	1	CS5.1.1.	1	CS5.1.1.	1	CS5.1.3.	1	CS5.1.1.		1	CS5.1.3.	1	CS5.1.3.		1	CS5.1.3.		1	CS5.1.3.		1	CS5.1.3.	
4	1	CS5.1.3.	1	CS5.1.1.	1	CS5.1.3.	1	CS5.1.3.		1	CS5.1.3.	1	CS5.1.1.		1	CS5.1.3.		2	CS5.1.3.		1	CS5.1.3.	
5	2	CS5.1.3.	2	CS5.3.1.1	2	CS5.3.1.1	1	CS5.3.1.1		2	CS5.4.2	1	CS5.3.1.1		2	CS1.2.		2	CS5.3.1.1		2	CS5.2.	
6																							
7	2	CS5.1.6.	2	CS5.1.6.	1	CS5.1.6.	2	CS5.1.6.		2	CS5.1.6.	2	CS5.1.6.		2	CS5.1.6.		2	CS5.1.6.		2	CS5.1.6.	
8	1	CS5.4.1.	1	CS5.4.2	1	CS5.4.1.	2	CS5.3.1.1		2	CS5.4.2	2	CS5.4.		2	CS1.2.		2	CS5.4.1.		2	CS5.4.	
9	1	CS5.4.2	2	CS5.4.2	1	CS5.4.2	1	CS5.4.2		1	CS5.4.2	1	CS5.4.2		1	CS5.4.2		1	CS5.4.1.		1	CS5.4.1.	
10	2	CS5.4.2	2	CS5.4.2	1	CS5.4.2	1	CS5.4.2		2	CS5.4.2	1	CS5.4.2		1	CS5.4.2		2	CS5.4.2		1	CS5.4.	
11	2	CS5.4.1.	2	CS5.4.1.	2	CS5.4.1.	1	CS5.4.1.		2	CS5.4.1.	1	CS5.4.1.		2	CS5.4.1.		1	CS5.4.1.		2	CS5.4.1.	
12	2	CS5.1.4.	2	CS5.1.4.	2	CS5.1.4.	2	CS3.4.1.		2	CS5.1.4.	2	CS5.1.4.		2	CS3.4.1.		2	CS5.1.4.		2	CS5.1.4.	
13	2	CS3.5.3.	2	CS1.5.	2	CS1.2.	1	CS1.5.		2	CS1.5.	2	CS1.2.		1	CS3.5.3.		2	CS1.2.		2	CS1.2.	
14	1	CS3.3.1.	2	CS3.3.1.	1	CS3.3.1.	1	CS3.3.		1	CS3.3.1.	1	CS3.3.1.		1	CS3.3.1.		1	CS3.3.1.		1	CS3.2.2.	
15	2	CS3.5.1.	2	CS3.5.1.	1	CS3.5.1.	1	CS3.5.1.		1	CS3.5.1.	2	CS3.5.1.		2	CS3.5.1.		1	CS3.5.1.		2	CS3.5.1.	
16	2	CS3.4.2.	2	CS3.4.2.	1	CS3.2.3.	1	CS3.4.2.		1	CS3.4.2.	2	CS3.4.2.		2	CS3.4.2.		1	CS3.4.2.		1	CS3.4.2.	
17	1	CS3.2.3.	1	CS3.2.3.	1	CS3.2.3.	1	CS3.2.3.		1	CS3.2.3.	1	CS3.2.3.		1	CS3.2.3.		1	CS3.2.3.		1	CS3.2.3.	
18																							
19	2	CS3.5.1.	1	CS3.5.1.	1	CS3.5.1.	1	CS3.5.1.		1	CS3.5.1.	1	CS3.5.1.		1	CS3.5.1.		2	CS3.5.2.		1	CS3.5.1.	
20	2	CS3.5.4.	3	CS3.5.4.	1	CS3.5.4.	1	CS3.5.2.		1	CS3.5.4.	2	CS3.5.4.		2	CS3.5.4.		2	CS3.5.4.		2	CS1.2.	
21	2	CS3.2.3.	2	CS3.2.3.	1	CS3.2.1.	1	CS3.2.1.		1	CS3.2.3.	1	CS3.2.1.		1	CS3.2.1.		1	CS3.2.1.		1	CS3.2.3.	
22	1	CS3.5.3.	2	CS1.2.	2	CS3.5.3.	2	CS3.5.4.		2	CS3.5.4.	2	CS3.5.3.		2	CS3.5.4.		2	CS3.5.3.		2	CS3.5.4.	
23	2	CS3.2.3.	1	CS3.2.3.	1	III	1	CS1.5.		2	CS1.5.	2	CS3.2.3.		1	CS3.2.3.		1	CS3.2.3.		2	CS1.5.	
24	1	CS1.4.	1	CS1.4.	1	CS1.4.	1	CS1.4.		1	CS1.4.	1	CS1.4.		1	CS1.4.		1	CS1.4.		1	CS1.3.	
25	1	CS1.5.	1	CS3.5.1.	1	CS3.5.1.	1	CS3.5.1.		1	CS3.5.1.	1	CS3.5.1.		1	CS5.1.1.		1	CS3.5.1.		1	CS3.5.1.	
26																							
27	1	CS4.1.4.	2	CS4.1.4.	2	CS1.2.	1	CS4.1.4.	CS1.2.	2	CS4.1.4.	2	CS4.1.4.		1	CS4.1.4.		1	CS4.1.4.		1	CS1.2.	
28	2	CS3.5.1.	2	CS3.2.3.	2	CS3.2.3.	1	CS3.2.4.		1	CS3.2.3.	2	CS1.2.		2	CS3.5.1.		2	CS3.5.2.	CS3.5.1.	1	CS3.2.3.	
29	1	CS3.4.2.	2	CS3.2.1.	1	CS3.4.2.	2	CS3.2.1.		1	CS3.4.2.	1	CS3.2.1.		2	CS3.4.2.		2	CS3.2.1.		2	CS3.2.1.	CS1.2.
30	1	CS5.1.6.	2	CS5.1.6.	1	CS5.1.6.	1	CS5.1.6.		2	CS3.5.4.	2	CS1.2.	CS2.4.	2	CS5.1.6.	CS2.4.	1	CS5.1.6.		1	CS5.1.6.	
31	1	CS3.2.1.	2	CS3.4.2.	2	CS3.4.1.	1	CS3.2.1.		1	CS3.4.1.	1	CS3.4.1.		1	CS3.2.1.		2	CS3.4.1.	CS3.2.4.	2	CS3.2.1.	
32	2	CS1.5.	2	CS1.5.	2	CS1.5.	2	CS1.5.		2	CS1.5.	2	CS1.5.		2	CS1.5.		2	CS1.5.		2	CS1.5.	
33	1	CS5.1.3.	2	CS5.1.3.	1	CS5.1.3.	2	CS5.1.3.		1	CS5.1.3.	2	CS2.1.		2	CS5.1.1.		2	CS5.1.4.		2	CS3.4.1.	
34	2	CS5.1.4.	2	CS3.4.2.	2	CS3.4.2.	1	CS3.4.2.		2	CS3.4.2.	3	CS3.2.1.		2	CS3.4.2.		2	CS3.4.2.		2	CS3.4.2.	
35																							
36																							
37																							
38																							
39	1	CS4.3.2.	2	CS4.3.2.	1	CS4.3.2.	1	CS4.3.2.		1	CS4.3.2.	1	CS4.3.2.		1	CS4.3.2.		1	CS4.3.2.		1	CS4.3.2.	
40	1	CS4.3.2.	2	CS4.3.2.	1	CS4.3.2.	1	CS4.3.2.		1	CS4.3.2.	1	CS4.3.2.		1	CS4.3.2.		1	CS4.3.2.		1	CS4.3.2.	

Table 5.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 5 Science, Form Fall 2005

41	1	CS2.3.	2	CS4.3.2.	2	CS4.3.2.	2	CS4.1.1.	CS4.3.2.	2	CS4.3.2.	2	CS1.2.		1	CS4.3.2.		2	CS4.3.2.		1	CS4.3.2.	
42	2	CS4.3.2.	2	CS4.3.2.	2	CS4.3.2.	2	CS4.3.2.		2	CS4.3.2.	2	CS4.3.2.		2	CS4.3.2.		2	CS4.3.2.		2	CS4.3.2.	
43	2	CS4.4.4.	1	CS4.4.4.	1	CS4.4.4.	2	CS4.4.4.		2	CS4.4.4.	2	CS4.4.4.		2	CS4.4.4.		2	CS4.4.4.		1	CS4.4.4.	
44	1	CS4.4.2.	1	CS4.4.1.	1	CS4.4.2.	1	CS4.4.2.		1	CS4.4.2.	1	CS4.4.2.		1	CS4.4.2.		1	CS4.4.2.		1	CS4.4.2.	
45	1	CS5.3.1.1	2	CS5.3.1.1	1	CS5.3.	2	CS4.2.1.	CS5.3.	2	CS5.2.1.	2	CS4.2.1.		2	CS5.2.1.		2	CS4.2.1.		1	CS5.3.	
46	2	CS4.2.2.	2	CS4.2.2.	1	CS4.2.2.	1	CS4.2.2.		1	CS4.2.2.	2	CS4.2.2.		2	CS4.2.2.		1	CS4.2.2.		1	CS4.2.2.	
47	1	CS4.4.3.	1	CS4.4.3.	2	CS4.4.3.	2	CS4.4.3.		2	CS4.4.3.	2	CS4.4.3.		3	CS1.2.		2	CS4.4.3.		1	CS4.4.3.	
48	1	CS4.4.4.	2	CS4.4.4.	1	CS4.4.4.	1	CS4.4.4.		1	CS4.4.4.	2	CS4.4.4.		2	CS4.4.4.		1	CS4.4.4.		2	CS4.4.4.	
49																							
50	2	CS4.3.2.	2	CS4.3.2.	1	CS4.3.2.	1	CS4.3.2.		1	CS4.3.2.	2	CS4.3.1.		1	CS4.3.2.		1	CS4.3.2.		1	CS4.3.2.	
51	1	CS4.3.4.	1	CS4.3.4.	1	CS4.3.4.	1	CS4.3.4.		1	CS4.3.4.	1	CS4.3.4.		1	CS4.3.4.		1	CS4.3.4.		1	CS4.3.4.	

Pairwise Comparison: 0.6615
Standard Pairwise Comparison: 0.8653

Table 5.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 5 Science, Form Fall 2005

Low		Medium		High
0		7.745098		11

1	CS4.2.1.	CS5.2.1.	CS5.2.1.	CS5.2.1.	CS5.2.1.	CS5.2.1.	CS5.2.1.	CS5.2.1.	CS5.2.3.
2	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.
3	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.
4	CS5.1.1.	CS5.1.1.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.
5	CS1.2.	CS5.1.3.	CS5.2.	CS5.3.1.1	CS5.3.1.1	CS5.3.1.1	CS5.3.1.1	CS5.3.1.1	CS5.4.2
6									
7	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.
8	CS1.2.	CS5.3.1.1	CS5.4.	CS5.4.	CS5.4.1.	CS5.4.1.	CS5.4.1.	CS5.4.2	CS5.4.2
9	CS5.4.1.	CS5.4.1.	CS5.4.2	CS5.4.2	CS5.4.2	CS5.4.2	CS5.4.2	CS5.4.2	CS5.4.2
10	CS5.4.	CS5.4.2	CS5.4.2	CS5.4.2	CS5.4.2	CS5.4.2	CS5.4.2	CS5.4.2	CS5.4.2
11	CS5.4.1.	CS5.4.1.	CS5.4.1.	CS5.4.1.	CS5.4.1.	CS5.4.1.	CS5.4.1.	CS5.4.1.	CS5.4.1.
12	CS3.4.1.	CS3.4.1.	CS5.1.4.	CS5.1.4.	CS5.1.4.	CS5.1.4.	CS5.1.4.	CS5.1.4.	CS5.1.4.
13	CS1.2.	CS1.2.	CS1.2.	CS1.2.	CS1.5.	CS1.5.	CS1.5.	CS3.5.3.	CS3.5.3.
14	CS3.2.2.	CS3.3.	CS3.3.1.	CS3.3.1.	CS3.3.1.	CS3.3.1.	CS3.3.1.	CS3.3.1.	CS3.3.1.
15	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.
16	CS3.2.3.	CS3.4.2.	CS3.4.2.	CS3.4.2.	CS3.4.2.	CS3.4.2.	CS3.4.2.	CS3.4.2.	CS3.4.2.
17	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.3.
18									
19	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.2.
20	CS1.2.	CS3.5.2.	CS3.5.4.	CS3.5.4.	CS3.5.4.	CS3.5.4.	CS3.5.4.	CS3.5.4.	CS3.5.4.
21	CS3.	CS3.	CS3.	CS3.	CS3.	CS3.	CS3.	CS3.	CS3.

Table 5.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 5 Science, Form Fall 2005

	2.1.	2.1.	2.1.	2.1.	2.1.	2.3.	2.3.	2.3.	2.3.	
22	CS1.2.	CS3.5.3.	CS3.5.3.	CS3.5.3.	CS3.5.3.	CS3.5.4.	CS3.5.4.	CS3.5.4.	CS3.5.4.	
23	CS1.5.	CS1.5.	CS1.5.	III	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.3.	
24	CS1.3.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	
25	CS1.5.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS5.1.1.	
26										
27	CS1.2.	CS1.2.	CS1.2.	CS4.1.4.	CS4.1.4.	CS4.1.4.	CS4.1.4.	CS4.1.4.	CS4.1.4.	CS4.1.4.
28	CS1.2.	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.4.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.2.
29	CS1.2.	CS3.2.1.	CS3.2.1.	CS3.2.1.	CS3.2.1.	CS3.2.1.	CS3.4.2.	CS3.4.2.	CS3.4.2.	CS3.4.2.
30	CS1.2.	CS2.4.	CS2.4.	CS3.5.4.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.
	CS5.1.6.									
31	CS3.2.1.	CS3.2.1.	CS3.2.1.	CS3.2.1.	CS3.2.4.	CS3.4.1.	CS3.4.1.	CS3.4.1.	CS3.4.1.	CS3.4.2.
32	CS1.5.	CS1.5.	CS1.5.	CS1.5.	CS1.5.	CS1.5.	CS1.5.	CS1.5.	CS1.5.	
33	CS2.1.	CS3.4.1.	CS5.1.1.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.4.	
34	CS3.2.1.	CS3.4.2.	CS3.4.2.	CS3.4.2.	CS3.4.2.	CS3.4.2.	CS3.4.2.	CS3.4.2.	CS5.1.4.	
35										
36										
37										
38										
39	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	
40	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	
41	CS1.2.	CS2.3.	CS4.1.1.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.

Table 5.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 5 Science, Form Fall 2005

42	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	
43	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	
44	CS4.4.1.	CS4.4.2.	CS4.4.2.	CS4.4.2.	CS4.4.2.	CS4.4.2.	CS4.4.2.	CS4.4.2.	CS4.4.2.	
45	CS4.2.1.	CS4.2.1.	CS4.2.1.	CS5.2.1.	CS5.2.1.	CS5.3.	CS5.3.	CS5.3.	CS5.3.1.1	CS5.3.1.1
46	CS4.2.2.	CS4.2.2.	CS4.2.2.	CS4.2.2.	CS4.2.2.	CS4.2.2.	CS4.2.2.	CS4.2.2.	CS4.2.2.	
47	CS1.2.	CS4.4.3.	CS4.4.3.	CS4.4.3.	CS4.4.3.	CS4.4.3.	CS4.4.3.	CS4.4.3.	CS4.4.3.	
48	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	
49										
50	CS4.3.1.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	
51	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	

Table 5.10
Items Coded by Reviewers to Each Objective
Michigan Grade 5 Science, Form Fall 2005

Low		Medium		High
0		5.486111		42

I																				
CS1.1.																				
CS1.2.	5	8	13	13	13	13	20	22	27	27	27	28	29	30	41	47				
CS1.3.	24																			
CS1.4.	2	2	2	2	2	2	2	2	2	24	24	24	24	24	24	24	24			
CS1.5.	13	13	13	23	23	23	25	32	32	32	32	32	32	32	32	32				
CS1.6																				
II																				
CS2.1.	33																			
CS2.2.																				
CS2.3.	41																			
CS2.4.	30	30																		
CS2.5.																				
III	23																			
CS3.1.																				
CS3.2.																				
CS3.2.1.	21	21	21	21	21	29	29	29	29	29	31	31	31	31	34					
CS3.2.2.	14																			
CS3.2.3.	16	17	17	17	17	17	17	17	17	17	21	21	21	21	23	23	23	23	23	28
	28	28	28																	
CS3.2.4.	28	31																		
CS3.																				

Table 5.10
Items Coded by Reviewers to Each Objective
Michigan Grade 5 Science, Form Fall 2005

2.5.																				
CS3.3.	14																			
CS3.3.1.	14	14	14	14	14	14	14													
CS3.4.																				
CS3.4.1.	12	12	31	31	31	31	33													
CS3.4.2.	16	16	16	16	16	16	16	16	29	29	29	29	31	34	34	34	34	34	34	34
CS3.5.																				
CS3.5.1.	15	15	15	15	15	15	15	15	15	19	19	19	19	19	19	19	19	25	25	25
	25	25	25	25	28	28	28													
CS3.5.2.	19	20	28																	
CS3.5.3.	13	13	22	22	22	22														
CS3.5.4.	20	20	20	20	20	20	20	22	22	22	22	30								
IV																				
CS4.1.																				
CS4.1.1.	41																			
CS4.1.2.																				
CS4.1.3.																				
CS4.1.4.	27	27	27	27	27	27	27													
CS4.1.5.																				
CS4.2																				
CS4.2.1.	1	45	45	45																
CS4.2.2.	46	46	46	46	46	46	46	46	46											
CS4.																				

Table 5.10
Items Coded by Reviewers to Each Objective
Michigan Grade 5 Science, Form Fall 2005

3.																				
CS4. 3.1.	50																			
CS4. 3.2.	39	39	39	39	39	39	39	39	39	40	40	40	40	40	40	40	40	40	41	41
	41	41	41	41	41	42	42	42	42	42	42	42	42	42	50	50	50	50	50	
	50	50	50																	
CS4. 3.3.																				
CS4. 3.4.	51	51	51	51	51	51	51	51	51											
CS4. 3.5.																				
CS4. 4.																				
CS4. 4.1.	44																			
CS4. 4.2.	44	44	44	44	44	44	44	44												
CS4. 4.3.	47	47	47	47	47	47	47	47												
CS4. 4.4.	43	43	43	43	43	43	43	43	43	48	48	48	48	48	48	48	48	48		
V																				
CS5. 1.																				
CS5. 1.1.	3	3	3	4	4	25	33													
CS5. 1.2.																				
CS5. 1.3.	3	3	3	3	3	3	4	4	4	4	4	4	4	5	33	33	33	33	33	
CS5. 1.4.	12	12	12	12	12	12	12	33	34											
CS5. 1.5.																				
CS5. 1.6.	7	7	7	7	7	7	7	7	7	30	30	30	30	30	30	30				
CS5. 2.	5																			
CS5. 2.1.	1	1	1	1	1	1	1	45	45											
CS5.																				

Table 5.10
Items Coded by Reviewers to Each Objective
Michigan Grade 5 Science, Form Fall 2005

2.2.																		
CS5.2.3.	1																	
CS5.3.	45	45	45															
CS5.3.1.1	5	5	5	5	5	8	45	45										
CS5.3.1.2.																		
CS5.3.1.3.																		
CS5.4.	8	8	10															
CS5.4.1.	8	8	8	9	9	11	11	11	11	11	11	11	11	11				
CS5.4.2	5	8	8	9	9	9	9	9	9	9	10	10	10	10	10	10	10	10

Table 5.11

Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 5 Science, Form Fall 2005

Low		Medium		High
1		4		9

I											
CS1. 1.											
CS1. 2.	5:1	8:1	13:4	20:1	22:1	27:3	28:1	29:1	30:1	41:1	47:1
CS1. 3.	24:1										
CS1. 4.	2:9	24:8									
CS1. 5.	13:3	23:3	25:1	32:9							
CS1. 6											
II											
CS2. 1.	33:1										
CS2. 2.											
CS2. 3.	41:1										
CS2. 4.	30:2										
CS2. 5.											
III	23:1										
CS3. 1.											
CS3. 2.											
CS3. 2.1.	21:5	29:5	31:4	34:1							
CS3. 2.2.	14:1										
CS3. 2.3.	16:1	17:9	21:4	23:5	28:4						
CS3. 2.4.	28:1	31:1									
CS3. 2.5.											

Table 5.11

Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 5 Science, Form Fall 2005

CS3.3.	14:1			
CS3.3.1.	14:7			
CS3.4.				
CS3.4.1.	12:2	31:4	33:1	
CS3.4.2.	16:8	29:4	31:1	34:7
CS3.5.				
CS3.5.1.	15:9	19:8	25:7	28:3
CS3.5.2.	19:1	20:1	28:1	
CS3.5.3.	13:2	22:4		
CS3.5.4.	20:7	22:4	30:1	
IV				
CS4.1.				
CS4.1.1.	41:1			
CS4.1.2.				
CS4.1.3.				
CS4.1.4.	27:7			
CS4.1.5.				
CS4.2				
CS4.2.1.	1:1	45:3		
CS4.2.2.	46:9			
CS4.3.				
CS4.3.1.	50:1			

Table 5.11

Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 5 Science, Form Fall 2005

CS4.3.2.	39:9	40:9	41:7	42:9	50:8
CS4.3.3.					
CS4.3.4.	51:9				
CS4.3.5.					
CS4.4.					
CS4.4.1.	44:1				
CS4.4.2.	44:8				
CS4.4.3.	47:8				
CS4.4.4.	43:9	48:9			
V					
CS5.1.					
CS5.1.1.	3:3	4:2	25:1	33:1	
CS5.1.2.					
CS5.1.3.	3:6	4:7	5:1	33:5	
CS5.1.4.	12:7	33:1	34:1		
CS5.1.5.					
CS5.1.6.	7:9	30:7			
CS5.2.	5:1				
CS5.2.1.	1:7	45:2			
CS5.2.2.					
CS5.2.3.	1:1				
CS5.3.	45:3				

Table 5.11

Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 5 Science, Form Fall 2005

CS5.3.1.1	5:5	8:1	45:2	
CS5.3.1.2.				
CS5.3.1.3.				
CS5.4.	8:2	10:1		
CS5.4.1.	8:3	9:2	11:9	
CS5.4.2	5:1	8:2	9:7	10:8

Table 5.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 5 Science, Form Fall 2005

Low DOK		Matched DOK		High DOK
1		4		9

I [2]:											
CS1.1. [2]:											
CS1.2. [3]:	5:1[2]	8:1[2]	13:4 [2]	20:1 [2]	22:1 [2]	27:3 [1.33]	28:1 [2]	29:1 [2]	30:1 [2]	41:1 [2]	47:1 [3]
CS1.3. [1]:	24:1 [1]										
CS1.4. [1]:	2:9[1.11]	24:8 [1]									
CS1.5. [2]:	13:3 [1.67]	23:3 [1.67]	25:1 [1]	32:9 [2]							
CS1.6 [2]:											
II [2]:											
CS2.1. [2]:	33:1 [2]										
CS2.2. [2]:											
CS2.3. [1]:	41:1 [1]										
CS2.4. [2]:	30:2 [2]										
CS2.5. [1]:											
III	23:1										

Table 5.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 5 Science, Form Fall 2005

[2]:	[1]				
CS3.1.[1]:					
CS3.2.[1]:					
CS3.2.1.[1]:	21:5 [1]	29:5 [1.8]	31:4 [1.25]	34:1 [3]	
CS3.2.2.[2]:	14:1 [1]				
CS3.2.3.[1]:	16:1 [1]	17:9 [1]	21:4 [1.5]	23:5 [1.4]	28:4 [1.5]
CS3.2.4.[2]:	28:1 [1]	31:1 [2]			
CS3.2.5.[1]:					
CS3.3.[2]:	14:1 [1]				
CS3.3.1.[2]:	14:7 [1.14]				
CS3.4.[2]:					
CS3.4.1.[2]:	12:2 [2]	31:4 [1.5]	33:1 [2]		
CS3.4.2.[1]:	16:8 [1.5]	29:4 [1.25]	31:1 [2]	34:7 [1.86]	
CS3.5.[2]:					
CS3.5.1.[2]:	15:9 [1.56]	19:8 [1.12]	25:7 [1]	28:3 [2]	

Table 5.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 5 Science, Form Fall 2005

CS3.5.2.[1]:	19:1 [2]	20:1 [1]	28:1 [2]
CS3.5.3.[3]:	13:2 [1.5]	22:4 [1.75]	
CS3.5.4.[2]:	20:7 [1.86]	22:4 [2]	30:1 [2]
IV [2]:			
CS4.1.[1]:			
CS4.1.1.[2]:	41:1 [2]		
CS4.1.2.[2]:			
CS4.1.3.[1]:			
CS4.1.4.[1]:	27:7 [1.43]		
CS4.1.5.[1]:			
CS4.2[2]:			
CS4.2.1.[1]:	1:1[1]	45:3 [2]	
CS4.2.2.[2]:	46:9 [1.44]		
CS4.3.[2]:			
CS4.3.1.	50:1 [2]		

Table 5.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 5 Science, Form Fall 2005

[2]:					
CS4.3.2.[2]:	39:9 [1.11]	40:9 [1.11]	41:7 [1.71]	42:9 [2]	50:8 [1.25]
CS4.3.3.[1]:					
CS4.3.4.[2]:	51:9 [1]				
CS4.3.5.[2]:					
CS4.4.[1]:					
CS4.4.1.[1]:	44:1 [1]				
CS4.4.2.[1]:	44:8 [1]				
CS4.4.3.[1]:	47:8 [1.62]				
CS4.4.4.[2]:	43:9 [1.67]	48:9 [1.44]			
V [1]:					
CS5.1.[2]:					
CS5.1.1.[1]:	3:3[1]	4:2[1]	25:1 [1]	33:1 [2]	
CS5.1.2.[2]:					
CS5.1.3.[1]:	3:6[1]	4:7[1.14]	5:1[2]	33:5 [1.4]	
CS5.	12:7	33:1	34:1		

Table 5.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 5 Science, Form Fall 2005

1.4. [2]:	[2]	[2]	[2]	
CS5. 1.5. [1]:				
CS5. 1.6. [2]:	7:9[1.89]	30:7 [1.2 9]		
CS5. 2. [1]:	5:1[2]			
CS5. 2.1. [1]:	1:7[1]	45:2 [2]		
CS5. 2.2. [1]:				
CS5. 2.3. [1]:	1:1[1]			
CS5. 3. [1]:	45:3 [1.3 3]			
CS5. 3.1.1 [1]:	5:5[1.6]	8:1[2]	45:2 [1.5]	
CS5. 3.1.2 . [1]:				
CS5. 3.1.3 . [1]:				
CS5. 4. [2]:	8:2[2]	10:1 [1]		
CS5. 4.1. [2]:	8:3[1.33]	9:2[1]	11:9 [1.6 7]	
CS5. 4.2 [2]:	5:1[2]	8:2[1.5]	9:7[1.14]	10:8 [1.5]

Table 5.1
Categorical Concurrence Between Standards and Assessment as Rated by Nine Reviewers
Michigan Grade 5 Science, Form Winter 2005
Number of Assessment Items - 43

Standards			Level by Objective			Hits		Cat. Concurr.
Title	Goals #	Objs #	Level	# of objs by Level	% w/in std by Level	Mean	S.D.	
I - Constructing New Scientific Knowledge	6	6	1 2 3	2 3 1	33 50 16	5.44	0.50	NO
II - Reflecting on Scientific Knowledge	5	5	1 2	2 3	40 60	0	0	NO
III - Using Life Science Knowledge	5	13.11	1 2 3	6 6 1	46 46 7	13.44	1.42	YES
IV - Using Physical Science Knowledge	4	16	1 2	8 8	50 50	12.89	0.74	YES
V - Using Earth Science Knowledge	4	14.33	1 2	9 5	64 35	10.89	1.10	YES
Total	24	54.44	1 2 3	27 25 2	50 46 3	42.67	1.63	

Table 5.2

Depth-of-Knowledge Consistency Between Standards and Assessment as Rated by Nine Reviewers

Michigan Grade 5 Science, Form Winter 2005

Number of Assessment Items - 43

Standards			Hits		Level of Item w.r.t. Standard						DOK Consistency
					% Under		% At		% Above		
Title	Goals #	Objs #	M	S.D.	M	S.D.	M	S.D.	M	S.D.	
I - Constructing New Scientific Knowledge	6	6	5.44	0.50	24	40	76	40	0	0	YES
II - Reflecting on Scientific Knowledge	5	5	0	0	0	0	0	0	0	0	NO
III - Using Life Science Knowledge	5	13.11	13.44	1.42	45	47	40	41	15	28	YES
IV - Using Physical Science Knowledge	4	16	12.89	0.74	17	34	54	46	29	43	YES
V - Using Earth Science Knowledge	4	14.33	10.89	1.10	38	45	53	46	10	29	YES
Total	24	54.44	42.67	1.63	31	43	53	45	16	34	

Table 5.3

Range-of-Knowledge Correspondence and Balance of Representation Between Standards and Assessment as Rated by Nine Reviewers
Michigan Grade 5 Science, Form Winter 2005
Number of Assessment Items - 43

Standards			Hits		Range of Objectives				Rng. of Know.	Balance Index				Bal. of Represent.
					# Objs Hit		% of Total			% Hits in Std/Ttl Hits		Index		
Title	Goals #	Objs #	Mean	S.D.	Mean	S.D.	Mean	S.D.		Mean	S.D.	Mean	S.D.	
I - Constructing New Scientific Knowledge	6	6	5.44	0.50	3.44	0.68	57	11	YES	13	1	0.87	0.05	YES
II - Reflecting on Scientific Knowledge	5	5	0	0	0	0	0	0	NO	0	0	0	0	NO
III - Using Life Science Knowledge	5	13.11	13.44	1.42	7.22	1.03	55	7	YES	31	2	0.77	0.04	YES
IV - Using Physical Science Knowledge	4	16	12.89	0.74	9.11	0.57	57	4	YES	30	2	0.81	0.02	YES
V - Using Earth Science Knowledge	4	14.33	10.89	1.10	7	0.82	49	5	WEAK	26	3	0.78	0.04	YES
Total	24	54.44	42.67	1.63	5.36	2.20	44	8		20	8	0.65	0.06	

Table 5.4
Summary of Attainment of Acceptable Alignment Level on Four Content Focus Criteria as Rated by Nine Reviewers
Michigan Grade 5 Science, Form Winter 2005
Number of Assessment Items - 43

Standards	Alignment Criteria			
	Categorical Concurrence	Depth-of-Knowledge Consistency	Range of Knowledge	Balance of Representation
I - Constructing New Scientific Knowledge	NO	YES	YES	YES
II - Reflecting on Scientific Knowledge	NO	NO	NO	NO
III - Using Life Science Knowledge	YES	YES	YES	YES
IV - Using Physical Science Knowledge	YES	YES	YES	YES
V - Using Earth Science Knowledge	YES	YES	WEAK	YES

Table 5.5
Source-of-Challenge Issues by Reviewer
Michigan Grade 5 Science, Form Winter 2005

Item Number	Comments by Reviewer
10	The fact that the light in the picture is closest to DC may mislead students to right answer for wrong reason.
10	Students could arrive at the right answer by looking at the diagram and not even considering rotation of the Earth. Washington DC would be the easiest guess because on the diagram it is closest to the sun.
14	students could answer "A" because seeds for bird food is important
21	Middle school benchmark stating "Explain how human use and benefit from plant and animal material
21	This is a middle school objective
38	Two correct answers: barren land erodes; the sediments that enter the river should be considered pollution.
40	From the answer pictures, both (A) and (D) would produce the same net lateral force on the box resulting in a straight line.
40	A could also be a correct answer.
40	Two correct answers (A and D)
46	A student familiar with different families of musical instruments would answer "A" and be correct.
46	Size is also a correct answer--pitch changes based on the size of an object as well....
46	Answers A and B are both correct. if the whistles are of different length, which would fall under size, then the whistles would make different sounds
46	The size (A) can effect the frequency. Pitch is not quite accurate and should read "frequency."
46	This is a poor question. The question asks "WHY", the answer simply restates the problem "they vary in pitch". "WHY" would be better answered by "they differ in size". From a musician's perspective, the pitch may also be altered on many wind instruments by changing the force of their lips, mouth, breath, as well as, the amount of energy they are exerting.
46	Two correct answers (A and B). Changing the size of an instrument changes pitch.
46	Since the question asks "why", the correct answer is "A", which would really make this a level 2 DOK and benchmark CS4.4.2
51	Although unlikely to be guessed, both (B) and (C) are correct.

Table 5.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 5 Science, Form Winter 2005

Item	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6	Rater 7	Rater 8	Rater 9
1	1	2	2	2	2	2	2	2	2
2	1	2	1	1	1	1	1	1	1
3	1	2	1	2	1	2	1	2	2
4	1	1	1	1	1	1	1	1	1
5	1	2	1	2	1	2	1	1	2
6	1	1	1	1	1	1	1	1	1
7									
8	1	1	1	2	2	2	2	2	1
9	1	1	1	1	1	1	1	1	1
10	2	2	1	1	2	1	1	2	1
11	2	1	1	1	2	1	2	1	2
12	2	2	2	1	2	2	2	2	2
13	1	2	1	2	1	1	1	2	1
14	1	2	1	2	1	1	1	1	1
15	1	2	2	1	1	2	2	2	2
16	2	2	2	2	2	2	2	2	2
17	1	1	1	1	1	1	1	1	1
18	1	1	1	1	1	1	1	1	1
19	1	1	1	1	1	2	1	1	1
20	1	1	1	1	1	1	1	1	1
21	1	2	2	1	1	2	1	1	2
22									
23	2	1	1	1	2	2	1	1	2
24	1	1	1	1	1	1	1	1	1
25	1	1	1	1	1	1	1	1	1
26									
27	2	2	2	2	2	2	2	2	2
28	1	1	1	1	1	1	1	1	1
29	2	2	2	2	2	3	2	2	2
30	2	2	2	1	1	2	1	1	1
31	2	2	2	1	1	2	2	2	1
32									
33									
34									
35									
36	1	2	1	1	1	2	1	2	2
37	1	1	1	1	1	1	1	1	1
38	2	2	1	1	1	1	1	1	2
39	1	2	1	1	1	2	1	1	2
40	2	2	2	2	2	2	1	2	2
41	1	2	1	1	1	2	1	1	1
42	1	1	1	2	1	1	1	1	1
43	1	2	2	2	2	2	2	2	2
44	1	1	1	1	1	1	1	1	1
45	2	1	2	1	1	1	1	1	2
46	1	2	1	2	1	2	1	2	1
47									
48	2	2	2	2	2	2	1	2	2

Table 5.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 5 Science, Form Winter 2005

49	1	2	1	2	1	2	1	2	1
50	1	2	1	2	2	2	1	2	2
51	1	1	1	1	1	1	1	1	1

Intraclass Correlation: 0.875
Pairwise Comparison: 0.7119

Table 5.7
Notes by Reviewer
Michigan Grade 5 Science, Form Winter 2005

Item Number	Comments by Reviewer
8	There are no standards for the importance of plant to human beings
10	A student could get this right for the wrong reason: Wash. DC is shown closest to the rays of the sun.
13	Not based on the info. given above.
15	The term "new wood based products" may be confusing to students.
16	A very weak match at best
21	No matching standard
21	Plant use is middle school standard.
21	This is a middle school objective. "Explain how humans use and benefit from plant material"
21	Difficulty matching this to an elementary benchmark.
23	Reading question
39	The level of difficulty of the task really should be a one, however, the phrase "describe ways trees can be recycled" may seem confusing to some students. This is why I gave it a 2. Also, this question is very similar to #21.
40	In answer A the picture appear as if Worker A is pushing directly over the centerline of the box diagonally. This would cause the box to move in a straight line. This is more a problem with the illustration
48	The question should state that the lamp is assumed to stay at the same height.

Table 5.8

DOK Levels and Objectives Coded by Each Reviewer

Michigan Grade 5 Science, Form Winter 2005

Item	DOK 0	PObj0	DOK 1	PObj1	DOK 2	PObj2	DOK 3	PObj3	DOK 4	PObj4	DOK 5	PObj5	DOK 6	PObj6	DOK 7	PObj7	S1Obj7	DOK 8	PObj8
1	1	CS1.6	2	CS1.6	2	CS1.6	2	CS1.6	2	CS1.6	2	CS1.6	2	CS1.6	2	CS1.6		2	CS1.6
2	1	CS5.1.4.	2	CS5.1.2.	1	CS5.1.4.	1	CS5.1.4.	1	CS5.1.3.	1	CS5.1.4.	1	CS5.1.4.	1	CS5.1.2.		1	CS5.1.4.
3	1	CS5.1.3.	2	CS5.1.3.	1	CS5.1.3.	2	CS5.1.3.	1	CS5.1.3.	2	CS5.1.3.	1	CS5.1.3.	2	CS5.1.3.		2	CS5.1.3.
4	1	CS5.1.1.	1	CS5.1.1.	1	CS5.1.1.	1	CS5.1.1.	1	CS5.1.1.	1	CS5.1.1.	1	CS5.1.1.	1	CS5.1.2.		1	CS5.1.1.
5	1	CS3.4.1.	2	CS5.1.4.	1	CS5.1.4.	2	CS3.4.1.	1	CS3.4.1.	2	CS3.4.1.	1	CS3.4.1.	1	CS3.4.1.		2	CS3.4.1.
6	1	CS1.4.	1	CS1.4.	1	CS1.4.	1	CS1.4.	1	CS1.4.	1	CS1.4.	1	CS1.4.	1	CS1.4.		1	CS1.4.
7																			
8	1		1	CS5.1.4.	1	CS5.1.4.	2	CS5.3.1.1	2	CS5.4.2	2	CS5.4.	2	CS1.2.	2	CS5.4.1.		1	CS5.4.
9	1	CS5.4.2	1	CS5.4.2	1	CS5.1.2.	1	CS5.4.2	1	CS5.4.2	1	CS5.4.2	1	CS5.4.2	1	CS5.1.4.		1	CS5.4.1.
10	2	CS5.4.2	2	CS5.4.2	1	CS5.1.4.	1	CS5.4.2	2	CS5.4.2	1	CS5.4.2	1	CS5.4.2	2	CS5.4.2		1	CS5.4.
11	2	CS5.4.1.	1	CS5.4.2	1	CS5.1.4.	1	CS5.4.1.	2	CS5.4.1.	1	CS5.4.1.	2	CS5.4.1.	1	CS5.4.1.		2	CS5.4.1.
12	2	CS1.6	2	CS1.6	2	CS1.6	1	CS1.6	2	CS1.5.	2	CS1.6	2	CS1.6	2	CS1.6	CS3.2.4.	2	CS1.6
13	1	CS3.2.5.	2	CS3.2.4.	1	CS3.4.2.	2	CS3.4.2.	1	CS3.4.2.	1	CS3.2.5.	1	CS3.2.5.	2	CS3.2.5.		1	CS3.2.5.
14	1	CS3.2.5.	2	CS3.2.5.	1	CS3.2.3.	2	CS3.2.5.	1	CS3.2.3.	1	CS3.2.3.	1	CS3.2.5.	1	CS3.2.5.		1	CS3.2.5.
15	1	CS5.1.6.	2	CS5.1.6.	2	CS5.1.6.	1	CS5.1.6.	1	CS5.1.6.	2	CS5.1.6.	2	CS5.1.6.	2	CS5.1.6.		2	CS5.1.6.
16	2	CS3.5.2.	2	CS3.5.2.	2	CS3.2.4.	2	CS1.5.	2	CS3.5.3.	2	CS1.5.	2	CS3.5.3.	2	CS1.5.	CS3.5.2.	2	CS3.5.2.
17	1	CS3.2.3.	1	CS3.2.3.	1	CS3.2.4.	1	CS3.2.3.	1	CS3.2.3.	1	CS3.2.3.	1	CS3.2.3.	1	CS3.2.3.		1	CS3.2.3.
18	1	CS3.2.5.	1	CS3.2.5.	1	CS3.2.5.	1	CS3.2.5.	1	CS3.2.5.	1	CS3.2.5.	1	CS3.2.5.	1	CS3.2.5.		1	CS3.2.5.
19	1	CS3.2.4.	1	CS3.2.4.	1	CS3.2.5.	1	CS3.5.3.	1	CS3.5.2.	2	CS3.2.4.	1	CS3.2.4.	1	CS3.2.4.		1	CS3.2.4.
20	1	CS3.2.5.	1	CS3.2.5.	1	CS3.2.5.	1	CS3.2.5.	1	CS3.2.5.	1	CS3.2.5.	1	CS3.2.5.	1	CS3.2.5.		1	CS3.2.5.
21	1		2	CS3.2.5.	2		1		1		2		1		1	CS3.5.		2	CS3.5.3.
22																			
23	2	CS1.5.	1	CS1.5.	1	CS1.5.	1	CS1.5.	2	CS1.5.	2	CS3.2.3.	1	CS3.2.3.	1	CS3.2.3.		2	CS1.5.
24	1	CS1.4.	1	CS1.4.	1	CS1.4.	1	CS1.4.	1	CS1.4.	1	CS1.4.	1	CS1.4.	1	CS1.4.		1	CS1.3.
25	1	CS3.5.1.	1	CS3.5.1.	1	CS3.5.1.	1	CS3.5.1.	1	CS3.5.1.	1	CS3.5.1.	1	CS5.1.	1	CS3.5.1.		1	CS3.5.1.
26																			
27	2	CS4.1.3.	2	CS4.1.3.	2	CS4.1.3.	2	CS4.1.3.	2	CS4.1.3.	2	CS4.1.3.	2	CS4.1.3.	2	CS4.1.3.		2	CS4.1.3.
28	1	CS4.2.1.	1	CS5.2.1.	1	CS5.2.1.	1	CS5.2.1.	1	CS5.2.1.	1	CS5.2.1.	1	CS5.2.1.	1	CS5.2.1.		1	CS5.2.1.
29	2	CS3.2.3.	2	CS3.2.3.	2	CS3.2.3.	2	CS3.2.3.	2	CS3.2.3.	3	CS3.2.3.	2	CS3.2.3.	2	CS3.2.3.		2	CS3.2.3.
30	2	CS4.1.4.	2	CS1.2.	2	CS1.2.	1	CS4.1.4.	1	CS4.1.4.	2	CS4.1.4.	1	CS4.1.4.	1	CS4.1.4.		1	CS1.2.
31	2	CS3.5.1.	2	CS3.2.3.	2	CS3.5.1.	1	CS3.2.4.	1	CS3.2.3.	2	CS3.2.3.	2	CS3.5.1.	2	CS3.5.1.	CS3.5.2.	1	CS3.2.3.
32																			
33																			
34																			
35																			
36	1	CS5.1.6.	2	CS5.1.6.	1	CS5.1.6.	1	CS5.1.6.	1	CS5.1.6.	2	CS5.1.6.	1	CS5.1.6.	2	CS5.1.6.		2	CS5.1.6.
37	1	CS3.5.1.	1	CS3.5.2.	1	CS3.5.1.	1	CS3.5.1.	1	CS3.5.1.	1	CS3.5.1.	1	CS3.5.1.	1	CS3.5.3.		1	CS3.5.1.
38	2	CS3.5.4.	2	CS3.5.4.	1	CS3.5.4.	1	CS3.5.4.	1	CS3.5.4.	1	CS3.5.4.	1	CS3.5.4.	1	CS3.5.4.		2	CS3.5.4.
39	1	CS3.5.4.	2	CS5.1.6.	1	CS5.1.6.	1	CS5.1.6.	1	CS5.1.6.	2	CS5.1.6.	1	CS5.1.6.	1	CS5.1.6.		2	CS5.1.6.
40	2	CS4.3.2.	2	CS4.3.1.	2	CS4.3.1.	2	CS4.3.2.	2	CS4.3.2.	2	CS4.3.2.	1	CS4.3.2.	2	CS4.3.2.		2	CS4.3.2.
41	1	CS4.3.4.	2	CS4.3.4.	1	CS4.3.4.	1	CS4.3.4.	1	CS4.3.4.	2	CS4.3.4.	1	CS4.3.4.	1	CS4.3.4.		1	CS4.3.4.

Table 5.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 5 Science, Form Winter 2005

42	1	CS4.3.2.	1	CS4.3.2.	1	CS4.3.2.	2	CS4.3.2.	1	CS4.3.2.	1	CS4.3.1.	1	CS4.3.2.	1	CS4.3.2.		1	CS4.3.2.
43	1	CS4.3.2.	2	CS4.3.2.	2	CS4.3.2.	2	CS4.3.2.	2	CS4.3.2.	2	CS4.3.2.	2	CS4.3.2.	2	CS4.3.2.		2	CS4.3.2.
44	1	CS4.3.4.	1	CS4.3.4.	1	CS4.3.4.	1	CS4.3.4.	1	CS4.3.4.	1	CS4.3.4.	1	CS4.3.4.	1	CS4.3.4.		1	CS4.3.4.
45	2	CS4.1.1.	1	CS4.3.3.	2	CS4.3.3.	1	CS4.3.3.	1	CS4.3.3.	1	CS4.1.1.	1	CS4.3.3.	1	CS4.3.3.		2	CS4.3.3.
46	1	CS4.4.2.	2	CS4.4.1.	1	CS4.4.1.	2	CS4.4.1.	1	CS4.4.1.	2	CS4.4.1.	1	CS4.4.1.	2	CS4.4.1.		1	CS4.4.1.
47																			
48	2	CS4.4.4.	2	CS4.4.4.	2	CS4.4.4.	2	CS4.4.4.	2	CS4.4.4.	2	CS4.4.4.	1	CS4.4.4.	2	CS4.4.4.		2	CS4.4.4.
49	1	CS4.4.3.	2	CS4.4.3.	1	CS4.4.3.	2	CS4.4.3.	1	CS4.4.3.	2	CS4.4.3.	1	CS4.4.3.	2	CS4.4.3.		1	CS4.4.3.
50	1	CS4.4.1.	2	CS4.4.2.	1	CS4.4.1.	2	CS4.4.2.	2	CS4.4.1.	2	CS4.4.1.	1	CS4.4.1.	2	CS4.4.2.	CS4.4.1.	2	CS4.4.2.
51	1	CS4.4.2.	1	CS4.4.2.	1	CS4.4.2.	1	CS4.4.2.	1	CS4.4.2.	1	CS4.4.2.	1	CS4.4.2.	1	CS4.4.2.		1	CS4.4.2.

Pairwise Comparison: 0.7129
Standard Pairwise Comparison: 0.9083

Table 5.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 5 Science, Form Winter 2005

Low		Medium		High
0		7.529412		10

1	CS1.6	CS1.6	CS1.6	CS1.6	CS1.6	CS1.6	CS1.6	CS1.6	CS1.6	
2	CS5.1.2.	CS5.1.2.	CS5.1.3.	CS5.1.4.	CS5.1.4.	CS5.1.4.	CS5.1.4.	CS5.1.4.	CS5.1.4.	
3	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	
4	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.2.	
5	CS3.4.1.	CS3.4.1.	CS3.4.1.	CS3.4.1.	CS3.4.1.	CS3.4.1.	CS3.4.1.	CS5.1.4.	CS5.1.4.	
6	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	
7										
8	CS1.2.	CS5.1.4.	CS5.1.4.	CS5.3.1.1	CS5.4.	CS5.4.	CS5.4.1.	CS5.4.2		
9	CS5.1.2.	CS5.1.4.	CS5.4.1.	CS5.4.2	CS5.4.2	CS5.4.2	CS5.4.2	CS5.4.2	CS5.4.2	
10	CS5.1.4.	CS5.4.	CS5.4.2	CS5.4.2	CS5.4.2	CS5.4.2	CS5.4.2	CS5.4.2	CS5.4.2	
11	CS5.1.4.	CS5.4.1.	CS5.4.1.	CS5.4.1.	CS5.4.1.	CS5.4.1.	CS5.4.1.	CS5.4.1.	CS5.4.2	
12	CS1.5.	CS1.6	CS1.6	CS1.6	CS1.6	CS1.6	CS1.6	CS1.6	CS1.6	CS3.2.4.
13	CS3.2.4.	CS3.2.5.	CS3.2.5.	CS3.2.5.	CS3.2.5.	CS3.2.5.	CS3.4.2.	CS3.4.2.	CS3.4.2.	
14	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.5.	CS3.2.5.	CS3.2.5.	CS3.2.5.	CS3.2.5.	CS3.2.5.	
15	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	
16	CS1.5.	CS1.5.	CS1.5.	CS3.2.4.	CS3.5.2.	CS3.5.2.	CS3.5.2.	CS3.5.2.	CS3.5.3.	CS3.5.3.
17	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.4.	
18	CS3.2.5.	CS3.2.5.	CS3.2.5.	CS3.2.5.	CS3.2.5.	CS3.2.5.	CS3.2.5.	CS3.2.5.	CS3.2.5.	
19	CS3.2.4.	CS3.2.4.	CS3.2.4.	CS3.2.4.	CS3.2.4.	CS3.2.4.	CS3.2.5.	CS3.5.2.	CS3.5.3.	

Table 5.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 5 Science, Form Winter 2005

20	CS3.2.5.	CS3.2.5.	CS3.2.5.	CS3.2.5.	CS3.2.5.	CS3.2.5.	CS3.2.5.	CS3.2.5.	CS3.2.5.	
21	CS3.2.5.	CS3.5.	CS3.5.3.							
22										
23	CS1.5.	CS1.5.	CS1.5.	CS1.5.	CS1.5.	CS1.5.	CS3.2.3.	CS3.2.3.	CS3.2.3.	
24	CS1.3.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	CS1.4.	
25	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS5.1.	
26										
27	CS4.1.3.	CS4.1.3.	CS4.1.3.	CS4.1.3.	CS4.1.3.	CS4.1.3.	CS4.1.3.	CS4.1.3.	CS4.1.3.	
28	CS4.2.1.	CS5.2.1.	CS5.2.1.	CS5.2.1.	CS5.2.1.	CS5.2.1.	CS5.2.1.	CS5.2.1.	CS5.2.1.	
29	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.3.	
30	CS1.2.	CS1.2.	CS1.2.	CS4.1.4.	CS4.1.4.	CS4.1.4.	CS4.1.4.	CS4.1.4.	CS4.1.4.	
31	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.3.	CS3.2.4.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.2.
32										
33										
34										
35										
36	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	
37	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.2.	CS3.5.3.	
38	CS3.5.4.	CS3.5.4.	CS3.5.4.	CS3.5.4.	CS3.5.4.	CS3.5.4.	CS3.5.4.	CS3.5.4.	CS3.5.4.	
39	CS3.5.4.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	CS5.1.6.	
40	CS4.3.1.	CS4.3.1.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	
41	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	
42	CS4.3.1.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	
43	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	

Table 5.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 5 Science, Form Winter 2005

44	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.4.	
45	CS4.1.1.	CS4.1.1.	CS4.3.3.	CS4.3.3.	CS4.3.3.	CS4.3.3.	CS4.3.3.	CS4.3.3.	CS4.3.3.	
46	CS4.4.1.	CS4.4.1.	CS4.4.1.	CS4.4.1.	CS4.4.1.	CS4.4.1.	CS4.4.1.	CS4.4.1.	CS4.4.2.	
47										
48	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	
49	CS4.4.3.	CS4.4.3.	CS4.4.3.	CS4.4.3.	CS4.4.3.	CS4.4.3.	CS4.4.3.	CS4.4.3.	CS4.4.3.	
50	CS4.4.1.	CS4.4.1.	CS4.4.1.	CS4.4.1.	CS4.4.1.	CS4.4.1.	CS4.4.2.	CS4.4.2.	CS4.4.2.	CS4.4.2.
51	CS4.4.2.	CS4.4.2.	CS4.4.2.	CS4.4.2.	CS4.4.2.	CS4.4.2.	CS4.4.2.	CS4.4.2.	CS4.4.2.	

Table 5.10
Items Coded by Reviewers to Each Objective
Michigan Grade 5 Science, Form Winter 2005

Low		Medium		High
0		5.333333		31

I																				
CS1.1.																				
CS1.2.	8	30	30	30																
CS1.3.	24																			
CS1.4.	6	6	6	6	6	6	6	6	6	24	24	24	24	24	24	24	24			
CS1.5.	12	16	16	16	23	23	23	23	23	23										
CS1.6	1	1	1	1	1	1	1	1	1	12	12	12	12	12	12	12	12			
II																				
CS2.1.																				
CS2.2.																				
CS2.3.																				
CS2.4.																				
CS2.5.																				
III																				
CS3.1.																				
CS3.2.																				
CS3.2.1.																				
CS3.2.2.																				
CS3.2.3.	14	14	14	17	17	17	17	17	17	17	17	23	23	23	29	29	29	29	29	29
	29	29	29	31	31	31	31													
CS3.2.4.	12	13	16	17	19	19	19	19	19	19	31									
CS3.	13	13	13	13	13	14	14	14	14	14	14	18	18	18	18	18	18	18	18	18

Table 5.10
Items Coded by Reviewers to Each Objective
Michigan Grade 5 Science, Form Winter 2005

2.5.																				
	19	20	20	20	20	20	20	20	20	20	21									
CS3.3.																				
CS3.3.1.																				
CS3.4.																				
CS3.4.1.	5	5	5	5	5	5	5													
CS3.4.2.	13	13	13																	
CS3.5.	21																			
CS3.5.1.	25	25	25	25	25	25	25	25	31	31	31	31	37	37	37	37	37	37	37	
CS3.5.2.	16	16	16	16	19	31	37													
CS3.5.3.	16	16	19	21	37															
CS3.5.4.	38	38	38	38	38	38	38	38	38	39										
IV																				
CS4.1.																				
CS4.1.1.	45	45																		
CS4.1.2.																				
CS4.1.3.	27	27	27	27	27	27	27	27	27											
CS4.1.4.	30	30	30	30	30	30														
CS4.1.5.																				
CS4.2																				
CS4.2.1.	28																			
CS4.2.2.																				
CS4.3.																				

Table 5.10
Items Coded by Reviewers to Each Objective
Michigan Grade 5 Science, Form Winter 2005

CS4.3.1.	40	40	42																	
CS4.3.2.	40	40	40	40	40	40	40	42	42	42	42	42	42	42	42	43	43	43	43	43
	43	43	43	43																
CS4.3.3.	45	45	45	45	45	45	45													
CS4.3.4.	41	41	41	41	41	41	41	41	41	44	44	44	44	44	44	44	44	44		
CS4.3.5.																				
CS4.4.																				
CS4.4.1.	46	46	46	46	46	46	46	46	50	50	50	50	50	50						
CS4.4.2.	46	50	50	50	50	51	51	51	51	51	51	51	51	51						
CS4.4.3.	49	49	49	49	49	49	49	49	49											
CS4.4.4.	48	48	48	48	48	48	48	48	48											
V																				
CS5.1.	25																			
CS5.1.1.	4	4	4	4	4	4	4	4												
CS5.1.2.	2	2	4	9																
CS5.1.3.	2	3	3	3	3	3	3	3	3	3										
CS5.1.4.	2	2	2	2	2	2	5	5	8	8	9	10	11							
CS5.1.5.																				
CS5.1.6.	15	15	15	15	15	15	15	15	15	36	36	36	36	36	36	36	36	36	39	39
	39	39	39	39	39	39														
CS5.2.																				
CS5.2.1.	28	28	28	28	28	28	28	28												
CS5.2.2.																				

Table 5.10
Items Coded by Reviewers to Each Objective
Michigan Grade 5 Science, Form Winter 2005

CS5.2.3.															
CS5.3.															
CS5.3.1.1	8														
CS5.3.1.2.															
CS5.3.1.3.															
CS5.4.	8	8	10												
CS5.4.1.	8	9	11	11	11	11	11	11	11						
CS5.4.2	8	9	9	9	9	9	9	10	10	10	10	10	10	10	11

Table 5.11

Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 5 Science, Form Winter 2005

Low		Medium		High
1		4		9

I						
CS1. 1.						
CS1. 2.	8:1	30:3				
CS1. 3.	24:1					
CS1. 4.	6:9	24:8				
CS1. 5.	12:1	16:3	23:6			
CS1. 6	1:9	12:8				
II						
CS2. 1.						
CS2. 2.						
CS2. 3.						
CS2. 4.						
CS2. 5.						
III						
CS3. 1.						
CS3. 2.						
CS3. 2.1.						
CS3. 2.2.						
CS3. 2.3.	14:3	17:8	23:3	29:9	31:4	
CS3. 2.4.	12:1	13:1	16:1	17:1	19:6	31:1
CS3. 2.5.	13:5	14:6	18:9	19:1	20:9	21:1

Table 5.11

Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)

Michigan Grade 5 Science, Form Winter 2005

CS3.3.				
CS3.3.1.				
CS3.4.				
CS3.4.1.	5:7			
CS3.4.2.	13:3			
CS3.5.	21:1			
CS3.5.1.	25:8	31:4	37:7	
CS3.5.2.	16:4	19:1	31:1	37:1
CS3.5.3.	16:2	19:1	21:1	37:1
CS3.5.4.	38:9	39:1		
IV				
CS4.1.				
CS4.1.1.	45:2			
CS4.1.2.				
CS4.1.3.	27:9			
CS4.1.4.	30:6			
CS4.1.5.				
CS4.2				
CS4.2.1.	28:1			
CS4.2.2.				
CS4.3.				
CS4.3.1.	40:2	42:1		

Table 5.11

Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)

Michigan Grade 5 Science, Form Winter 2005

CS4.3.2.	40:7	42:8	43:9			
CS4.3.3.	45:7					
CS4.3.4.	41:9	44:9				
CS4.3.5.						
CS4.4.						
CS4.4.1.	46:8	50:6				
CS4.4.2.	46:1	50:4	51:9			
CS4.4.3.	49:9					
CS4.4.4.	48:9					
V						
CS5.1.	25:1					
CS5.1.1.	4:8					
CS5.1.2.	2:2	4:1	9:1			
CS5.1.3.	2:1	3:9				
CS5.1.4.	2:6	5:2	8:2	9:1	10:1	11:1
CS5.1.5.						
CS5.1.6.	15:9	36:9	39:8			
CS5.2.						
CS5.2.1.	28:8					
CS5.2.2.						
CS5.2.3.						
CS5.3.						

Table 5.11

Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 5 Science, Form Winter 2005

CS5.3.1.1	8:1			
CS5.3.1.2.				
CS5.3.1.3.				
CS5.4.	8:2	10:1		
CS5.4.1.	8:1	9:1	11:7	
CS5.4.2	8:1	9:6	10:7	11:1

Table 5.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 5 Science, Form Winter 2005

Low DOK		Matched DOK		High DOK
1		4		9

I [2]:			
CS1.1. [2]:			
CS1.2. [3]:	8:1[2]	30:3 [1.67]	
CS1.3. [1]:	24:1 [1]		
CS1.4. [1]:	6:9[1]	24:8 [1]	
CS1.5. [2]:	12:1 [2]	16:3 [2]	23:6 [1.5]
CS1.6 [2]:	1:9[1.89]	12:8 [1.88]	
II [2]:			
CS2.1. [2]:			
CS2.2. [2]:			
CS2.3. [1]:			
CS2.4. [2]:			
CS2.5. [1]:			
III			

Table 5.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 5 Science, Form Winter 2005

[2]:						
CS3.1.[1]:						
CS3.2.[1]:						
CS3.2.1.[1]:						
CS3.2.2.[2]:						
CS3.2.3.[1]:	14:3 [1]	17:8 [1]	23:3 [1.33]	29:9 [2.11]	31:4 [1.5]	
CS3.2.4.[2]:	12:1 [2]	13:1 [2]	16:1 [2]	17:1 [1]	19:6 [1.17]	31:1 [1]
CS3.2.5.[1]:	13:5 [1.2]	14:6 [1.33]	18:9 [1]	19:1 [1]	20:9 [1]	21:1 [2]
CS3.3.[2]:						
CS3.3.1.[2]:						
CS3.4.[2]:						
CS3.4.1.[2]:	5:7[1.43]					
CS3.4.2.[1]:	13:3 [1.33]					
CS3.5.[2]:	21:1 [1]					
CS3.5.1.[2]:	25:8 [1]	31:4 [2]	37:7 [1]			

Table 5.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 5 Science, Form Winter 2005

CS3.5.2.[1]:	16:4 [2]	19:1 [1]	31:1 [2]	37:1 [1]
CS3.5.3.[3]:	16:2 [2]	19:1 [1]	21:1 [2]	37:1 [1]
CS3.5.4.[2]:	38:9 [1.33]	39:1 [1]		
IV [2]:				
CS4.1.[1]:				
CS4.1.1.[2]:	45:2 [1.5]			
CS4.1.2.[2]:				
CS4.1.3.[1]:	27:9 [2]			
CS4.1.4.[1]:	30:6 [1.33]			
CS4.1.5.[1]:				
CS4.2[2]:				
CS4.2.1.[1]:	28:1 [1]			
CS4.2.2.[2]:				
CS4.3.[2]:				
CS4.3.1.	40:2 [2]	42:1 [1]		

Table 5.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 5 Science, Form Winter 2005

[2]:						
CS4.3.2.[2]:	40:7[1.86]	42:8[1.12]	43:9[1.89]			
CS4.3.3.[1]:	45:7[1.29]					
CS4.3.4.[2]:	41:9[1.22]	44:9[1]				
CS4.3.5.[2]:						
CS4.4.[1]:						
CS4.4.1.[1]:	46:8[1.5]	50:6[1.5]				
CS4.4.2.[1]:	46:1[1]	50:4[2]	51:9[1]			
CS4.4.3.[1]:	49:9[1.44]					
CS4.4.4.[2]:	48:9[1.89]					
V[1]:						
CS5.1.[2]:	25:1[1]					
CS5.1.1.[1]:	4:8[1]					
CS5.1.2.[2]:	2:2[1.5]	4:1[1]	9:1[1]			
CS5.1.3.[1]:	2:1[1]	3:9[1.56]				
CS5.	2:6[	5:2[	8:2[	9:1[	10:1	11:1

Table 5.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 5 Science, Form Winter 2005

1.4. [2]:	1]	1.5]	1]	1]	[1]	[1]
CS5. 1.5. [1]:						
CS5. 1.6. [2]:	15:9 [1.67]	36:9 [1.44]	39:8 [1.38]			
CS5. 2. [1]:						
CS5. 2.1. [1]:	28:8 [1]					
CS5. 2.2. [1]:						
CS5. 2.3. [1]:						
CS5. 3. [1]:						
CS5. 3.1.1 [1]:	8:1[2]					
CS5. 3.1.2. [1]:						
CS5. 3.1.3. [1]:						
CS5. 4. [2]:	8:2[1.5]	10:1 [1]				
CS5. 4.1. [2]:	8:1[2]	9:1[1]	11:7 [1.57]			
CS5. 4.2 [2]:	8:1[2]	9:6[1]	10:7 [1.57]	11:1 [1]		

Table 8.1
Categorical Concurrence Between Standards and Assessment as Rated by Four Reviewers
Michigan Grade 8 Science, Form Winter 2004
Number of Assessment Items - 50

Standards			Level by Objective			Hits		Cat. Concurr.
Title	Goals #	Objs #	Level	# of objs by Level	% w/in std by Level	Mean	S.D.	
I - Constructing New Scientific Knowledge	6	6	1 2 3	2 3 1	33 50 16	11.5	1.5	YES
II - Reflecting on Scientific Knowledge	6	6	1 2 3	2 3 1	33 50 16	1.25	0.43	NO
III - Using Life Science Knowledge	5	16.25	1 2	8 8	50 50	16.25	0.43	YES
IV - Using Physical Science Knowledge	4	21	1 2	9 12	42 57	8.5	0.5	YES
V - Using Earth Science Knowledge	4	16.25	1 2	6 10	37 62	13.5	1.66	YES
Total	25	65.5	1 2 3	27 36 2	41 55 3	51	1	

Table 8.2

Depth-of-Knowledge Consistency Between Standards and Assessment as Rated by Four Reviewers

Michigan Grade 8 Science, Form Winter 2004

Number of Assessment Items - 50

Standards			Hits		Level of Item w.r.t. Standard						DOK Consistency
					% Under		% At		% Above		
Title	Goals #	Objs #	M	S.D.	M	S.D.	M	S.D.	M	S.D.	
I - Constructing New Scientific Knowledge	6	6	11.5	1.5	35	42	52	42	13	31	YES
II - Reflecting on Scientific Knowledge	6	6	1.25	0.43	62	41	38	41	0	0	NO
III - Using Life Science Knowledge	5	16.25	16.25	0.43	20	36	69	36	11	20	YES
IV - Using Physical Science Knowledge	4	21	8.5	0.5	52	49	40	47	8	26	WEAK
V - Using Earth Science Knowledge	4	16.25	13.5	1.66	40	46	49	47	11	31	YES
Total	25	65.5	51	1	37	45	52	45	10	27	

Table 8.3

Range-of-Knowledge Correspondence and Balance of Representation Between Standards and Assessment as Rated by Four Reviewers
Michigan Grade 8 Science, Form Winter 2004
Number of Assessment Items - 50

Standards			Hits		Range of Objectives				Rng. of Know.	Balance Index				Bal. of Represent.
					# Objs Hit		% of Total			% Hits in Std/Ttl Hits		Index		
Title	Goals #	Objs #	Mean	S.D.	Mean	S.D.	Mean	S.D.		Mean	S.D.	Mean	S.D.	
I - Constructing New Scientific Knowledge	6	6	11.5	1.5	5	0.71	83	12	YES	23	3	0.82	0.04	YES
II - Reflecting on Scientific Knowledge	6	6	1.25	0.43	1	0	17	0	NO	2	1	1	0	YES
III - Using Life Science Knowledge	5	16.25	16.25	0.43	8.5	0.5	52	3	YES	32	1	0.78	0.06	YES
IV - Using Physical Science Knowledge	4	21	8.5	0.5	7.5	0.5	36	2	NO	17	1	0.90	0	YES
V - Using Earth Science Knowledge	4	16.25	13.5	1.66	9.5	1.80	59	12	YES	26	3	0.81	0.05	YES
Total	25	65.5	51	1	6.3	3.18	49	24		20	10	0.86	0.09	

Table 8.4
Summary of Attainment of Acceptable Alignment Level on Four Content Focus Criteria as Rated by Four Reviewers
Michigan Grade 8 Science, Form Winter 2004
Number of Assessment Items - 50

Standards	Alignment Criteria			
	Categorical Concurrence	Depth-of-Knowledge Consistency	Range of Knowledge	Balance of Representation
I - Constructing New Scientific Knowledge	YES	YES	YES	YES
II - Reflecting on Scientific Knowledge	NO	NO	NO	YES
III - Using Life Science Knowledge	YES	YES	YES	YES
IV - Using Physical Science Knowledge	YES	WEAK	NO	YES
V - Using Earth Science Knowledge	YES	YES	YES	YES

Table 8.5
Source-of-Challenge Issues by Reviewer
Michigan Grade 8 Science, Form Winter 2004

Item Number	Comments by Reviewer
7	Although the accepted answer is "A: store food", the actual purpose of the corn seed is reproductive in nature. The seed stores food for US, not for the plant.
21	The question should include that the spacecraft is going to Mars.
25	Much (or maybe even most) of the suspended sediment comes from runoff into the river, in addition to the river eroding its own banks. Tn addition, the question asks for the asks for the relationship between speed and suspension, not speed and erosion. Consider either revising question or answers to make them commensurate.

Table 8.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 8 Science, Form Winter 2004

Item	Rater 1	Rater 2	Rater 3	Rater 4
1	1	1	1	1
2	2	2	2	2
3	2	2	1	2
4				
5	1	1	1	1
6	1	1	2	2
7	1	1	2	1
8	1	1	1	1
9	1	1	1	1
10	2	1	2	2
11	1	1	2	2
12	1	1	1	2
13	2	1	2	2
14	1	1	1	1
15	1	2	1	1
16	1	1	2	1
17	2	1	1	1
18	2	1	1	1
19				
20	1	1	1	1
21	2	1	1	2
22	2	1	2	1
23	1	1	1	1
24	2	1	2	2
25	1	2	2	1
26	2	1	2	2
27	1	1	2	2
28	1	2	1	1
29	1	2	1	1
30	2	2	2	2
31	3	2	3	2
32	2	2	2	2
33	2	1	2	2
34	1	1	1	1
35				
36	2	2	1	1
37	1	2	2	1
38				
39				
40				

Table 8.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 8 Science, Form Winter 2004

41				
42	2	1	2	1
43	1	2	2	1
44	2	2	1	1
45	1	1	2	1
46	2	2	2	1
47	2	1	2	1
48	1	1	1	1
49	2	1	1	1
50	1	1	1	1
51	2	2	1	2
52	2	1	1	1
53				
54	1	2	1	1
55	2	1	1	1
56	1	1	1	1
57	1	1	1	1
58	2	2	1	2

Intraclass Correlation: 0.5851
Pairwise Comparison: 0.6067

Table 8.7
Notes by Reviewer
Michigan Grade 8 Science, Form Winter 2004

Item Number	Comments by Reviewer
3	The answers are all oversimplifications. The correct questions is "Is there is a relationship between distance and dance?"
7	Both #7 and #8 have nothing to do with the stem and might confuse the test taker.
14	Not all organisms are based on photosynthesis. Since the discovery of ecosystems first discovered at deep-ocean vents about 30 years ago, the number of communities based on chemo synthesis has grown.
15	Benchmark 3.5.6 doesn't seem like a good fit -- there is a better statement in the elementary benchmarks.
17	This might fit 5.4.1 were it not for the restriction caused by the phrase "in terms of supporting life".
25	1) I chose 5.2.4 even though it isn't clear anywhere that sediment (dirt?) is considered a pollutant. 2) The question seems to be more about the speed of erosion rather than how the speed of moving water affects the amount of suspended material it can hold. 3) Answers A and C say the same thing in different ways. 4) The info. given "for questions 25 through 28" seems unnecessary for this question.
27	The info. given "for questions 25 through 28" seems unnecessary for this question.
52	The question should read, "WHICH OF THE FOLLOWING is the greatest force...?

Table 8.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 8 Science, Form Winter 2004

Item	DOK 0	PObj 0	S1Obj0	S2Obj0	DOK 1	PObj 1	S1Obj1	S2Obj1	DOK 2	PObj 2	S1Obj2	S2Obj2	DOK 3	PObj 3	S1Obj3	S2Obj3
1	1	CS3. 2.4.			1	CS3. 2.4.			1	CS3. 1.2.			1	CS3. 2.4.		
2	2	CS1. 5.			2	CS1. 5.			2	CS3. 2.4.	CS1. 6.		2	CS3. 2.4.		
3	2	CS1. 1.			2	CS1. 1.			1	CS1. 1.			2	CS1. 5.		
4																
5	1	CS3. 5.1.			1	CS3. 5.1.			1	CS3. 5.1.			1	CS3. 5.1.		
6	1	CS3. 5.2.			1	CS3. 2.3.			2	CS3. 5.2.			2	CS3. 5.2.		
7	1	CS3. 1.2.			1	CS3. 2.3.			2	CS3. 1.2.			1	CS3. 2.3.		
8	1	CS3. 2.2.			1	CS3. 2.2.			1	CS3. 2.2.			1	CS3. 2.2.		
9	1	CS1. 5.			1	CS1. 5.			1	CS1. 6.			1	CS1. 5.		
10	2	CS3. 5.3.			1	CS3. 5.1.			2	CS3. 5.1.			2	CS1. 5.		
11	1	CS3. 5.3.			1	CS3. 5.3.			2	CS3. 5.3.			2	CS1. 5.		
12	1	CS3. 5.1.			1	CS3. 5.1.			1	CS3. 2.4.			2	CS3. 5.1.		
13	2	CS3. 5.3.			1	CS3. 5.			2	CS3. 4.2.			2	CS3. 5.1.		
14	1	CS3. 5.2.			1	CS3. 5.2.			1	CS3. 5.2.			1	CS3. 5.2.		
15	1	CS3. 5.6.			2	CS3. 5.6.			1	CS3. 5.6.			1	CS3. 5.6.		
16	1	CS5. 4.3.			1	CS5. 4.3.			2	CS5. 4.2.			1	CS5. 4.3.		
17	2	CS5. 4.1.	CS5. 4.3.		1	CS1. 3.			1	CS5. 4.3.			1	CS5. 4.		
18	2	CS5. 3.1.			1	CS1. 3.			1	CS1. 3.			1	CS5. 3.1.		
19																
20	1	CS1. 2.			1	CS1. 2.			1	CS1. 2.			1	CS1. 2.		
21	2	CS5.			1	CS5.			1	CS1.			2	CS4.		

Table 8.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 8 Science, Form Winter 2004

		4.2.				4.2.				5.				3.2.		
22	2	CS5. 4.1.			1	CS5. 4.1.			2	CS5. 4.1.			1	CS5. 4.1.		
23	1	CS3. 5.1.			1	CS3. 5.1.			1	CS3. 5.1.			1	CS3. 5.1.		
24	2	CS3. 4.1.			1	CS3. 3.2.			2	CS3. 4.2.			2	CS3. 4.2.		
25	1	CS5. 1.3.			2	CS5. 1.3.			2	CS5. 1.3.			1	CS5. 2.4.		
26	2	CS5. 2.2.			1	CS5. 2.2.			2	CS5. 1.3.			2	CS5. 2.2.		
27	1	CS5. 1.3.			1	CS5. 1.3.			2	CS5. 1.4.			2	CS5. 1.3.		
28	1	CS5. 2.4.			2	CS3. 5.6.			1	CS5. 1.5.			1	CS3. 5.6.		
29	1	CS5. 1.3.			2	CS4. 2.2.			1	CS5. 1.2.			1	CS5. 1.3.		
30	2	CS2. 1.			2	CS1. 5.			2	CS1. 5.			2	CS1. 5.		
31	3	CS2. 1.			2	CS2. 1.			3	CS2. 1.			2	CS2. 1.		
32	2	CS3. 4.1.			2	CS1. 1.			2	CS5. 1.4.			2	CS3. 4.1.		
33	2	CS3. 5.6.			1	CS3. 5.6.			2	CS3. 5.6.			2	CS3. 5.6.		
34	1	CS3. 5.2.			1	CS3. 2.3.			1	CS3. 2.3.			1	CS3. 5.2.		
35																
36	2	CS4. 3.1.			2	CS4. 3.1.			1	CS4. 3.2.			1	CS4. 3.1.		
37	1	CS5. 3.1.			2	CS5. 3.1.			2	CS4. 3.1.			1	CS5. 3.1.		
38																
39																
40																
41																
42	2	CS5. 2.1.			1	CS5. 2.2.			2	CS5. 2.2.			1	CS5. 2.2.		
43	1	CS5. 3.1.			2	CS5. 3.1.			2	CS5. 3.2.			1	CS5. 3.1.		

Table 8.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 8 Science, Form Winter 2004

44	2	CS5.1.1.			2	CS5.2.1.			1	CS5.1.1.			1	CS5.2.2.		
45	1	CS5.3.4.			1	CS5.3.4.			2	CS5.3.4.			1	CS3.5.6.		
46	2	CS1.3.			2	CS1.4.			2	CS4.1.2.	CS1.3.		1	CS1.3.		
47	2	CS4.1.2.			1	CS4.1.2.			2	CS1.4.			1	CS1.3.		
48	1	CS1.4.			1	CS1.4.			1	CS4.1.2.			1	CS1.4.		
49	2	CS4.1.2.	CS1.3.		1	CS1.4.			1	CS1.3.			1	CS1.3.		
50	1	CS4.1.3.			1	CS4.1.3.			1	CS4.1.3.			1	CS4.1.3.		
51	2	CS4.1.1			2	CS4.3.2.			1	CS4.1.1			2	CS4.1.1		
52	2	CS4.3.2.			1	CS4.3.5.			1	CS4.3.3.			1	CS4.3.2.		
53																
54	1	CS4.2.2.			2	CS4.2.2.			1	CS4.2.2.			1	CS4.2.2.		
55	2	CS4.2.1.			1	CS5.3.3.			1	CS5.3.3.			1	CS4.2.1.		
56	1	CS1.2.			1	CS1.2.			1	CS1.1.			1	CS1.2.		
57	1	CS4.1.6.			1	CS4.1.6.			1	CS4.1.6.			1	CS4.1.5.		
58	2	CS1.5.			2	CS1.5.			1	CS1.5.			2	CS1.5.		

Pairwise Comparison: 0.5167
Standard Pairwise Comparison: 0.8117

Table 8.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 8 Science, Form Winter 2004

Low		Medium		High
0		3.517241		5

1	CS3. 1.2.	CS3. 2.4.	CS3. 2.4.	CS3. 2.4.	
2	CS1. 5.	CS1. 5.	CS1. 6.	CS3. 2.4.	CS3. 2.4.
3	CS1. 1.	CS1. 1.	CS1. 1.	CS1. 5.	
4					
5	CS3. 5.1.	CS3. 5.1.	CS3. 5.1.	CS3. 5.1.	
6	CS3. 2.3.	CS3. 5.2.	CS3. 5.2.	CS3. 5.2.	
7	CS3. 1.2.	CS3. 1.2.	CS3. 2.3.	CS3. 2.3.	
8	CS3. 2.2.	CS3. 2.2.	CS3. 2.2.	CS3. 2.2.	
9	CS1. 5.	CS1. 5.	CS1. 5.	CS1. 6.	
10	CS1. 5.	CS3. 5.1.	CS3. 5.1.	CS3. 5.3.	
11	CS1. 5.	CS3. 5.3.	CS3. 5.3.	CS3. 5.3.	
12	CS3. 2.4.	CS3. 5.1.	CS3. 5.1.	CS3. 5.1.	
13	CS3. 4.2.	CS3. 5.	CS3. 5.1.	CS3. 5.3.	
14	CS3. 5.2.	CS3. 5.2.	CS3. 5.2.	CS3. 5.2.	
15	CS3. 5.6.	CS3. 5.6.	CS3. 5.6.	CS3. 5.6.	
16	CS5. 4.2.	CS5. 4.3.	CS5. 4.3.	CS5. 4.3.	
17	CS1. 3.	CS5. 4.	CS5. 4.1.	CS5. 4.3.	CS5. 4.3.
18	CS1. 3.	CS1. 3.	CS5. 3.1.	CS5. 3.1.	
19					
20	CS1. 2.	CS1. 2.	CS1. 2.	CS1. 2.	
21	CS1.	CS4.	CS5.	CS5.	

Table 8.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 8 Science, Form Winter 2004

	5.	3.2.	4.2.	4.2.
22	CS5. 4.1.	CS5. 4.1.	CS5. 4.1.	CS5. 4.1.
23	CS3. 5.1.	CS3. 5.1.	CS3. 5.1.	CS3. 5.1.
24	CS3. 3.2.	CS3. 4.1.	CS3. 4.2.	CS3. 4.2.
25	CS5. 1.3.	CS5. 1.3.	CS5. 1.3.	CS5. 2.4.
26	CS5. 1.3.	CS5. 2.2.	CS5. 2.2.	CS5. 2.2.
27	CS5. 1.3.	CS5. 1.3.	CS5. 1.3.	CS5. 1.4.
28	CS3. 5.6.	CS3. 5.6.	CS5. 1.5.	CS5. 2.4.
29	CS4. 2.2.	CS5. 1.2.	CS5. 1.3.	CS5. 1.3.
30	CS1. 5.	CS1. 5.	CS1. 5.	CS2. 1.
31	CS2. 1.	CS2. 1.	CS2. 1.	CS2. 1.
32	CS1. 1.	CS3. 4.1.	CS3. 4.1.	CS5. 1.4.
33	CS3. 5.6.	CS3. 5.6.	CS3. 5.6.	CS3. 5.6.
34	CS3. 2.3.	CS3. 2.3.	CS3. 5.2.	CS3. 5.2.
35				
36	CS4. 3.1.	CS4. 3.1.	CS4. 3.1.	CS4. 3.2.
37	CS4. 3.1.	CS5. 3.1.	CS5. 3.1.	CS5. 3.1.
38				
39				
40				
41				
42	CS5. 2.1.	CS5. 2.2.	CS5. 2.2.	CS5. 2.2.
43	CS5. 3.1.	CS5. 3.1.	CS5. 3.1.	CS5. 3.2.
44	CS5. 1.1.	CS5. 1.1.	CS5. 2.1.	CS5. 2.2.
45	CS3.	CS5.	CS5.	CS5.

Table 8.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 8 Science, Form Winter 2004

	5.6.	3.4.	3.4.	3.4.	
46	CS1.3.	CS1.3.	CS1.3.	CS1.4.	CS4.1.2.
47	CS1.3.	CS1.4.	CS4.1.2.	CS4.1.2.	
48	CS1.4.	CS1.4.	CS1.4.	CS4.1.2.	
49	CS1.3.	CS1.3.	CS1.3.	CS1.4.	CS4.1.2.
50	CS4.1.3.	CS4.1.3.	CS4.1.3.	CS4.1.3.	
51	CS4.1.1	CS4.1.1	CS4.1.1	CS4.3.2.	
52	CS4.3.2.	CS4.3.2.	CS4.3.3.	CS4.3.5.	
53					
54	CS4.2.2.	CS4.2.2.	CS4.2.2.	CS4.2.2.	
55	CS4.2.1.	CS4.2.1.	CS5.3.3.	CS5.3.3.	
56	CS1.1.	CS1.2.	CS1.2.	CS1.2.	
57	CS4.1.5.	CS4.1.6.	CS4.1.6.	CS4.1.6.	
58	CS1.5.	CS1.5.	CS1.5.	CS1.5.	

Table 8.10
Items Coded by Reviewers to Each Objective
Michigan Grade 8 Science, Form Winter 2004

Low		Medium		High
0		2.428571		16

I																
CS1.1.	3	3	3	32	56											
CS1.2.	20	20	20	20	56	56	56									
CS1.3.	17	18	18	46	46	46	47	49	49	49						
CS1.4.	46	47	48	48	48	49										
CS1.5.	2	2	3	9	9	9	10	11	21	30	30	30	58	58	58	58
CS1.6.	2	9														
II																
CS2.1.	30	31	31	31	31											
CS2.2.																
CS2.3.																
CS2.4.																
CS2.5.																
CS2.6.																
III																
CS3.1.																
CS3.1.1.																
CS3.1.2.	1	7	7													
CS3.2.																
CS3.2.1.																
CS3.2.2.	8	8	8	8												

Table 8.10
Items Coded by Reviewers to Each Objective
Michigan Grade 8 Science, Form Winter 2004

CS3.2.3.	6	7	7	34	34									
CS3.2.4.	1	1	1	2	2	12								
CS3.3.														
CS3.3.1														
CS3.3.2.	24													
CS3.4.														
CS3.4.1.	24	32	32											
CS3.4.2.	13	24	24											
CS3.5.	13													
CS3.5.1.	5	5	5	5	10	10	12	12	12	13	23	23	23	23
CS3.5.2.	6	6	6	14	14	14	14	34	34					
CS3.5.3.	10	11	11	11	13									
CS3.5.4.														
CS3.5.5.														
CS3.5.6.	15	15	15	15	28	28	33	33	33	33	45			
IV														
CS4.1.														
CS4.1.1	51	51	51											
CS4.1.2.	46	47	47	48	49									
CS4.1.3.	50	50	50	50										
CS4.1.4.														
CS4.1.5.	57													

Table 8.10
Items Coded by Reviewers to Each Objective
Michigan Grade 8 Science, Form Winter 2004

CS4.1.6.	57	57	57		
CS4.2.					
CS4.2.1.	55	55			
CS4.2.2.	29	54	54	54	54
CS4.2.3.					
CS4.2.4.					
CS4.3.					
CS4.3.1.	36	36	36	37	
CS4.3.2.	21	36	51	52	52
CS4.3.3.	52				
CS4.3.4.					
CS4.3.5.	52				
CS4.4.					
CS4.4.1.					
CS4.4.2.					
CS4.4.3.					
CS4.4.4.					
CS4.4.5.					
CS4.4.6.					
V					
CS5.1.					
CS5.1.1.	44	44			

Table 8.10
Items Coded by Reviewers to Each Objective
Michigan Grade 8 Science, Form Winter 2004

CS5.1.2.	29								
CS5.1.3.	25	25	25	26	27	27	27	29	29
CS5.1.4.	27	32							
CS5.1.5.	28								
CS5.2.									
CS5.2.1.	42	44							
CS5.2.2.	26	26	26	42	42	42	44		
CS5.2.3.									
CS5.2.4.	25	28							
CS5.3.									
CS5.3.1.	18	18	37	37	37	43	43	43	
CS5.3.2.	43								
CS5.3.3.	55	55							
CS5.3.4.	45	45	45						
CS5.4.	17								
CS5.4.1.	17	22	22	22	22				
CS5.4.2.	16	21	21						
CS5.4.3.	16	16	16	17	17				

Table 8.11

Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)

Michigan Grade 8 Science, Form Winter 2004

Low		Medium		High
1		2		4

I								
CS1.1.	3:3	32:1	56:1					
CS1.2.	20:4	56:3						
CS1.3.	17:1	18:2	46:3	47:1	49:3			
CS1.4.	46:1	47:1	48:3	49:1				
CS1.5.	2:2	3:1	9:3	10:1	11:1	21:1	30:3	58:4
CS1.6.	2:1	9:1						
II								
CS2.1.	30:1	31:4						
CS2.2.								
CS2.3.								
CS2.4.								
CS2.5.								
CS2.6.								
III								
CS3.1.								
CS3.1.1.								
CS3.1.2.	1:1	7:2						
CS3.2.								
CS3.2.1.								
CS3.2.2.	8:4							

Table 8.11

Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 8 Science, Form Winter 2004

CS3.2.3.	6:1	7:2	34:2		
CS3.2.4.	1:3	2:2	12:1		
CS3.3.					
CS3.3.1					
CS3.3.2.	24:1				
CS3.4.					
CS3.4.1.	24:1	32:2			
CS3.4.2.	13:1	24:2			
CS3.5.	13:1				
CS3.5.1.	5:4	10:2	12:3	13:1	23:4
CS3.5.2.	6:3	14:4	34:2		
CS3.5.3.	10:1	11:3	13:1		
CS3.5.4.					
CS3.5.5.					
CS3.5.6.	15:4	28:2	33:4	45:1	
IV					
CS4.1.					
CS4.1.1	51:3				
CS4.1.2.	46:1	47:2	48:1	49:1	
CS4.1.3.	50:4				
CS4.1.4.					
CS4.1.5.	57:1				

Table 8.11

Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 8 Science, Form Winter 2004

CS4.1.6.	57:3			
CS4.2.				
CS4.2.1.	55:2			
CS4.2.2.	29:1	54:4		
CS4.2.3.				
CS4.2.4.				
CS4.3.				
CS4.3.1.	36:3	37:1		
CS4.3.2.	21:1	36:1	51:1	52:2
CS4.3.3.	52:1			
CS4.3.4.				
CS4.3.5.	52:1			
CS4.4.				
CS4.4.1.				
CS4.4.2.				
CS4.4.3.				
CS4.4.4.				
CS4.4.5.				
CS4.4.6.				
V				
CS5.1.				
CS5.1.1.	44:2			

Table 8.11

Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 8 Science, Form Winter 2004

CS5.1.2.	29:1			
CS5.1.3.	25:3	26:1	27:3	29:2
CS5.1.4.	27:1	32:1		
CS5.1.5.	28:1			
CS5.2.				
CS5.2.1.	42:1	44:1		
CS5.2.2.	26:3	42:3	44:1	
CS5.2.3.				
CS5.2.4.	25:1	28:1		
CS5.3.				
CS5.3.1.	18:2	37:3	43:3	
CS5.3.2.	43:1			
CS5.3.3.	55:2			
CS5.3.4.	45:3			
CS5.4.	17:1			
CS5.4.1.	17:1	22:4		
CS5.4.2.	16:1	21:2		
CS5.4.3.	16:3	17:2		

Table 8.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 8 Science, Form Winter 2004

Low DOK		Matched DOK		High DOK
1		2		4

I [2]:								
CS1.1. [2]:	3:3[1.67]	32:1 [2]	56:1 [1]					
CS1.2. [3]:	20:4 [1]	56:3 [1]						
CS1.3. [1]:	17:1 [1]	18:2 [1]	46:3 [1.67]	47:1 [1]	49:3 [1.33]			
CS1.4. [1]:	46:1 [2]	47:1 [2]	48:3 [1]	49:1 [1]				
CS1.5. [2]:	2:2[2]	3:1[2]	9:3[1]	10:1 [2]	11:1 [2]	21:1 [1]	30:3 [2]	58:4 [1.75]
CS1.6. [2]:	2:1[2]	9:1[1]						
II [2]:								
CS2.1. [3]:	30:1 [2]	31:4 [2.5]						
CS2.2. [2]:								
CS2.3. [2]:								
CS2.4. [1]:								
CS2.5. [2]:								
CS2.								

Table 8.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 8 Science, Form Winter 2004

6. [1]:			
III [2]:			
CS3. 1. [2]:			
CS3. 1.1. [1]:			
CS3. 1.2. [2]:	1:1[1]	7:2[1.5]	
CS3. 2. [2]:			
CS3. 2.1. [2]:			
CS3. 2.2. [1]:	8:4[1]		
CS3. 2.3. [1]:	6:1[1]	7:2[1]	34:2 [1]
CS3. 2.4. [2]:	1:3[1]	2:2[2]	12:1 [1]
CS3. 3. [2]:			
CS3. 3.1 [2]:			
CS3. 3.2. [2]:	24:1 [1]		
CS3. 4. [2]:			
CS3. 4.1. [2]:	24:1 [2]	32:2 [2]	

Table 8.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 8 Science, Form Winter 2004

CS3.4.2.[2]:	13:1 [2]	24:2 [2]			
CS3.5.[1]:	13:1 [1]				
CS3.5.1.[1]:	5:4[1]	10:2 [1.5]	12:3 [1.33]	13:1 [2]	23:4 [1]
CS3.5.2.[1]:	6:3[1.67]	14:4 [1]	34:2 [1]		
CS3.5.3.[2]:	10:1 [2]	11:3 [1.33]	13:1 [2]		
CS3.5.4.[1]:					
CS3.5.5.[1]:					
CS3.5.6.[1]:	15:4 [1.25]	28:2 [1.5]	33:4 [1.75]	45:1 [1]	
IV [2]:					
CS4.1.[2]:					
CS4.1.1[2]:	51:3 [1.67]				
CS4.1.2.[1]:	46:1 [2]	47:2 [1.5]	48:1 [1]	49:1 [2]	
CS4.1.3.[2]:	50:4 [1]				
CS4.1.4.[1]:					
CS4.1.5.	57:1 [1]				

Table 8.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 8 Science, Form Winter 2004

[2]:				
CS4.1.6.[2]:	57:3 [1]			
CS4.2.[2]:				
CS4.2.1.[1]:	55:2 [1.5]			
CS4.2.2.[2]:	29:1 [2]	54:4 [1.25]		
CS4.2.3.[2]:				
CS4.2.4.[1]:				
CS4.3.[2]:				
CS4.3.1.[2]:	36:3 [1.67]	37:1 [2]		
CS4.3.2.[2]:	21:1 [2]	36:1 [1]	51:1 [2]	52:2 [1.5]
CS4.3.3.[1]:	52:1 [1]			
CS4.3.4.[2]:				
CS4.3.5.[2]:	52:1 [1]			
CS4.4.[1]:				
CS4.4.1.[1]:				

Table 8.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 8 Science, Form Winter 2004

CS4.4.2.[1]:				
CS4.4.3.[1]:				
CS4.4.4.[2]:				
CS4.4.5.[1]:				
CS4.4.6.[2]:				
V[2]:				
CS5.1.[2]:				
CS5.1.1.[2]:	44:2 [1.5]			
CS5.1.2.[2]:	29:1 [1]			
CS5.1.3.[2]:	25:3 [1.67]	26:1 [2]	27:3 [1.33]	29:2 [1]
CS5.1.4.[2]:	27:1 [2]	32:1 [2]		
CS5.1.5.[1]:	28:1 [1]			
CS5.2.[1]:				
CS5.2.1.[2]:	42:1 [2]	44:1 [2]		
CS5.2.2.	26:3 [1.6	42:3 [1.3	44:1 [1]	

Table 8.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 8 Science, Form Winter 2004

[1]:	7]	3]	
CS5.2.3.[1]:			
CS5.2.4.[1]:	25:1 [1]	28:1 [1]	
CS5.3.[2]:			
CS5.3.1.[2]:	18:2 [1.5]	37:3 [1.33]	43:3 [1.33]
CS5.3.2.[1]:	43:1 [2]		
CS5.3.3.[2]:	55:2 [1]		
CS5.3.4.[1]:	45:3 [1.33]		
CS5.4.[2]:	17:1 [1]		
CS5.4.1.[2]:	17:1 [2]	22:4 [1.5]	
CS5.4.2.[2]:	16:1 [2]	21:2 [1.5]	
CS5.4.3.[2]:	16:3 [1]	17:2 [1.5]	

Table 8.1
Categorical Concurrence Between Standards and Assessment as Rated by Nine Reviewers
Michigan Grade 8 Science, Form Fall 2005
Number of Assessment Items - 50

Standards			Level by Objective			Hits		Cat. Concurr.
Title	Goals #	Objs #	Level	# of objs by Level	% w/in std by Level	Mean	S.D.	
I - Constructing New Scientific Knowledge	6	6	1 2 3	2 3 1	33 50 16	4.33	1.41	NO
II - Reflecting on Scientific Knowledge	6	6	1 2 3	2 3 1	33 50 16	0.78	0.79	NO
III - Using Life Science Knowledge	5	16.67	1 2	8 8	50 50	18.11	1.91	YES
IV - Using Physical Science Knowledge	4	21.22	1 2	9 12	42 57	13.44	1.17	YES
V - Using Earth Science Knowledge	4	16.44	1 2	6 10	37 62	15	2.21	YES
Total	25	66.33	1 2 3	27 36 2	41 55 3	51.67	2.11	

Table 8.2

Depth-of-Knowledge Consistency Between Standards and Assessment as Rated by Nine Reviewers

Michigan Grade 8 Science, Form Fall 2005

Number of Assessment Items - 50

Standards			Hits		Level of Item w.r.t. Standard						DOK Consistency
					% Under		% At		% Above		
Title	Goals #	Objs #	M	S.D.	M	S.D.	M	S.D.	M	S.D.	
I - Constructing New Scientific Knowledge	6	6	4.33	1.41	51	46	49	46	0	0	WEAK
II - Reflecting on Scientific Knowledge	6	6	0.78	0.79	71	45	29	45	0	0	NO
III - Using Life Science Knowledge	5	16.67	18.11	1.91	20	36	63	38	16	29	YES
IV - Using Physical Science Knowledge	4	21.22	13.44	1.17	46	45	44	44	11	29	YES
V - Using Earth Science Knowledge	4	16.44	15	2.21	34	46	58	46	8	23	YES
Total	25	66.33	51.67	2.11	36	45	54	44	10	26	

Table 8.3

Range-of-Knowledge Correspondence and Balance of Representation Between Standards and Assessment as Rated by Nine Reviewers
Michigan Grade 8 Science, Form Fall 2005
Number of Assessment Items - 50

Standards			Hits		Range of Objectives				Rng. of Know.	Balance Index				Bal. of Represent.
					# Objs Hit		% of Total			% Hits in Std/Ttl Hits		Index		
Title	Goals #	Objs #	Mean	S.D.	Mean	S.D.	Mean	S.D.		Mean	S.D.	Mean	S.D.	
I - Constructing New Scientific Knowledge	6	6	4.33	1.41	2	0.67	33	11	NO	8	3	0.85	0.11	YES
II - Reflecting on Scientific Knowledge	6	6	0.78	0.79	0.78	0.79	13	13	NO	2	2	0.56	0.44	NO
III - Using Life Science Knowledge	5	16.67	18.11	1.91	7.56	1.34	45	8	WEAK	35	3	0.71	0.03	YES
IV - Using Physical Science Knowledge	4	21.22	13.44	1.17	8.89	0.99	42	4	WEAK	26	2	0.80	0.01	YES
V - Using Earth Science Knowledge	4	16.44	15	2.21	9.89	1.10	60	6	YES	29	4	0.76	0.04	YES
Total	25	66.33	51.67	2.11	5.82	3.55	39	14		20	12	0.74	0.10	

Table 8.4
Summary of Attainment of Acceptable Alignment Level on Four Content Focus Criteria as Rated by Nine Reviewers
Michigan Grade 8 Science, Form Fall 2005
Number of Assessment Items - 50

Standards	Alignment Criteria			
	Categorical Concurrence	Depth-of-Knowledge Consistency	Range of Knowledge	Balance of Representation
I - Constructing New Scientific Knowledge	NO	WEAK	NO	YES
II - Reflecting on Scientific Knowledge	NO	NO	NO	NO
III - Using Life Science Knowledge	YES	YES	WEAK	YES
IV - Using Physical Science Knowledge	YES	YES	WEAK	YES
V - Using Earth Science Knowledge	YES	YES	YES	YES

Table 8.5
Source-of-Challenge Issues by Reviewer
Michigan Grade 8 Science, Form Fall 2005

Item Number	Comments by Reviewer
6	Answer code is "D". The correct response should be "A"
6	The keyed answer (D) is incorrect. Correct answer is (A)
6	Answer key has "D" as correct answer. The correct answer is "A".
6	The correct answer for this question is VERY QUESTIONABLE! When we are talking about being environmentally friendly, the best response should be A "purchase only recycled paper products". The correct answer D "use Styrofoam filler to pack boxes instead of old newspaper" does not seem as environmentally friendly. Traditionally, styrofoam, from a students' perspective, is not very biodegradeable. This option seems that it is deliberately "ANTI" environmental. The answer key needs to be change
6	The answer code indicates D as the correct answer when really the answer should be A
6	Answer is incorrect.
6	Wrong answer given in the key! The correct answer is D.
26	If you look directly to the left of the word winnegance, the bank looks flat. Students could very easily arrive at A to be the right answer and not B.
36	None of the answers are correct. Density has no correlation to fragility or elasticity.
36	While B may be the BEST answer, there are many other more correct factors of why this will occur. This will lead many students to guess at a wrong answer. This question will show only best guesses, not accuracy of knowledge.
36	Th fact that the snowball breaks is really not a factor of density.
36	Question the density having anything to do with the snowball.
36	Density of an object doesn't necessrily determine its fragility; a styrofoam ball would not have broken as did the snow ball.
55	The answer depends wholly on what is being measured. It must be stated in the stem.

Table 8.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 8 Science, Form Fall 2005

Item	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6	Rater 7	Rater 8	Rater 9
1	2	1	1	2	1	2	1	1	1
2	1	1	1	1	1	1	1	2	1
3	2	2	1	2	1	2	2	2	2
4	1	2	1	2	1	1	2	1	1
5	2	2	2	2	2	2	2	1	2
6	1	2	1	1	1	2	1	1	1
7	1	2	1	1	1	2	1	1	1
8	1	2	1	2	1	1	2	1	1
9									
10	2	2	1	2	2	2	2	2	2
11	1	1	1	2	1	1	2	1	2
12	1	1	1	1	1	1	1	1	1
13	2	2	2	2	2	2	2	2	2
14	1	2	2	1	1	2	2	2	2
15	1	2	1	2	1	2	1	2	1
16	2	2	1	2	2	1	1	2	2
17	1	2	1	1	1	1	1	1	1
18	1	1	1	1	2	1	1	1	1
19	1	2	2	2	1	1	2	2	1
20	1	2	1	1	1	1	1	1	1
21	2	2	1	1	2	2	2	2	2
22	1	2	1	1	1	1	1	1	2
23	2	2	2	1	1	2	1	2	2
24									
25	2	2	2	2	2	2	2	2	2
26	2	2	2	2	2	2	2	2	2
27	2	2	2	2	2	2	2	2	2
28	2	3	2	2	2	3	2	2	2
29	1	1	1	1	1	1	1	1	1
30	2	2	1	1	2	1	1	2	1
31	1	2	1	2	1	2	1	1	1
32	2	2	2	2	1	2	1	2	1
33	1	2	2	2	1	2	1	1	1
34	2	2	1	2	1	2	1	2	2
35	1	1	1	1	1	1	1	1	1
36	2	2	1	2	2	2	1	2	2
37									
38	2	2	2	2	1	2	2	2	2
39	1	2	2	1	1	1	1	1	2
40	1	1	1	1	1	1	1	1	1
41	2	2	1	2	2	1	2	1	1
42									
43									
44									
45									
46	1	1	1	1	1	1	1	1	1
47	1	2	1	1	1	1	1	1	1
48	1	2	1	2	1	1	1	2	1

Table 8.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 8 Science, Form Fall 2005

49	1	2	1	1	1	1	1	1	1
50	1	2	1	1	1	1	1	1	1
51	1	1	1	1	1	1	1	1	1
52	1	1	1	2	2	1	1	2	2
53	1	2	1	2	1	1	1	1	1
54									
55	2	2	1	2	2	2	1	3	2
56	1	1	1	1	2	2	1	2	1
57	1	2	1	2	2	2	1	2	1
58	2	2	2	2	2	2	2	2	1

Intraclass Correlation: 0.8596
Pairwise Comparison: 0.67

Table 8.7
Notes by Reviewer
Michigan Grade 8 Science, Form Fall 2005

Item Number	Comments by Reviewer
6	This exact question was asked on an elementary exam. Was that intentional?
6	This is an elementary objective
6	This doesn't fit any middle school benchmarks; it fits an elementary benchmark -- and this exact question is on an elementary (grade 5) test.
8	This question's focus is really on adaptation of animals for survival. This does not fit under any of the ecology benchmarks.
11	This question is answered in the reading of the information supplied
11	This item deals with physical characteristics and adaptations of particular species. This is content that is not covered in the middle school standards, but is covered in the elementary standards.
11	This question really aligns with the elementary objective CS.3.2.1.
12	The answer is provided in the information
12	The fact that the reading passage used the word hunter, which is a synonym of predator, may clue students to the answer
12	This item does not seem to fit into any of the more specific standards, so had to be aligned at the strand level.
12	This is an elementary objective
13	Again, this item deals with a specific species characteristics and adaptations allowing it to survive. This relates to an elementary standard, but not clearly to a middle school standard.
14	5.1.4 deals with understanding geologic history, this question deals with environmental history
14	This doesn't seem to fit any benchmark, but it does fit one of the elementary benchmarks.
27	A few more contour lines labeled with altitudes would be helpful for students.
30	This question is really just a recitation of textual information. The students need no prior knowledge of spiders, they can get the answer directly from the text. This aligns with no particular science benchmark, language arts perhaps...
30	This question is answered in the reading passage.
31	This is a 5th grade standard
33	Answer A could also be considered a decent response--although not quite the same as soil erosion, in this case a collapse of the sediment could occur if not reforested. D is the best answer; however A isn't bad....
35	This doesn't fit under 5.2.1 because there is no use of a map, it does not fit under 5.2.2. because there is no direct connection to Michigan. We touch on runoff in the water cycle, but 5.3.3. Objective deals with water in the atmosphere
36	This is a bad question and beyond the comprehension of most 7th grade students
39	This is a better match to an elementary standard

Table 8.7
Notes by Reviewer
Michigan Grade 8 Science, Form Fall 2005

39	This test is OVERSATURATED with Ecosystems. It is already almost overtested at 5th grade.
40	this is a better match to an elementary standard
41	Again, OVERKILL on Ecosystems. An elementary student could answer this question
50	This is an elementary objective
51	This really is just an identification of a simple machine, and is aligned with the elementary objective CS434. The middle school ojbective deals with designing strategies to use simple machines. This question definitely does not deal with any type of design.

Table 8.8

DOK Levels and Objectives Coded by Each Reviewer

Michigan Grade 8 Science, Form Fall 2005

Item	DOK0	PObj0	DOK1	PObj1	S1Obj1	DOK2	PObj2	S1Obj2	DOK3	PObj3	S1Obj3	DOK4	PObj4	S1Obj4	DOK5	PObj5	S1Obj5	S2Obj5	DOK6	PObj6	S1Obj6	DOK7	PObj7	S1Obj7	S2Obj7	DOK8	PObj8
1	2	CS3.5.	1	CS3.5. 3.		1	CS3.5. 1.		2	CS3.5. 3.		1	CS3.5. 6.		2	CS3.5. 3.			1	CS3.5. 1.		1	CS3.5. 4.			1	CS3.5. 4.
2	1	CS3.5. 1.	1	CS3.5. 1.		1	CS3.5. 1.		1	CS3.5. 1.		1	CS3.5. 1.		1	CS3.5. 1.			1	CS3.5. 1.		2	CS3.2. 4.			1	CS3.5. 1.
3	2	CS1.5.	2	CS3.4. 2.		1	CS1.5.		2	CS1.5.		1	CS1.5.		2	CS1.5.			2	CS1.5.		2	CS1.5.			2	CS1.5.
4	1	CS4.1. 1	2	CS4.1. 1		1	CS4.1. 1		2	CS4.1. 1		1	CS4.1. 1		1	CS4.1. 2.			2	CS4.1. 1		1	CS4.1. 1			1	CS4.1. 1
5	2	CS1.5.	2	CS1.5.		2	CS1.5.		2	CS1.5.		2	CS3.5. 1.		2	CS1.5.			2	CS1.5.		1	CS3.5. 1.			2	CS3.5. 1.
6	1	CS2.5.	2	CS2.3.		1	CS3.5. 6.		1	CS3.5. 6.		1	CS2.5.		2	CS2.5.			1	CS2.5.		1	CS3.5. 6.			1	CS3.5.
7	1	CS3.5. 5.	2	CS3.5. 5.		1	CS3.5. 5.		1	CS3.5. 1.		1	CS3.5. 5.		2	CS3.5. 1.			1	CS3.5. 5.		1	CS3.5. 5.			1	CS3.5. 1.
8	1	CS3.2.	2	CS3.5. 1.		1	CS3.5. 1.		2	CS3.4. 2.		1	CS3.5.		1	CS3.5.			2	CS3.3. 2.		1	CS3.5. 3.			1	CS3.4. 2.
9																											
10	2	CS3.5. 3.	2	CS3.5. 3.		1	CS3.5. 3.		2	CS3.5. 3.		2	CS3.5. 3.		2	CS3.5. 3.			2	CS3.5. 3.		2	CS3.5. 1.			2	CS1.5.
11	1	CS1.5.	1	CS3.3. 1		1	CS3.3. 1		2	CS3.4.		1			1				2	CS3.3. 2.		1	CS3.2. 1.			2	CS1.5.
12	1	CS1.5.	1	CS3.5. 1.		1	CS3.5. 1.		1	CS3.5. 1.		1	CS3.5.		1	CS3.5. 1.			1	CS3.5. 1.		1	CS3.5. 1.			1	CS3.5. 1.
13	2	CS3.5. 6.	2	CS3.3. 2.		2	CS3.5. 3.		2	CS3.4. 2.		2	CS3.5.		2	CS3.5. 3.			2	CS3.5. 1.	CS3.5. 6.	2	CS3.5. 4.	CS3.5. 3.		2	CS3.5. 1.
14	1	CS5.1. 4.	2	CS5.1. 4.		2	CS5.1. 4.		1	CS5.1. 4.		1	CS5.1. 4.		2	CS5.1. 4.			2	CS5.1.		2	CS5.1. 4.			2	CS3.5.
15	1	CS5.1. 2.	2	CS5.1. 5.		1	CS5.1. 5.		2	CS3.5. 6.		1	CS3.5. 6.		2	CS3.5. 6.			1	CS5.1. 5.		2	CS5.1. 3.			1	CS3.5. 6.
16	2	CS5.2. 1.	2	CS5.2.		1	CS5.2.		2	CS5.2. 3.		2	CS5.1. 3.		1	CS5.2. 3.			1	CS5.2. 3.		2	CS5.2. 3.			2	CS5.2. 2.
17	1	CS5.3. 1.	2	CS5.3. 1.		1	CS5.3. 1.		1	CS5.3. 1.		1	CS5.3. 1.		1	CS5.3. 1.			1	CS5.3. 2.		1	CS5.3. 2.			1	CS5.3. 2.
18	1	CS5.4. 2.	1	CS5.4. 2.		1	CS5.4. 2.		1	CS5.4. 2.		2	CS5.4. 2.		1	CS5.4. 2.			1	CS5.4. 2.		1	CS5.4. 2.			1	CS5.3. 1.
19	1	CS4.4. 4.	2	CS5.3. 3.		2	CS4.4. 4.		2	CS4.4. 4.		1	CS4.4. 4.		1	CS4.4. 4.			2	CS4.4. 4.		2	CS4.4. 4.			1	CS4.4. 4.
20	1	CS5.1. 2.	2	CS5.1. 2.		1	CS5.1. 2.		1	CS5.1. 2.		1	CS5.1. 2.		1	CS5.1. 2.			1	CS5.1. 2.		1	CS5.1. 2.			1	CS5.1. 2.
21	2	CS5.3. 3.	2	CS5.3. 3.		1	CS5.3. 3.		1	CS5.3. 3.		2	CS5.3. 3.		2	CS5.3. 3.			2	CS5.3. 3.		2	CS5.3. 3.			2	CS5.3. 3.
22	1	CS5.1. 5.	2	CS5.1. 5.		1	CS5.1. 5.		1	CS3.5. 6.		1	CS3.5. 6.		1	CS5.1. 5.			1	CS5.1. 5.		1	CS5.1. 5.	CS3.5. 6.		2	CS3.5. 6.

Table 8.8

DOK Levels and Objectives Coded by Each Reviewer

Michigan Grade 8 Science, Form Fall 2005

23	2	CS5.1.3.	2	CS5.1.3.		2	CS5.1.3.		1	CS5.1.3.		1	CS5.1.3.		2	CS5.1.3.			1	CS5.1.3.		2	CS5.1.3.			2	CS5.1.3.
24																											
25	2	CS5.1.1.	2	CS5.1.1.		2	CS5.1.1.		2	CS5.1.1.		2	CS5.1.1.		2	CS5.1.1.			2	CS5.1.1.		2	CS5.1.1.			2	CS1.5.
26	2	CS5.1.1.	2	CS5.1.1.		2	CS5.1.1.		2	CS5.1.1.		2	CS5.1.1.		2	CS5.1.1.			2	CS5.1.1.		2	CS5.1.1.			2	CS1.5.
27	2	CS5.1.1.	2	CS5.1.1.		2	CS5.1.1.		2	CS5.1.1.		2	CS5.1.1.		2	CS5.1.1.			2	CS5.1.1.		2	CS5.2.1.			2	CS1.5.
28	2	CS5.1.3.	3	CS5.1.1.	CS5.1.3.	2	CS5.1.1.	CS5.1.3.	2	CS5.1.1.	CS5.1.3.	2	CS5.1.1.	CS5.1.3.	3	CS5.1.1.	CS5.1.3.		2	CS5.1.1.	CS5.1.3.	2	CS5.1.3.			2	CS5.1.3.
29	1	CS3.3.1	1	CS3.3.1		1	CS3.3.1		1	CS3.3.2.		1	CS3.3.2.		1	CS3.3.1			1	CS3.3.1		1	CS3.3.1			1	CS3.3.1
30	2	CS3.3.2.	2	CS3.5.1.		1	CS3.5.1.		1	CS1.5.		2	CS3.4.2.		1				1	CS3.5.1.		2	CS3.3.2.			1	CS3.4.2.
31	1	CS3.5.1.	2	CS3.5.2.		1	CS3.5.2.		2	CS3.5.1.		1	CS3.5.2.		2	CS3.5.1.			1	CS3.5.3.		1	CS3.5.1.			1	CS3.5.1.
32	2	CS1.2.	2	CS1.5.		2	CS1.5.		2	CS1.2.		1	CS1.2.		2	CS1.5.			1	CS1.3.		2	CS1.5.			1	CS5.3.4.
33	1	CS3.5.6.	2	CS5.1.5.		2	CS5.1.3.		2	CS5.1.5.		1	CS3.5.6.		2	CS5.1.5.	CS5.1.3.	CS3.5.6.	1	CS3.5.6.	CS5.1.5.	1	CS3.5.6.	CS5.1.5.		1	CS3.5.6.
34	2	CS3.3.2.	2	CS3.3.1		1	CS3.3.1		2	CS3.3.2.		1	CS3.3.1		2	CS3.3.1			1	CS3.3.2.		2	CS3.3.2.			2	CS3.4.2.
35	1	CS5.2.2.	1	CS5.2.2.		1	CS5.2.2.		1	CS5.2.2.		1	CS5.2.2.		1	CS5.2.			1	CS5.2.2.		1	CS5.2.3.			1	CS5.2.2.
36	2	CS4.1.2.	2	CS4.1.1		1	CS4.2.3.		2	CS4.1.2.		2	CS4.1.1		2				1	CS4.1.1		2	CS4.1.1			2	CS4.1.1
37																											
38	2	CS3.5.6.	2	CS3.5.4.		2	CS3.5.1.		2	CS3.5.3.		1	CS3.5.3.		2	CS3.5.3.			2	CS3.5.3.		2	CS3.5.6.			2	CS3.5.3.
39	1	CS3.5.1.	2	CS3.5.3.		2	CS3.5.1.		1	CS3.5.1.		1	CS3.5.		1	CS3.5.1.			1	CS3.5.1.		1	CS3.5.1.			2	CS3.5.1.
40	1	CS5.1.1.	1	CS3.5.3.		1	CS3.5.2.		1	CS3.5.1.		1	CS3.5.2.		1	CS3.5.1.	CS3.5.2.		1	CS3.2.3.		1	CS3.2.3.			1	CS3.5.2.
41	2	CS3.5.1.	2	CS3.5.3.		1	CS3.5.1.		2	CS3.5.1.		2	CS3.5.3.		1	CS3.5.1.			2	CS3.5.1.		1	CS3.5.1.	CS1.6.		1	CS3.5.1.
42																											
43																											
44																											
45																											
46	1	CS4.1.6.	1	CS4.1.6.		1	CS4.2.4.		1	CS4.1.6.		1	CS4.1.6.		1	CS4.1.5.			1	CS4.1.5.		1	CS4.3.3.			1	CS4.1.5.
47	1	CS4.1.3.	2	CS4.2.3.		1	CS4.1.3.		1	CS4.1.3.		1	CS4.1.3.		1	CS4.1.3.			1	CS4.1.3.		1	CS4.1.3.			1	CS4.1.3.
48	1	CS4.3.	2	CS4.3.		1	CS4.3.		2	CS4.3.		1	CS4.3.		1	CS4.3.			1	CS4.3.		2	CS4.3.			1	CS4.3.

Table 8.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 8 Science, Form Fall 2005

		2.		1.			2.			2.			2.			2.				2.			2.				2.
49	1	CS4.4.4.	2	CS4.4.4.		1	CS4.4.1.		1	CS4.4.4.		1	CS4.4.4.		1	CS4.4.4.			1	CS4.4.2.		1	CS4.4.4.			1	CS4.4.4.
50	1	CS4.3.3.	2	CS5.4.1.		1	CS4.3.2.		1	CS5.4.1.		1	CS4.3.3.		1	CS5.4.1.			1	CS4.1.1		1	CS4.3.3.			1	CS5.4.1.
51	1	CS3.5.1.	1	CS4.3.5.		1	CS4.3.5.		1	CS4.3.5.		1	CS4.3.5.		1				1	CS4.3.5.		1	CS4.3.5.			1	CS4.3.5.
52	1	CS4.4.4.	1	CS4.4.4.		1	CS4.4.4.		2	CS4.4.4.		2	CS4.4.4.		1	CS4.4.4.			1	CS4.4.4.		2	CS4.4.4.			2	CS4.4.4.
53	1	CS4.4.2.	2	CS4.4.1.		1	CS4.4.2.		2	CS4.4.2.		1	CS4.4.2.		1	CS4.4.2.			1	CS4.4.2.		1	CS4.4.1.	CS4.4.2.		1	CS4.4.2.
54																											
55	2	CS1.2.	2	CS2.1.		1	CS1.2.		2	CS1.2.		2	CS1.2.		2	CS1.5.	CS2.1.		1	CS1.2.		3	CS1.2.			2	CS1.2.
56	1	CS4.1.4.	1	CS4.1.4.		1	CS4.1.4.		1	CS4.1.4.		2	CS4.1.4.		2	CS4.1.4.			1	CS4.1.4.		2	CS4.1.4.			1	CS4.1.4.
57	1	CS4.3.2.	2	CS4.1.1		1	CS4.3.2.		2	CS4.3.2.		2	CS4.3.		2	CS4.3.2.			1	CS4.2.4.		2	CS3.3.2.			1	CS4.3.2.
58	2	CS4.1.1	2	CS4.1.4.		2	CS4.1.4.		2	CS4.1.		2	CS4.1.4.		2	CS4.1.3.	CS4.1.4.		2	CS4.1.4.		2	CS4.1.1	CS4.1.3.	CS4.1.4.	1	CS4.1.4.

Pairwise Comparison: 0.5261
Standard Pairwise Comparison: 0.8439

Table 8.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 8 Science, Form Fall 2005

Low		Medium		High
0		8.017241		15

1	CS3.5.	CS3.5.1.	CS3.5.1.	CS3.5.3.	CS3.5.3.	CS3.5.3.	CS3.5.4.	CS3.5.4.	CS3.5.6.	
2	CS3.2.4.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	
3	CS1.5.	CS1.5.	CS1.5.	CS1.5.	CS1.5.	CS1.5.	CS1.5.	CS1.5.	CS3.4.2.	
4	CS4.1.1	CS4.1.1	CS4.1.1	CS4.1.1	CS4.1.1	CS4.1.1	CS4.1.1	CS4.1.1	CS4.1.2.	
5	CS1.5.	CS1.5.	CS1.5.	CS1.5.	CS1.5.	CS1.5.	CS3.5.1.	CS3.5.1.	CS3.5.1.	
6	CS2.3.	CS2.5.	CS2.5.	CS2.5.	CS2.5.	CS3.5.	CS3.5.6.	CS3.5.6.	CS3.5.6.	
7	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.5.	CS3.5.5.	CS3.5.5.	CS3.5.5.	CS3.5.5.	CS3.5.5.	
8	CS3.2.	CS3.3.2.	CS3.4.2.	CS3.4.2.	CS3.5.	CS3.5.	CS3.5.1.	CS3.5.1.	CS3.5.3.	
9										
10	CS1.5.	CS3.5.1.	CS3.5.3.	CS3.5.3.	CS3.5.3.	CS3.5.3.	CS3.5.3.	CS3.5.3.	CS3.5.3.	
11	CS1.5.	CS1.5.	CS3.2.1.	CS3.3.1	CS3.3.1	CS3.3.2.	CS3.4.			
12	CS1.5.	CS3.5.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	
13	CS3.3.2.	CS3.4.2.	CS3.5.	CS3.5.1.	CS3.5.1.	CS3.5.3.	CS3.5.3.	CS3.5.3.	CS3.5.4.	CS3.5.6.
	CS3.5.6.									
14	CS3.5.	CS5.1.	CS5.1.4.	CS5.1.4.	CS5.1.4.	CS5.1.4.	CS5.1.4.	CS5.1.4.	CS5.1.4.	
15	CS3.5.6.	CS3.5.6.	CS3.5.6.	CS3.5.6.	CS5.1.2.	CS5.1.3.	CS5.1.5.	CS5.1.5.	CS5.1.5.	
16	CS5.1.3.	CS5.2.	CS5.2.	CS5.2.1.	CS5.2.2.	CS5.2.3.	CS5.2.3.	CS5.2.3.	CS5.2.3.	
17	CS5.3.1.	CS5.3.1.	CS5.3.1.	CS5.3.1.	CS5.3.1.	CS5.3.1.	CS5.3.2.	CS5.3.2.	CS5.3.2.	
18	CS5.3.1.	CS5.4.2.	CS5.4.2.	CS5.4.2.	CS5.4.2.	CS5.4.2.	CS5.4.2.	CS5.4.2.	CS5.4.2.	
19	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS5.3.3.	

Table 8.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 8 Science, Form Fall 2005

20	CS5.1.2.	CS5.1.2.	CS5.1.2.	CS5.1.2.	CS5.1.2.	CS5.1.2.	CS5.1.2.	CS5.1.2.	CS5.1.2.	
21	CS5.3.3.	CS5.3.3.	CS5.3.3.	CS5.3.3.	CS5.3.3.	CS5.3.3.	CS5.3.3.	CS5.3.3.	CS5.3.3.	
22	CS3.5.6.	CS3.5.6.	CS3.5.6.	CS3.5.6.	CS5.1.5.	CS5.1.5.	CS5.1.5.	CS5.1.5.	CS5.1.5.	CS5.1.5.
23	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	
24										
25	CS1.5.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	
26	CS1.5.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	
27	CS1.5.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.2.1.	
28	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.1.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.
	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.					
29	CS3.3.1	CS3.3.1	CS3.3.1	CS3.3.1	CS3.3.1	CS3.3.1	CS3.3.1	CS3.3.2.	CS3.3.2.	
30	CS1.5.	CS3.3.2.	CS3.3.2.	CS3.4.2.	CS3.4.2.	CS3.5.1.	CS3.5.1.	CS3.5.1.		
31	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.2.	CS3.5.2.	CS3.5.2.	CS3.5.3.	
32	CS1.2.	CS1.2.	CS1.2.	CS1.3.	CS1.5.	CS1.5.	CS1.5.	CS1.5.	CS5.3.4.	
33	CS3.5.6.	CS3.5.6.	CS3.5.6.	CS3.5.6.	CS3.5.6.	CS3.5.6.	CS5.1.3.	CS5.1.3.	CS5.1.5.	CS5.1.5.
	CS5.1.5.	CS5.1.5.	CS5.1.5.							
34	CS3.3.1	CS3.3.1	CS3.3.1	CS3.3.1	CS3.3.2.	CS3.3.2.	CS3.3.2.	CS3.3.2.	CS3.4.2.	
35	CS5.2.	CS5.2.2.	CS5.2.2.	CS5.2.2.	CS5.2.2.	CS5.2.2.	CS5.2.2.	CS5.2.2.	CS5.2.3.	
36	CS4.1.1	CS4.1.1	CS4.1.1	CS4.1.1	CS4.1.1	CS4.1.2.	CS4.1.2.	CS4.2.3.		
37										
38	CS3.5.1.	CS3.5.3.	CS3.5.3.	CS3.5.3.	CS3.5.3.	CS3.5.3.	CS3.5.4.	CS3.5.6.	CS3.5.6.	
39	CS3.5.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.3.	

Table 8.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 8 Science, Form Fall 2005

40	CS3.2.3.	CS3.2.3.	CS3.5.1.	CS3.5.1.	CS3.5.2.	CS3.5.2.	CS3.5.2.	CS3.5.2.	CS3.5.3.	CS5.1.1.
41	CS1.6.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.1.	CS3.5.3.	CS3.5.3.
42										
43										
44										
45										
46	CS4.1.5.	CS4.1.5.	CS4.1.5.	CS4.1.6.	CS4.1.6.	CS4.1.6.	CS4.1.6.	CS4.2.4.	CS4.3.3.	
47	CS4.1.3.	CS4.1.3.	CS4.1.3.	CS4.1.3.	CS4.1.3.	CS4.1.3.	CS4.1.3.	CS4.1.3.	CS4.2.3.	
48	CS4.3.1.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	
49	CS4.4.1.	CS4.4.2.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	
50	CS4.1.1	CS4.3.2.	CS4.3.3.	CS4.3.3.	CS4.3.3.	CS5.4.1.	CS5.4.1.	CS5.4.1.	CS5.4.1.	
51	CS3.5.1.	CS4.3.5.	CS4.3.5.	CS4.3.5.	CS4.3.5.	CS4.3.5.	CS4.3.5.	CS4.3.5.		
52	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	
53	CS4.4.1.	CS4.4.1.	CS4.4.2.	CS4.4.2.	CS4.4.2.	CS4.4.2.	CS4.4.2.	CS4.4.2.	CS4.4.2.	CS4.4.2.
54										
55	CS1.2.	CS1.2.	CS1.2.	CS1.2.	CS1.2.	CS1.2.	CS1.2.	CS1.5.	CS2.1.	CS2.1.
56	CS4.1.4.	CS4.1.4.	CS4.1.4.	CS4.1.4.	CS4.1.4.	CS4.1.4.	CS4.1.4.	CS4.1.4.	CS4.1.4.	
57	CS3.3.2.	CS4.1.1	CS4.2.4.	CS4.3.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	
58	CS4.1.	CS4.1.1	CS4.1.1	CS4.1.3.	CS4.1.3.	CS4.1.4.	CS4.1.4.	CS4.1.4.	CS4.1.4.	CS4.1.4.
	CS4.1.4.	CS4.1.4.								

Table 8.10
Items Coded by Reviewers to Each Objective
Michigan Grade 8 Science, Form Fall 2005

Low		Medium		High
0		5.535714		54

I																				
CS1.1.																				
CS1.2.	32	32	32	55	55	55	55	55	55	55										
CS1.3.	32																			
CS1.4.																				
CS1.5.	3	3	3	3	3	3	3	3	5	5	5	5	5	5	10	11	11	12	25	26
	27	30	32	32	32	32	55													
CS1.6.	41																			
II																				
CS2.1.	55	55																		
CS2.2.																				
CS2.3.	6																			
CS2.4.																				
CS2.5.	6	6	6	6																
CS2.6.																				
III																				
CS3.1.																				
CS3.1.1.																				
CS3.1.2.																				
CS3.2.	8																			
CS3.2.1.	11																			
CS3.																				

Table 8.10
Items Coded by Reviewers to Each Objective
Michigan Grade 8 Science, Form Fall 2005

2.2.																				
CS3. 2.3.	40	40																		
CS3. 2.4.	2																			
CS3. 3.																				
CS3. 3.1	11	11	29	29	29	29	29	29	29	34	34	34	34							
CS3. 3.2.	8	11	13	29	29	30	30	34	34	34	34	57								
CS3. 4.	11																			
CS3. 4.1.																				
CS3. 4.2.	3	8	8	13	30	30	34													
CS3. 5.	1	6	8	8	12	13	14	39												
CS3. 5.1.	1	1	2	2	2	2	2	2	2	2	5	5	5	7	7	7	8	8	10	12
	12	12	12	12	12	12	13	13	30	30	30	31	31	31	31	31	38	39	39	
	39	39	39	39	39	40	40	41	41	41	41	41	41	41	51					
CS3. 5.2.	31	31	31	40	40	40	40													
CS3. 5.3.	1	1	1	8	10	10	10	10	10	10	10	13	13	13	31	38	38	38	38	38
	39	40	41	41																
CS3. 5.4.	1	1	13	38																
CS3. 5.5.	7	7	7	7	7	7														
CS3. 5.6.	1	6	6	6	13	13	15	15	15	15	22	22	22	22	33	33	33	33	33	33
	38	38																		
IV																				
CS4. 1.	58																			
CS4. 1.1	4	4	4	4	4	4	4	4	36	36	36	36	36	50	57	58	58			
CS4. 1.2.	4	36	36																	
CS4.	47	47	47	47	47	47	47	47	58	58										

Table 8.10
Items Coded by Reviewers to Each Objective
Michigan Grade 8 Science, Form Fall 2005

1.3.																				
CS4. 1.4.	56	56	56	56	56	56	56	56	56	58	58	58	58	58	58	58				
CS4. 1.5.	46	46	46																	
CS4. 1.6.	46	46	46	46																
CS4. 2.																				
CS4. 2.1.																				
CS4. 2.2.																				
CS4. 2.3.	36	47																		
CS4. 2.4.	46	57																		
CS4. 3.	57																			
CS4. 3.1.	48																			
CS4. 3.2.	48	48	48	48	48	48	48	48	50	57	57	57	57	57						
CS4. 3.3.	46	50	50	50																
CS4. 3.4.																				
CS4. 3.5.	51	51	51	51	51	51	51													
CS4. 4.																				
CS4. 4.1.	49	53	53																	
CS4. 4.2.	49	53	53	53	53	53	53	53	53											
CS4. 4.3.																				
CS4. 4.4.	19	19	19	19	19	19	19	19	49	49	49	49	49	49	49	52	52	52	52	52
	52	52	52	52																
CS4. 4.5.																				
CS4.																				

Table 8.10
Items Coded by Reviewers to Each Objective
Michigan Grade 8 Science, Form Fall 2005

4.6.																				
V																				
CS5. 1.	14																			
CS5. 1.1.	25	25	25	25	25	25	25	25	26	26	26	26	26	26	26	26	27	27	27	27
	27	27	27	28	28	28	28	28	28	40										
CS5. 1.2.	15	20	20	20	20	20	20	20	20	20										
CS5. 1.3.	15	16	23	23	23	23	23	23	23	23	23	28	28	28	28	28	28	28	28	28
	33	33																		
CS5. 1.4.	14	14	14	14	14	14	14													
CS5. 1.5.	15	15	15	22	22	22	22	22	22	33	33	33	33	33						
CS5. 2.	16	16	35																	
CS5. 2.1.	16	27																		
CS5. 2.2.	16	35	35	35	35	35	35	35												
CS5. 2.3.	16	16	16	16	35															
CS5. 2.4.																				
CS5. 3.																				
CS5. 3.1.	17	17	17	17	17	17	18													
CS5. 3.2.	17	17	17																	
CS5. 3.3.	19	21	21	21	21	21	21	21	21	21										
CS5. 3.4.	32																			
CS5. 4.																				
CS5. 4.1.	50	50	50	50																
CS5. 4.2.	18	18	18	18	18	18	18	18												
CS5.																				

Table 8.10
Items Coded by Reviewers to Each Objective
Michigan Grade 8 Science, Form Fall 2005

4.3.

Table 8.11

Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 8 Science, Form Fall 2005

Low		Medium		High
1		4		9

I											
CS1.1.											
CS1.2.	32:3	55:7									
CS1.3.	32:1										
CS1.4.											
CS1.5.	3:8	5:6	10:1	11:2	12:1	25:1	26:1	27:1	30:1	32:4	55:1
CS1.6.	41:1										
II											
CS2.1.	55:2										
CS2.2.											
CS2.3.	6:1										
CS2.4.											
CS2.5.	6:4										
CS2.6.											
III											
CS3.1.											
CS3.1.1.											
CS3.1.2.											
CS3.2.	8:1										
CS3.2.1.	11:1										
CS3.2.2.											

Table 8.11

Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 8 Science, Form Fall 2005

CS3. 2.3.	40:2												
CS3. 2.4.	2:1												
CS3. 3.													
CS3. 3.1	11:2	29:7	34:4										
CS3. 3.2.	8:1	11:1	13:1	29:2	30:2	34:4	57:1						
CS3. 4.	11:1												
CS3. 4.1.													
CS3. 4.2.	3:1	8:2	13:1	30:2	34:1								
CS3. 5.	1:1	6:1	8:2	12:1	13:1	14:1	39:1						
CS3. 5.1.	1:2	2:8	5:3	7:3	8:2	10:1	12:7	13:2	30:3	31:5	38:1	39:7	40:2
	41:7	51:1											
CS3. 5.2.	31:3	40:4											
CS3. 5.3.	1:3	8:1	10:7	13:3	31:1	38:5	39:1	40:1	41:2				
CS3. 5.4.	1:2	13:1	38:1										
CS3. 5.5.	7:6												
CS3. 5.6.	1:1	6:3	13:2	15:4	22:4	33:6	38:2						
IV													
CS4. 1.	58:1												
CS4. 1.1	4:8	36:5	50:1	57:1	58:2								
CS4. 1.2.	4:1	36:2											
CS4. 1.3.	47:8	58:2											
CS4. 1.4.	56:9	58:7											
CS4.	46:3												

Table 8.11
Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 8 Science, Form Fall 2005

1.5.					
CS4. 1.6.	46:4				
CS4. 2.					
CS4. 2.1.					
CS4. 2.2.					
CS4. 2.3.	36:1	47:1			
CS4. 2.4.	46:1	57:1			
CS4. 3.	57:1				
CS4. 3.1.	48:1				
CS4. 3.2.	48:8	50:1	57:5		
CS4. 3.3.	46:1	50:3			
CS4. 3.4.					
CS4. 3.5.	51:7				
CS4. 4.					
CS4. 4.1.	49:1	53:2			
CS4. 4.2.	49:1	53:8			
CS4. 4.3.					
CS4. 4.4.	19:8	49:7	52:9		
CS4. 4.5.					
CS4. 4.6.					
V					
CS5. 1.	14:1				
CS5.	25:8	26:8	27:7	28:6	40:1

Table 8.11

Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 8 Science, Form Fall 2005

1.1.					
CS5. 1.2.	15:1	20:9			
CS5. 1.3.	15:1	16:1	23:9	28:9	33:2
CS5. 1.4.	14:7				
CS5. 1.5.	15:3	22:6	33:5		
CS5. 2.	16:2	35:1			
CS5. 2.1.	16:1	27:1			
CS5. 2.2.	16:1	35:7			
CS5. 2.3.	16:4	35:1			
CS5. 2.4.					
CS5. 3.					
CS5. 3.1.	17:6	18:1			
CS5. 3.2.	17:3				
CS5. 3.3.	19:1	21:9			
CS5. 3.4.	32:1				
CS5. 4.					
CS5. 4.1.	50:4				
CS5. 4.2.	18:8				
CS5. 4.3.					

Table 8.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 8 Science, Form Fall 2005

Low DOK		Matched DOK		High DOK
1		4		9

I [2]:											
CS1.1. [2]:											
CS1.2. [3]:	32:3 [1.67]	55:7 [1.86]									
CS1.3. [1]:	32:1 [1]										
CS1.4. [1]:											
CS1.5. [2]:	3:8[1.75]	5:6[2]	10:1 [2]	11:2 [1.5]	12:1 [1]	25:1 [2]	26:1 [2]	27:1 [2]	30:1 [1]	32:4 [2]	55:1 [2]
CS1.6. [2]:	41:1 [1]										
II [2]:											
CS2.1. [3]:	55:2 [2]										
CS2.2. [2]:											
CS2.3. [2]:	6:1[2]										
CS2.4. [1]:											
CS2.5. [2]:	6:4[1.25]										
CS2.											

Table 8.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 8 Science, Form Fall 2005

6. [1]:							
III [2]:							
CS3. 1. [2]:							
CS3. 1.1. [1]:							
CS3. 1.2. [2]:							
CS3. 2. [2]:	8:1[1]						
CS3. 2.1. [2]:	11:1 [1]						
CS3. 2.2. [1]:							
CS3. 2.3. [1]:	40:2 [1]						
CS3. 2.4. [2]:	2:1[2]						
CS3. 3. [2]:							
CS3. 3.1 [2]:	11:2 [1]	29:7 [1]	34:4 [1.5]				
CS3. 3.2. [2]:	8:1[2]	11:1 [2]	13:1 [2]	29:2 [1]	30:2 [2]	34:4 [1.75]	57:1 [2]
CS3. 4. [2]:	11:1 [2]						
CS3. 4.1. [2]:							

Table 8.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 8 Science, Form Fall 2005

CS3.4.2.[2]:	3:1[2]	8:2[1.5]	13:1[2]	30:2[1.5]	34:1[2]								
CS3.5.[1]:	1:1[2]	6:1[1]	8:2[1]	12:1[1]	13:1[2]	14:1[2]	39:1[1]						
CS3.5.1.[1]:	1:2[1]	2:8[1]	5:3[1.67]	7:3[1.33]	8:2[1.5]	10:1[2]	12:7[1]	13:2[2]	30:3[1.33]	31:5[1.4]	38:1[2]	39:7[1.29]	40:2[1]
	41:7[1.43]	51:1[1]											
CS3.5.2.[1]:	31:3[1.33]	40:4[1]											
CS3.5.3.[2]:	1:3[1.67]	8:1[1]	10:7[1.86]	13:3[2]	31:1[1]	38:5[1.8]	39:1[2]	40:1[1]	41:2[2]				
CS3.5.4.[1]:	1:2[1]	13:1[2]	38:1[2]										
CS3.5.5.[1]:	7:6[1.17]												
CS3.5.6.[1]:	1:1[1]	6:3[1]	13:2[2]	15:4[1.5]	22:4[1.25]	33:6[1.17]	38:2[2]						
IV[2]:													
CS4.1.[2]:	58:1[2]												
CS4.1.1[2]:	4:8[1.38]	36:5[1.8]	50:1[1]	57:1[2]	58:2[2]								
CS4.1.2.[1]:	4:1[1]	36:2[2]											
CS4.1.3.[2]:	47:8[1]	58:2[2]											
CS4.1.4.	56:9[1.3	58:7[1.8											

Table 8.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 8 Science, Form Fall 2005

[1]:	3]	6]	
CS4. 1.5. [2]:	46:3 [1]		
CS4. 1.6. [2]:	46:4 [1]		
CS4. 2. [2]:			
CS4. 2.1. [1]:			
CS4. 2.2. [2]:			
CS4. 2.3. [2]:	36:1 [1]	47:1 [2]	
CS4. 2.4. [1]:	46:1 [1]	57:1 [1]	
CS4. 3. [2]:	57:1 [2]		
CS4. 3.1. [2]:	48:1 [2]		
CS4. 3.2. [2]:	48:8 [1.25]	50:1 [1]	57:5 [1.4]
CS4. 3.3. [1]:	46:1 [1]	50:3 [1]	
CS4. 3.4. [2]:			
CS4. 3.5. [2]:	51:7 [1]		
CS4. 4. [1]:			

Table 8.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 8 Science, Form Fall 2005

CS4.4.1.[1]:	49:1 [1]	53:2 [1.5]			
CS4.4.2.[1]:	49:1 [1]	53:8 [1.12]			
CS4.4.3.[1]:					
CS4.4.4.[2]:	19:8 [1.5]	49:7 [1.14]	52:9 [1.44]		
CS4.4.5.[1]:					
CS4.4.6.[2]:					
V [2]:					
CS5.1.[2]:	14:1 [2]				
CS5.1.1.[2]:	25:8 [2]	26:8 [2]	27:7 [2]	28:6 [2.33]	40:1 [1]
CS5.1.2.[2]:	15:1 [1]	20:9 [1.11]			
CS5.1.3.[2]:	15:1 [2]	16:1 [2]	23:9 [1.67]	28:9 [2.22]	33:2 [2]
CS5.1.4.[2]:	14:7 [1.57]				
CS5.1.5.[1]:	15:3 [1.33]	22:6 [1.17]	33:5 [1.6]		
CS5.2.[1]:	16:2 [1.5]	35:1 [1]			
CS5.2.1.	16:1 [2]	27:1 [2]			

Table 8.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 8 Science, Form Fall 2005

[2]:		
CS5.2.2.[1]:	16:1 [2]	35:7 [1]
CS5.2.3.[1]:	16:4 [1.5]	35:1 [1]
CS5.2.4.[1]:		
CS5.3.[2]:		
CS5.3.1.[2]:	17:6 [1.17]	18:1 [1]
CS5.3.2.[1]:	17:3 [1]	
CS5.3.3.[2]:	19:1 [2]	21:9 [1.78]
CS5.3.4.[1]:	32:1 [1]	
CS5.4.[2]:		
CS5.4.1.[2]:	50:4 [1.25]	
CS5.4.2.[2]:	18:8 [1.12]	
CS5.4.3.[2]:		

Table 8.1

Categorical Concurrence Between Standards and Assessment as Rated by Six Reviewers
Michigan Grade 8 Science, Form Winter 2005
Number of Assessment Items - 50

Standards			Level by Objective			Hits		Cat. Concurr.
Title	Goals #	Objs #	Level	# of objs by Level	% w/in std by Level	Mean	S.D.	
I - Constructing New Scientific Knowledge	6	6	1 2 3	2 3 1	33 50 16	8.17	1.21	YES
II - Reflecting on Scientific Knowledge	6	6	1 2 3	2 3 1	33 50 16	1.33	0.97	NO
III - Using Life Science Knowledge	5	16.33	1 2	8 8	50 50	15.67	0.75	YES
IV - Using Physical Science Knowledge	4	21.17	1 2	9 12	42 57	14	0.58	YES
V - Using Earth Science Knowledge	4	16.33	1 2	6 10	37 62	11.67	0.75	YES
Total	25	65.83	1 2 3	27 36 2	41 55 3	50.83	1.34	

Table 8.2

Depth-of-Knowledge Consistency Between Standards and Assessment as Rated by Six Reviewers

Michigan Grade 8 Science, Form Winter 2005

Number of Assessment Items - 50

Standards			Hits		Level of Item w.r.t. Standard						DOK Consistency
					% Under		% At		% Above		
Title	Goals #	Objs #	M	S.D.	M	S.D.	M	S.D.	M	S.D.	
I - Constructing New Scientific Knowledge	6	6	8.17	1.21	18	34	77	37	4	20	YES
II - Reflecting on Scientific Knowledge	6	6	1.33	0.97	67	47	33	47	0	0	NO
III - Using Life Science Knowledge	5	16.33	15.67	0.75	23	41	51	45	26	39	YES
IV - Using Physical Science Knowledge	4	21.17	14	0.58	35	45	54	47	12	31	YES
V - Using Earth Science Knowledge	4	16.33	11.67	0.75	39	45	55	44	6	18	YES
Total	25	65.83	50.83	1.34	31	44	56	45	13	31	

Table 8.3

Range-of-Knowledge Correspondence and Balance of Representation Between Standards and Assessment as Rated by Six Reviewers
Michigan Grade 8 Science, Form Winter 2005
Number of Assessment Items - 50

Standards			Hits		Range of Objectives				Rng. of Know.	Balance Index				Bal. of Represent.
					# Objs Hit		% of Total			% Hits in Std/Ttl Hits		Index		
Title	Goals #	Objs #	Mean	S.D.	Mean	S.D.	Mean	S.D.		Mean	S.D.	Mean	S.D.	
I - Constructing New Scientific Knowledge	6	6	8.17	1.21	3.83	1.07	64	18	YES	16	2	0.66	0.06	WEAK
II - Reflecting on Scientific Knowledge	6	6	1.33	0.97	1	0.71	17	12	NO	3	2	0.64	0.33	WEAK
III - Using Life Science Knowledge	5	16.33	15.67	0.75	8.83	0.37	54	2	YES	31	2	0.73	0.04	YES
IV - Using Physical Science Knowledge	4	21.17	14	0.58	10.83	1.46	51	6	YES	28	1	0.85	0.05	YES
V - Using Earth Science Knowledge	4	16.33	11.67	0.75	6.83	1.21	42	7	WEAK	23	1	0.82	0.08	YES
Total	25	65.83	50.83	1.34	6.27	3.37	46	16		20	9	0.74	0.11	

Table 8.4
Summary of Attainment of Acceptable Alignment Level on Four Content Focus Criteria as Rated by Six Reviewers
Michigan Grade 8 Science, Form Winter 2005
Number of Assessment Items - 50

Standards	Alignment Criteria			
	Categorical Concurrence	Depth-of-Knowledge Consistency	Range of Knowledge	Balance of Representation
I - Constructing New Scientific Knowledge	YES	YES	YES	WEAK
II - Reflecting on Scientific Knowledge	NO	NO	NO	WEAK
III - Using Life Science Knowledge	YES	YES	YES	YES
IV - Using Physical Science Knowledge	YES	YES	YES	YES
V - Using Earth Science Knowledge	YES	YES	WEAK	YES

Table 8.5
Source-of-Challenge Issues by Reviewer
Michigan Grade 8 Science, Form Winter 2005

Item Number	Comments by Reviewer
4	This question will lead students to automatically eliminate the correct answer because it is the only answer that does not mention the words "suspended sediment". This is unfair because the question directly asks about the speed of the water and "suspended sediment". The correct answer does not directly correlate with the question and this is very misleading.
20	The purpose of the experiment and what is being investigated should be stated in scenario.
26	The answer is given in the reading. No science skill needed
32	The definition of "current" is opposite the flow of electrons. The correct answer is (A), not (B)
50	This item assumes specific knowledge about two species--one of which isn't even found in Michigan. Has nothing to do with anything except "do you have specific background info on these animals?"
52	Although not recommended, sometimes the unintended effect of a non-native species has a positive impact. Example--zebra mussels do create cleaner water--so, D could be correct at times.

Table 8.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 8 Science, Form Winter 2005

Item	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6
1	1	2	1	1	1	1
2	1	2	1	1	1	1
3	1	2	1	1	1	1
4	1	2	1	1	2	1
5	2	2	2	2	2	1
6	2	2	1	1	2	1
7	1	2	1	2	2	2
8	2	2	1	2	2	2
9	1	2	1	1	1	1
10	2	2	2	2	2	2
11						
12	1	2	1	2	1	1
13	1	1	1	1	1	1
14	1	1	1	2	2	1
15	1	2	1	1	1	1
16	1	2	1	1	2	1
17	2	1	1	2	1	1
18	1	2	1	2	1	1
19	1	2	1	2	1	1
20	2	2	2	3	2	1
21	1	1	1	1	2	1
22	2	2	2	2	2	1
23	2	2	2	2	2	1
24						
25	1	2	1	1	1	1
26	2	2	1	1	1	1
27	1	2	1	2	2	1
28	1	1	1	2	2	1
29	1	2	1	2	2	1
30	1	1	1	1	1	1
31	1	1	1	1	1	1
32	2	1	1	2	2	1
33						
34	2	2	2	2	1	2
35	1	1	1	1	1	1
36	1	1	1	2	1	1
37	3	2	2	2	2	2
38						
39						
40						

Table 8.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 8 Science, Form Winter 2005

41						
42	1	2	1	1	2	1
43	2	2	1	2	2	1
44	2	1	1	2	1	1
45	2	2	2	2	2	2
46	1	1	1	1	1	1
47	2	2	1	2	2	1
48						
49	2	2	1	2	2	2
50	1	2	1	2	1	2
51	2	2	2	2	2	2
52	1	2	1	1	2	1
53	1	2	1	1	2	1
54	1	2	1	2	1	2
55	1	1	1	1	2	1
56	2	2	1	2	2	1
57	2	1	2	2	2	2
58	2	2	2	2	2	1

Intraclass Correlation: 0.7499
Pairwise Comparison: 0.6147

Table 8.7
Notes by Reviewer
Michigan Grade 8 Science, Form Winter 2005

Item Number	Comments by Reviewer
5	This question does not align directly with a specific hydrosphere benchmark.
7	You do not need the chart to answer this question
8	Again the chart is extraneous and not necessary for this question.
9	AGAIN, the HUGE waste of paper chart is not necessary for this question.
10	This is the only question that needed the chart.
26	This is simply a question that needs no content knowledge on spiders to answer. The answer is clearly stated in the text.
27	This is a better match to an elementary standard
31	This question is a general question about how water behaves on our planet and does not fall specifically under any of the benchmarks
34	With reluctance, I must assign this a DOK of 1. A first grade student could answer this question though...
36	It falls under this objective, although this objective also deals with using a map and there is no map with this question
53	weak match
54	weak match
54	This is really more in alignment with an elementary objective on adaptations of animals.

Table 8.8

DOK Levels and Objectives Coded by Each Reviewer

Michigan Grade 8 Science, Form Winter 2005

Item	DOK0	PObj0	DOK1	PObj1	DOK2	PObj2	DOK3	PObj3	S1Obj3	DOK4	PObj4	S1Obj4	DOK5	PObj5	S1Obj5
1	1	CS5.2.3.	2	CS5.2.1.	1	CS5.2.	1	CS5.2.3.		1	CS5.2.3.		1	CS5.2.3.	
2	1	CS5.2.3.	2	CS5.2.2.	1	CS5.2.3.	1	CS5.2.3.		1	CS5.2.3.		1	CS5.2.3.	
3	1	CS5.1.2.	2	CS5.1.2.	1	CS5.1.2.	1	CS5.1.4.		1	CS5.1.2.		1	CS5.1.2.	
4	1	CS5.1.3.	2	CS5.2.2.	1	CS5.1.3.	1	CS5.1.3.		2	CS5.1.3.		1	CS5.1.3.	
5	2	CS5.2.2.	2	CS5.2.2.	2	CS5.1.3.	2	CS5.2.2.		2	CS5.2.		1	CS5.2.2.	
6	2	CS5.1.3.	2	CS5.2.2.	1	CS5.1.3.	1	CS5.1.3.		2	CS5.1.3.		1	CS5.1.3.	
7	1	CS5.4.1.	2	CS5.4.2.	1	CS5.4.2.	2	CS5.4.2.		2	CS5.4.2.		2	CS5.4.2.	
8	2	CS5.4.1.	2	CS5.4.2.	1	CS5.4.1.	2	CS5.4.1.		2	CS5.4.1.		2	CS5.4.1.	
9	1	CS5.4.2.	2	CS5.4.2.	1	CS5.4.3.	1	CS5.4.3.		1	CS5.4.3.		1	CS5.4.2.	
10	2	CS5.4.2.	2	CS1.5.	2	CS5.4.2.	2	CS1.5.	CS5.4.2.	2	CS5.4.1.		2	CS5.4.2.	CS1.5.
11															
12	1	CS4.2.1.	2	CS4.2.3.	1	CS4.2.1.	2	CS4.2.1.		1	CS4.2.1.		1	CS4.1.4.	
13	1	CS4.1.3.	1	CS4.1.3.	1	CS4.1.3.	1	CS4.1.3.		1	CS4.1.3.		1	CS4.1.4.	
14	1	CS4.1.1	1	CS4.1.1	1	CS4.1.1	2	CS4.1.1		2	CS4.1.1		1	CS4.1.1	
15	1	CS4.4.4.	2	CS4.4.4.	1	CS4.4.4.	1	CS4.4.4.		1	CS4.4.4.		1	CS4.4.4.	
16	1	CS4.3.3.	2	CS4.1.5.	1	CS4.3.4.	1	CS4.3.4.		2	CS4.3.4.		1	CS4.3.5.	
17	2	CS4.2.2.	1	CS4.2.3.	1	CS4.2.3.	2	CS4.2.3.		1	CS4.2.1.		1	CS4.2.4.	
18	1	CS4.4.1.	2	CS4.4.1.	1	CS4.4.1.	2	CS4.4.1.		1	CS4.4.1.		1	CS4.4.1.	
19	1	CS4.3.2.	2	CS4.1.4.	1	CS4.3.2.	2	CS4.3.2.		1	CS4.3.2.		1	CS4.3.2.	
20	2	CS1.2.	2	CS1.5.	2	CS1.2.	3	CS1.2.		2	CS1.5.	CS2.1.	1	CS1.2.	
21	1	CS4.1.4.	1	CS4.1.3.	1	CS4.1.4.	1	CS4.1.4.		2	CS4.1.4.		1	CS4.1.4.	
22	2	CS4.3.2.	2	CS4.1.1	2	CS4.3.3.	2	CS4.3.2.		2	CS4.3.2.		1	CS4.2.4.	
23	2	CS4.1.1	2	CS4.1.4.	2	CS4.1.4.	2	CS4.1.		2	CS4.1.3.	CS4.1.4.	1	CS4.1.4.	
24															
25	1	CS3.3.1	2	CS3.3.1	1	CS3.3.1	1	CS3.3.2.		1	CS3.3.1		1	CS3.3.1	
26	2	CS3.3.2.	2	CS3.3.2.	1	CS3.4.2.	1	CS1.5.		1			1	CS3.5.1.	
27	1	CS3.5.1.	2	CS3.5.2.	1	CS3.5.2.	2	CS3.5.1.		2	CS3.5.1.		1	CS3.5.3.	
28	1	CS1.3.	1	CS1.1.	1	CS2.3.	2	CS5.4.1.	CS1.3.	2	CS1.1.		1	CS1.3.	
29	1	CS3.5.6.	2	CS1.1.	1	CS3.5.6.	2	CS3.5.6.		2	CS2.5.		1	CS2.5.	
30	1	CS3.5.2.	1	CS3.5.2.	1	CS3.5.2.	1	CS3.5.2.		1	CS3.2.3.		1	CS3.2.3.	
31	1	CS5.2.2.	1	CS5.2.2.	1	CS5.2.2.	1	CS5.2.2.		1	CS5.2.		1	CS5.2.2.	
32	2	CS4.1.5.	1	CS4.1.5.	1	CS4.3.4.	2	CS4.1.5.		2	CS4.1.5.		1	CS4.1.5.	
33															
34	2	CS4.3.1.	2	CS4.3.1.	2	CS4.3.1.	2	CS4.3.1.		1	CS4.3.1.		2	CS4.3.1.	
35	1	CS1.4.	1	CS1.4.	1	CS1.4.	1	CS1.4.		1	CS4.1.2.		1	CS1.4.	
36	1	CS4.2.1.	1	CS5.3.1.	1	CS4.2.4.	2	CS5.2.1.		1	CS5.2.1.		1	CS5.2.2.	
37	3	CS2.1.	2	CS4.3.2.	2	CS1.5.	2	CS1.5.	CS4.1.2.	2	CS1.5.		2	CS1.5.	
38															
39															
40															
41															
42	1	CS3.5.1.	2	CS3.5.1.	1	CS3.5.1.	1	CS3.5.1.		2	CS3.5.1.		1	CS3.5.1.	
43	2	CS3.2.2.	2	CS3.2.2.	1	CS3.2.2.	2	CS3.2.2.		2	CS3.2.2.		1	CS3.2.2.	

Table 8.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 8 Science, Form Winter 2005

44	2	CS3.2.3.	1	CS3.5.2.	1	CS3.5.2.	2	CS3.5.2.		1	CS3.2.3.		1	CS3.2.3.	
45	2	CS3.5.6.	2	CS3.5.1.	2	CS3.5.6.	2	CS3.5.6.		2	CS3.5.6.		2	CS3.5.3.	
46	1	CS3.5.1.	1	CS3.5.1.	1	CS3.5.1.	1	CS3.5.1.		1	CS3.5.1.		1	CS3.5.1.	
47	2	CS3.3.2.	2	CS3.4.2.	1	CS3.4.2.	2	CS3.4.1.		2	CS3.4.2.		1	CS3.4.2.	
48															
49	2	CS1.5.	2	CS1.5.	1	CS1.5.	2	CS1.5.		2	CS1.5.		2	CS1.5.	
50	1	CS3.2.1.	2		1	CS3.2.1.	2	CS3.2.1.		1	CS3.2.1.		2	CS3.2.1.	
51	2	CS1.5.	2	CS1.5.	2	CS1.5.	2	CS1.5.		2	CS1.5.		2	CS1.5.	
52	1	CS2.5.	2	CS3.5.6.	1	CS3.5.6.	1	CS3.5.6.		2	CS2.5.	CS3.5.6.	1	CS2.5.	
53	1	CS3.5.1.	2	CS3.5.5.	1	CS3.5.5.	1	CS3.5.1.		2	CS3.5.1.		1	CS3.5.5.	
54	1	CS3.2.	2	CS3.5.2.	1	CS3.5.1.	2	CS3.4.2.		1	CS3.5.		2	CS3.4.2.	
55	1	CS3.5.2.	1	CS3.5.2.	1	CS3.5.2.	1	CS3.5.2.		2	CS3.5.2.		1	CS3.5.2.	
56	2	CS3.5.2.	2	CS3.5.1.	1	CS3.5.3.	2	CS3.5.3.		2	CS3.5.		1	CS3.5.3.	
57	2	CS1.5.	1	CS1.5.	2	CS1.5.	2	CS1.5.		2	CS1.5.		2	CS1.5.	
58	2	CS1.1.	2	CS1.5.	2	CS1.1.	2	CS1.1.		2	CS1.5.		1	CS1.5.	

Pairwise Comparison: 0.5587
Standard Pairwise Comparison: 0.9027

Table 8.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 8 Science, Form Winter 2005

Low		Medium		High
0		5.258621		8

1	CS5.2.	CS5.2.1.	CS5.2.3.	CS5.2.3.	CS5.2.3.	CS5.2.3.		
2	CS5.2.2.	CS5.2.3.	CS5.2.3.	CS5.2.3.	CS5.2.3.	CS5.2.3.		
3	CS5.1.2.	CS5.1.2.	CS5.1.2.	CS5.1.2.	CS5.1.2.	CS5.1.4.		
4	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.2.2.		
5	CS5.1.3.	CS5.2.	CS5.2.2.	CS5.2.2.	CS5.2.2.	CS5.2.2.		
6	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.1.3.	CS5.2.2.		
7	CS5.4.1.	CS5.4.2.	CS5.4.2.	CS5.4.2.	CS5.4.2.	CS5.4.2.		
8	CS5.4.1.	CS5.4.1.	CS5.4.1.	CS5.4.1.	CS5.4.1.	CS5.4.2.		
9	CS5.4.2.	CS5.4.2.	CS5.4.2.	CS5.4.3.	CS5.4.3.	CS5.4.3.		
10	CS1.5.	CS1.5.	CS1.5.	CS5.4.1.	CS5.4.2.	CS5.4.2.	CS5.4.2.	CS5.4.2.
11								
12	CS4.1.4.	CS4.2.1.	CS4.2.1.	CS4.2.1.	CS4.2.1.	CS4.2.3.		
13	CS4.1.3.	CS4.1.3.	CS4.1.3.	CS4.1.3.	CS4.1.3.	CS4.1.4.		
14	CS4.1.1	CS4.1.1	CS4.1.1	CS4.1.1	CS4.1.1	CS4.1.1		
15	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.	CS4.4.4.		
16	CS4.1.5.	CS4.3.3.	CS4.3.4.	CS4.3.4.	CS4.3.4.	CS4.3.5.		
17	CS4.2.1.	CS4.2.2.	CS4.2.3.	CS4.2.3.	CS4.2.3.	CS4.2.4.		
18	CS4.4.1.	CS4.4.1.	CS4.4.1.	CS4.4.1.	CS4.4.1.	CS4.4.1.		
19	CS4.1.4.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.	CS4.3.2.		
20	CS1.2.	CS1.2.	CS1.2.	CS1.2.	CS1.5.	CS1.5.	CS2.1.	

Table 8.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 8 Science, Form Winter 2005

21	CS4. 1.3.	CS4. 1.4.	CS4. 1.4.	CS4. 1.4.	CS4. 1.4.	CS4. 1.4.	
22	CS4. 1.1	CS4. 2.4.	CS4. 3.2.	CS4. 3.2.	CS4. 3.2.	CS4. 3.3.	
23	CS4. 1.	CS4. 1.1	CS4. 1.3.	CS4. 1.4.	CS4. 1.4.	CS4. 1.4.	CS4. 1.4.
24							
25	CS3. 3.1	CS3. 3.1	CS3. 3.1	CS3. 3.1	CS3. 3.1	CS3. 3.2.	
26	CS1. 5.	CS3. 3.2.	CS3. 3.2.	CS3. 4.2.	CS3. 5.1.		
27	CS3. 5.1.	CS3. 5.1.	CS3. 5.1.	CS3. 5.2.	CS3. 5.2.	CS3. 5.3.	
28	CS1. 1.	CS1. 1.	CS1. 3.	CS1. 3.	CS1. 3.	CS2. 3.	CS5. 4.1.
29	CS1. 1.	CS2. 5.	CS2. 5.	CS3. 5.6.	CS3. 5.6.	CS3. 5.6.	
30	CS3. 2.3.	CS3. 2.3.	CS3. 5.2.	CS3. 5.2.	CS3. 5.2.	CS3. 5.2.	
31	CS5. 2.	CS5. 2.2.	CS5. 2.2.	CS5. 2.2.	CS5. 2.2.	CS5. 2.2.	
32	CS4. 1.5.	CS4. 1.5.	CS4. 1.5.	CS4. 1.5.	CS4. 1.5.	CS4. 3.4.	
33							
34	CS4. 3.1.	CS4. 3.1.	CS4. 3.1.	CS4. 3.1.	CS4. 3.1.	CS4. 3.1.	
35	CS1. 4.	CS1. 4.	CS1. 4.	CS1. 4.	CS1. 4.	CS4. 1.2.	
36	CS4. 2.1.	CS4. 2.4.	CS5. 2.1.	CS5. 2.1.	CS5. 2.2.	CS5. 3.1.	
37	CS1. 5.	CS1. 5.	CS1. 5.	CS1. 5.	CS2. 1.	CS4. 1.2.	CS4. 3.2.
38							
39							
40							
41							
42	CS3. 5.1.	CS3. 5.1.	CS3. 5.1.	CS3. 5.1.	CS3. 5.1.	CS3. 5.1.	
43	CS3. 2.2.	CS3. 2.2.	CS3. 2.2.	CS3. 2.2.	CS3. 2.2.	CS3. 2.2.	
44	CS3. 2.3.	CS3. 2.3.	CS3. 2.3.	CS3. 5.2.	CS3. 5.2.	CS3. 5.2.	
45	CS3.	CS3.	CS3.	CS3.	CS3.	CS3.	

Table 8.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 8 Science, Form Winter 2005

	5.1.	5.3.	5.6.	5.6.	5.6.	5.6.	
46	CS3. 5.1.	CS3. 5.1.	CS3. 5.1.	CS3. 5.1.	CS3. 5.1.	CS3. 5.1.	
47	CS3. 3.2.	CS3. 4.1.	CS3. 4.2.	CS3. 4.2.	CS3. 4.2.	CS3. 4.2.	
48							
49	CS1. 5.	CS1. 5.	CS1. 5.	CS1. 5.	CS1. 5.	CS1. 5.	
50	CS3. 2.1.	CS3. 2.1.	CS3. 2.1.	CS3. 2.1.	CS3. 2.1.		
51	CS1. 5.	CS1. 5.	CS1. 5.	CS1. 5.	CS1. 5.	CS1. 5.	
52	CS2. 5.	CS2. 5.	CS2. 5.	CS3. 5.6.	CS3. 5.6.	CS3. 5.6.	CS3. 5.6.
53	CS3. 5.1.	CS3. 5.1.	CS3. 5.1.	CS3. 5.5.	CS3. 5.5.	CS3. 5.5.	
54	CS3. 2.	CS3. 4.2.	CS3. 4.2.	CS3. 5.	CS3. 5.1.	CS3. 5.2.	
55	CS3. 5.2.	CS3. 5.2.	CS3. 5.2.	CS3. 5.2.	CS3. 5.2.	CS3. 5.2.	
56	CS3. 5.	CS3. 5.1.	CS3. 5.2.	CS3. 5.3.	CS3. 5.3.	CS3. 5.3.	
57	CS1. 5.	CS1. 5.	CS1. 5.	CS1. 5.	CS1. 5.	CS1. 5.	
58	CS1. 1.	CS1. 1.	CS1. 1.	CS1. 5.	CS1. 5.	CS1. 5.	

Table 8.10
Items Coded by Reviewers to Each Objective
Michigan Grade 8 Science, Form Winter 2005

Low		Medium		High
0		3.630952		31

I																				
CS1.1.	28	28	29	58	58	58														
CS1.2.	20	20	20	20																
CS1.3.	28	28	28																	
CS1.4.	35	35	35	35	35															
CS1.5.	10	10	10	20	20	26	37	37	37	37	49	49	49	49	49	49	51	51	51	51
	51	51	57	57	57	57	57	57	58	58	58									
CS1.6.																				
II																				
CS2.1.	20	37																		
CS2.2.																				
CS2.3.	28																			
CS2.4.																				
CS2.5.	29	29	52	52	52															
CS2.6.																				
III																				
CS3.1.																				
CS3.1.1.																				
CS3.1.2.																				
CS3.2.	54																			
CS3.2.1.	50	50	50	50	50															
CS3.	43	43	43	43	43	43														

Table 8.10
Items Coded by Reviewers to Each Objective
Michigan Grade 8 Science, Form Winter 2005

2.2.																				
CS3. 2.3.	30	30	44	44	44															
CS3. 2.4.																				
CS3. 3.																				
CS3. 3.1	25	25	25	25	25															
CS3. 3.2.	25	26	26	47																
CS3. 4.																				
CS3. 4.1.	47																			
CS3. 4.2.	26	47	47	47	47	54	54													
CS3. 5.	54	56																		
CS3. 5.1.	26	27	27	27	42	42	42	42	42	42	45	46	46	46	46	46	46	53	53	53
	54	56																		
CS3. 5.2.	27	27	30	30	30	30	44	44	44	54	55	55	55	55	55	55	56			
CS3. 5.3.	27	45	56	56	56															
CS3. 5.4.																				
CS3. 5.5.	53	53	53																	
CS3. 5.6.	29	29	29	45	45	45	45	52	52	52	52									
IV																				
CS4. 1.	23																			
CS4. 1.1	14	14	14	14	14	14	22	23												
CS4. 1.2.	35	37																		
CS4. 1.3.	13	13	13	13	13	21	23													
CS4. 1.4.	12	13	19	21	21	21	21	21	23	23	23	23								

Table 8.10
Items Coded by Reviewers to Each Objective
Michigan Grade 8 Science, Form Winter 2005

CS4.1.5.	16	32	32	32	32	32			
CS4.1.6.									
CS4.2.									
CS4.2.1.	12	12	12	12	17	36			
CS4.2.2.	17								
CS4.2.3.	12	17	17	17					
CS4.2.4.	17	22	36						
CS4.3.									
CS4.3.1.	34	34	34	34	34	34			
CS4.3.2.	19	19	19	19	19	22	22	22	37
CS4.3.3.	16	22							
CS4.3.4.	16	16	16	32					
CS4.3.5.	16								
CS4.4.									
CS4.4.1.	18	18	18	18	18	18			
CS4.4.2.									
CS4.4.3.									
CS4.4.4.	15	15	15	15	15	15			
CS4.4.5.									
CS4.4.6.									
V									
CS5.1.									

Table 8.10
Items Coded by Reviewers to Each Objective
Michigan Grade 8 Science, Form Winter 2005

CS5.1.1.													
CS5.1.2.	3	3	3	3	3								
CS5.1.3.	4	4	4	4	4	5	6	6	6	6	6		
CS5.1.4.	3												
CS5.1.5.													
CS5.2.	1	5	31										
CS5.2.1.	1	36	36										
CS5.2.2.	2	4	5	5	5	5	6	31	31	31	31	31	36
CS5.2.3.	1	1	1	1	2	2	2	2	2				
CS5.2.4.													
CS5.3.													
CS5.3.1.	36												
CS5.3.2.													
CS5.3.3.													
CS5.3.4.													
CS5.4.													
CS5.4.1.	7	8	8	8	8	8	10	28					
CS5.4.2.	7	7	7	7	7	8	9	9	9	10	10	10	10
CS5.4.3.	9	9	9										

Table 8.11

Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 8 Science, Form Winter 2005

Low		Medium		High
1		3		6

I								
CS1.1.	28:2	29:1	58:3					
CS1.2.	20:4							
CS1.3.	28:3							
CS1.4.	35:5							
CS1.5.	10:3	20:2	26:1	37:4	49:6	51:6	57:6	58:3
CS1.6.								
II								
CS2.1.	20:1	37:1						
CS2.2.								
CS2.3.	28:1							
CS2.4.								
CS2.5.	29:2	52:3						
CS2.6.								
III								
CS3.1.								
CS3.1.1.								
CS3.1.2.								
CS3.2.	54:1							
CS3.2.1.	50:5							
CS3.2.2.	43:6							

Table 8.11

Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 8 Science, Form Winter 2005

CS3. 2.3.	30:2	44:3						
CS3. 2.4.								
CS3. 3.								
CS3. 3.1	25:5							
CS3. 3.2.	25:1	26:2	47:1					
CS3. 4.								
CS3. 4.1.	47:1							
CS3. 4.2.	26:1	47:4	54:2					
CS3. 5.	54:1	56:1						
CS3. 5.1.	26:1	27:3	42:6	45:1	46:6	53:3	54:1	56:1
CS3. 5.2.	27:2	30:4	44:3	54:1	55:6	56:1		
CS3. 5.3.	27:1	45:1	56:3					
CS3. 5.4.								
CS3. 5.5.	53:3							
CS3. 5.6.	29:3	45:4	52:4					
IV								
CS4. 1.	23:1							
CS4. 1.1	14:6	22:1	23:1					
CS4. 1.2.	35:1	37:1						
CS4. 1.3.	13:5	21:1	23:1					
CS4. 1.4.	12:1	13:1	19:1	21:5	23:4			
CS4. 1.5.	16:1	32:5						

Table 8.11
Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 8 Science, Form Winter 2005

CS4. 1.6.			
CS4. 2.			
CS4. 2.1.	12:4	17:1	36:1
CS4. 2.2.	17:1		
CS4. 2.3.	12:1	17:3	
CS4. 2.4.	17:1	22:1	36:1
CS4. 3.			
CS4. 3.1.	34:6		
CS4. 3.2.	19:5	22:3	37:1
CS4. 3.3.	16:1	22:1	
CS4. 3.4.	16:3	32:1	
CS4. 3.5.	16:1		
CS4. 4.			
CS4. 4.1.	18:6		
CS4. 4.2.			
CS4. 4.3.			
CS4. 4.4.	15:6		
CS4. 4.5.			
CS4. 4.6.			
V			
CS5. 1.			
CS5. 1.1.			

Table 8.11

Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 8 Science, Form Winter 2005

CS5.1.2.	3:5					
CS5.1.3.	4:5	5:1	6:5			
CS5.1.4.	3:1					
CS5.1.5.						
CS5.2.	1:1	5:1	31:1			
CS5.2.1.	1:1	36:2				
CS5.2.2.	2:1	4:1	5:4	6:1	31:5	36:1
CS5.2.3.	1:4	2:5				
CS5.2.4.						
CS5.3.						
CS5.3.1.	36:1					
CS5.3.2.						
CS5.3.3.						
CS5.3.4.						
CS5.4.						
CS5.4.1.	7:1	8:5	10:1	28:1		
CS5.4.2.	7:5	8:1	9:3	10:4		
CS5.4.3.	9:3					

Table 8.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 8 Science, Form Winter 2005

Low DOK		Matched DOK		High DOK
1		3		6

I [2]:								
CS1.1. [2]:	28:2 [1.5]	29:1 [2]	58:3 [2]					
CS1.2. [3]:	20:4 [2]							
CS1.3. [1]:	28:3 [1.33]							
CS1.4. [1]:	35:5 [1]							
CS1.5. [2]:	10:3 [2]	20:2 [2]	26:1 [1]	37:4 [2]	49:6 [1.83]	51:6 [2]	57:6 [1.83]	58:3 [1.67]
CS1.6. [2]:								
II [2]:								
CS2.1. [3]:	20:1 [2]	37:1 [3]						
CS2.2. [2]:								
CS2.3. [2]:	28:1 [1]							
CS2.4. [1]:								
CS2.5. [2]:	29:2 [1.5]	52:3 [1.33]						
CS2.								

Table 8.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 8 Science, Form Winter 2005

6. [1]:			
III [2]:			
CS3. 1. [2]:			
CS3. 1.1. [1]:			
CS3. 1.2. [2]:			
CS3. 2. [2]:	54:1 [1]		
CS3. 2.1. [2]:	50:5 [1.4]		
CS3. 2.2. [1]:	43:6 [1.67]		
CS3. 2.3. [1]:	30:2 [1]	44:3 [1.33]	
CS3. 2.4. [2]:			
CS3. 3. [2]:			
CS3. 3.1 [2]:	25:5 [1.2]		
CS3. 3.2. [2]:	25:1 [1]	26:2 [2]	47:1 [2]
CS3. 4. [2]:			
CS3. 4.1. [2]:	47:1 [2]		

Table 8.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 8 Science, Form Winter 2005

CS3.4.2.[2]:	26:1 [1]	47:4 [1.5]	54:2 [2]					
CS3.5.[1]:	54:1 [1]	56:1 [2]						
CS3.5.1.[1]:	26:1 [1]	27:3 [1.67]	42:6 [1.33]	45:1 [2]	46:6 [1]	53:3 [1.33]	54:1 [1]	56:1 [2]
CS3.5.2.[1]:	27:2 [1.5]	30:4 [1]	44:3 [1.33]	54:1 [2]	55:6 [1.17]	56:1 [2]		
CS3.5.3.[2]:	27:1 [1]	45:1 [2]	56:3 [1.33]					
CS3.5.4.[1]:								
CS3.5.5.[1]:	53:3 [1.33]							
CS3.5.6.[1]:	29:3 [1.33]	45:4 [2]	52:4 [1.5]					
IV[2]:								
CS4.1.[2]:	23:1 [2]							
CS4.1.1[2]:	14:6 [1.33]	22:1 [2]	23:1 [2]					
CS4.1.2.[1]:	35:1 [1]	37:1 [2]						
CS4.1.3.[2]:	13:5 [1]	21:1 [1]	23:1 [2]					
CS4.1.4.[1]:	12:1 [1]	13:1 [1]	19:1 [2]	21:5 [1.2]	23:4 [1.75]			
CS4.1.5.	16:1 [2]	32:5 [1.6]						

Table 8.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 8 Science, Form Winter 2005

[2]:			
CS4.1.6.[2]:			
CS4.2.[2]:			
CS4.2.1.[1]:	12:4 [1.25]	17:1 [1]	36:1 [1]
CS4.2.2.[2]:	17:1 [2]		
CS4.2.3.[2]:	12:1 [2]	17:3 [1.33]	
CS4.2.4.[1]:	17:1 [1]	22:1 [1]	36:1 [1]
CS4.3.[2]:			
CS4.3.1.[2]:	34:6 [1.83]		
CS4.3.2.[2]:	19:5 [1.2]	22:3 [2]	37:1 [2]
CS4.3.3.[1]:	16:1 [1]	22:1 [2]	
CS4.3.4.[2]:	16:3 [1.33]	32:1 [1]	
CS4.3.5.[2]:	16:1 [1]		
CS4.4.[1]:			
CS4.4.1.[1]:	18:6 [1.33]		

Table 8.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 8 Science, Form Winter 2005

CS4.4.2.[1]:						
CS4.4.3.[1]:						
CS4.4.4.[2]:	15:6[1.17]					
CS4.4.5.[1]:						
CS4.4.6.[2]:						
V[2]:						
CS5.1.[2]:						
CS5.1.1.[2]:						
CS5.1.2.[2]:	3:5[1.2]					
CS5.1.3.[2]:	4:5[1.2]	5:1[2]	6:5[1.4]			
CS5.1.4.[2]:	3:1[1]					
CS5.1.5.[1]:						
CS5.2.[1]:	1:1[1]	5:1[2]	31:1[1]			
CS5.2.1.[2]:	1:1[2]	36:2[1.5]				
CS5.2.2.	2:1[2]	4:1[2]	5:4[1.75	6:1[2]	31:5[1]	36:1[1]

Table 8.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 8 Science, Form Winter 2005

[1]:			]			
CS5.2.3.[1]:	1:4[1]	2:5[1]				
CS5.2.4.[1]:						
CS5.3.[2]:						
CS5.3.1.[2]:	36:1[1]					
CS5.3.2.[1]:						
CS5.3.3.[2]:						
CS5.3.4.[1]:						
CS5.4.[2]:						
CS5.4.1.[2]:	7:1[1]	8:5[1.8]	10:1[2]	28:1[2]		
CS5.4.2.[2]:	7:5[1.8]	8:1[2]	9:3[1.33]	10:4[2]		
CS5.4.3.[2]:	9:3[1]					