Models for Alignment Analysis and Assistance to States

Prepared by the Council of Chief State School Officers

September 2002

Recent advances have been made in developing and applying more detailed, in-depth measures of the degree of alignment of assessments and the content standards or curriculum guiding instruction. Many states are seeking ways to tighten the link between their policies for the content of instruction, such as standards documents or curriculum frameworks, and the statewide assessment instruments used to measure achievement.

In this summary, the Council staff is providing basic information to chiefs and state leaders on several models for alignment analyses. Our goal is to assist chiefs in making informed decisions about improving capacity for analyzing alignment. Each of the models summarized here has been used by several states, and they all are operational. In coming months, CCSSO expects to expand our work with states on alignment analyses, and we will cooperate with the other organizations that can assist states with alignment studies.

Need for State Alignment Analysis

There are a number of reasons for the heightened interest in methods of determining the degree of alignment of state content standards with state assessments, as well as with curriculum materials and instruction in classrooms. The policy demands of accountability systems increase the need for schools to focus curriculum and instruction on what will be measured system-wide. At the same time, educators typically do not want to have teaching dictated by the limits of what can be tested in on-demand assessments. Methods of measuring and reporting on alignment can allow all parties to see where standards and assessments intersect and where they do not. In addition, the reauthorization of ESEA under No Child Left Behind legislation has placed greater responsibility on states to implement assessment and accountability systems that are aligned with state content standards. Evidence needs to be provided of how the degree of alignment is measured. State funds under NCLB can be used by states to conduct alignment studies.

Models for Alignment

The Council has participated in developing two models, or approaches, to conducting an alignment analysis, and we are very familiar with two other models. In this memo, we outline information about four models that are available to assist states in planning and conducting alignment studies:

- **"Webb"** -- The model was developed by Norman Webb of the Wisconsin Center for Education Research (Univ. of Wisconsin-Madison) with assistance from CCSSO and states.

- **"SEC"** -- The SEC (Surveys of Enacted Curriculum) model was developed by Andrew Porter, Director of the Wisconsin Center for Education Research, and John Smithson (Univ. of Wisconsin-Madison) with assistance from CCSSO and states.

- **"Achieve"** -- The Achieve model was developed by Achieve, Inc., a nonprofit education leadership organization based in Washington, DC.

- **"CBE"** -- The Council for Basic Education (CBE), based in Washington, DC, is providing technical support to states for implementing No Child Left Behind including alignment analysis.

Finally we describe an interactive web-based system for curriculum mapping, developed by NCREL, which has primarily been used by districts to compare local curriculum, textbooks, and materials with international frameworks for mathematics and science education.

Description of Models[1]

<u>Webb</u>

The model developed by Norman Webb provides a reliable set of procedures and criteria for conducting alignment analysis studies, which combine qualitative expert judgments and quantified coding and analysis of standards and assessments. The product of the analysis is a set of statistics for each standard and grade on the degree of intersection, or alignment, between the content embedded in state content standards and the content in state assessments. The Webb model has been used in alignment studies with more than 10 states, partly through SCASS collaborative projects managed by CCSSO. The model has been used for language arts, mathematics, science, and social studies.

Following the training process, four to six reviewers, including teachers and content specialists, individually identify the content standard objectives that match each assessment item. They first determine the 'depth of knowledge' required by each objective or benchmark of the content standards being analyzed, and code each using one of four levels of knowledge: (a) Recall, (b) Skill/Concept, (c) Strategic Thinking, (d) Extended Thinking. Operational definitions and labels vary somewhat by subject. Second, reviewers determine the objective or benchmark represented by each item or task on the state assessment being

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[1] In addition to the alignment models presented, other organizations have conducted studies that have examined the content of state standards or state assessments, including American Association for Advancement of Science/Project 2061, Fordham Foundation, American Federation of Teachers, and TIMSS. In this summary, we are referring to alignment methods that have the intended primary goal of determining the degree of alignment of state content standards and state assessments for the same subject and level, and that are models using multiple criteria for measuring degree of alignment.   We are not discussing simple topic checklists that are often provided with curriculum materials or tests.

reviewed, and they rate the level of knowledge necessary for a student to successfully complete the item or task.

The results for each reviewer are entered into a spreadsheet by tracking the corresponding objectives for each item and if the level of knowledge of the item is below, at, or above the level of knowledge of the corresponding objective. The content ratings and codes are statistically analyzed across the reviewers to produce statistics and tabular reports on four criteria of alignment for each standard: 1) Categorical concurrence, 2) Depth-of-knowledge consistency, 3) Range of knowledge correspondence, and 4) Balance of representation. Reliability among reviewers in assigning levels of knowledge to items has been relatively high, generally ranging from .6 to .9. The criteria and measures were developed by a multi-disciplinary panel selected and convened by Webb and CCSSO.

For further information on the model, and reports, please refer to the following web sites, or contact Norman Webb (608/263-4287), or John Olson at CCSSO (202/336-7075):
http://www.wcer.wisc.edu
http://www.ccsso.org/pdfs/AlignmentPaper.pdf

SEC

The Surveys of Enacted Curriculum (SEC) alignment methodology has been field tested and demonstrated with 11 states and four large urban districts. Development and application of the model was supported by CCSSO through grants from the National Science Foundation and through a state collaborative project. The SEC model produces alignment analyses of standards, assessments, and instruction by use of a common content matrix or template that allows comparison across schools, districts or states. The content matrix and language has two dimensions for categorizing subject content: Content Topics and Cognitive Demand (or expectations for student performance).

To produce an alignment analysis, standards, assessments, instruction, or curriculum materials are systematically categorized according to a common framework of content topics (down to fine grain topics) by cognitive demand.   The cognitive demand includes five categories, such as, for mathematics: a) Memorize, b) Perform procedures, c) Communicate understanding, d) Generalize/prove, and e) Solve non-routine problems. For standards or assessment documents, four reviewers, who are content experts (including teachers), code each assessment item or benchmark into the two-dimensional matrix. To produce data on instructional content, surveys are conducted with teachers who report the time spent teaching content in their class over a one-year period using the same content matrix.

Highly accessible content maps and graphs are used to visually portray differences and similarities in content from instruction to standards to assessments, and written interpretations of the content charts are provided. Also, statistics of alignment for each grade and subject are computed. A new, Internet web-based survey, analysis, and reporting system will reduce time and costs and greatly increase accessibility to a variety of

users. Alignment studies have focused on math and science, and, by early 2003, language arts/reading analysis will be available.

For further information on the SEC model or to review completed state alignment analyses, please contact Andrew Porter or John Smithson at WCER (johns@education.wisc.edu, 608/263-4200 or 263-4354), or Rolf Blank at CCSSO (rolfb@ccsso.org). Please refer to these websites for further details:http://www.ccsso.org/sec.html or http://www.wcer.wisc.edu.

Achieve

The Achieve model provides an in-depth qualitative and quantitative analysis on the alignment of assessments to state standards. A number of states have worked with Achieve using this approach. In the Achieve model (protocol), a panel of content experts judges the degree of alignment between assessment items and standards using five criteria:

1) Content Centrality,
2) 2) Performance Centrality,
3) 3) Challenge,
4) 4) Balance, and
5) 5) Range.

To determine content and performance centrality, reviewers compare, in turn, the content and the performance, required by an individual assessment item to that of the related standard and assign each item to one of four categories for both content and performance centrality based on the degree of alignment. To evaluate challenge, reviewers analyze each item for source of challenge to ensure that the item is "fair," and for level of demand—rating the item on a scale of 1 to 4. They then examine all the items that relate to a particular standard, such as algebra, and judge the overall level of challenge of the item set. To evaluate balance, reviewers compare the extent to which the content delineated in the standards receives the same emphasis on the related item set and if that emphasis is appropriate. Reviewers also compute the range (the proportion of objectives explicating a standard that are assessed by at least one item) of each item set as a simple check on coverage. (Before reviewers apply the protocol they confirm the test developer's blueprint, verifying that each item generally corresponds to at least one standard. If an item does **not** map to any of the standards, that item is not evaluated further. Where the test developer fails to provide a blueprint, reviewers construct one. Confirming the test blueprint is important because blueprints are the basis of score reports.) Achieve provides quantitative data on the test blueprint, content and performance centrality, source of challenge and level of demand, as well as written commentary on overall patterns, including the level of challenge and balance for each standard and for the test as a whole.

Achieve also provides four additional services: Standards Benchmarking in which content experts compare a state's standards to exemplary state and international standards (This service is often coupled with alignment studies so states receive a comprehensive review of their standards and assessment system); Augmentation Analysis in which experts compare "off-the-shelf," norm-referenced tests to a state's standards and recommend ways to

customize the test to improve alignment and conform to NCLB; Professional Development for state educators to build their capacity to conduct their own alignment studies; and Policy Audits in which an expert panel examines state documents and conducts a site visit to determine the effectiveness of a state's reform efforts, identifying strengths and areas for improvement. Future policy reviews will also focus on helping states maintain the quality of their reforms, while implementing NCLB.

For further information and examples of standards benchmarking, alignment analysis and policy studies, refer to the Achieve website, http://www.achieve.org or contact Jean Slattery, Director Benchmarking Initiative (jslattery@achieve.org).

CBE

The Council for Basic Education was founded in 1956 and is an independent, non-profit organization, whose mission is to promote high academic standards, exemplary teaching, and high achievement for all students. No Child Left Behind requires states to align their current state-wide test with their state's standards or select a new test for state-wide administration that is aligned to the state's standards. CBE can provide technical support in both of these instances, either by conducting the alignment work or, if desired, by training and supervising a team of educators to conduct the alignment.

The CBE alignment process and tools are straightforward and easy to use. The process will identify test items or framework specifications that match benchmarks and record the degree of match in content and performance level. Decisions are reached through reviewers working in pairs to apply an evaluation rubric and exemplars to determine degrees of match. Since state standards require higher order thinking skills, the alignment reviewers will be trained to recognize and record the rigor of the items. The process provides for continual quality checks so that drift from agreed-upon standards of alignment is quickly identified.

At the completion of the alignment process, the state will receive from CBE a report of the areas reviewed and the content areas and grade levels in which the state will need to augment the test to render it in appropriate alignment with the state content standards. CBE will also specify the steps needed for the test to be in compliance with the ESEA/NCLB requirements and to serve the state's goals of improved student performance. These recommendations will include those necessary to maintain validity and reliability. Recommendations will address psychometric issues that must be such as comparison of performance on an augmented version of a test to regular versions, performance of students in other states and NAEP. As an option, CBE can also provide services to write or review modifications to the test and can conduct reviews and alignment in all subject areas in the liberal arts (English language arts, mathematics, science, history, civics, geography, foreign languages, and the arts). For local school systems, this process can be used for alignment of standards and curriculum and can be combined with an audit of the "taught curriculum." CBE's training and alignment processes have been executed in several projects, including a standards and assessment alignment study for a local school system, several states, and the standards alignment described in CBE's "Great Expectations" report

on the analysis of content and rigor in English language arts and mathematics in all 50 states**.**

For further information, contact Robert C. Rice at Council for Basic Education, (202/347-4171; brice@c-b-e.org).

Dimensions for Comparison

Key Features

Webb:
- Qualitative ratings produce quantified data; analysis provides multiple statistics and rating of each standard by grade, or alignment "profile."
- Low inference judgments required by reviewers on depth of knowledge and match of assessments to standards.
- Independent coding by reviewers.
- Statistical procedures for measuring inter-rater reliability, and variation in alignment statistics.
- Modest investment and comparatively short completion time.

SEC:
- Common content matrix allows comparison of instruction ("enacted curriculum") with standards and assessments, and alignment analysis of standards with assessments and curriculum materials.
- Flexible model for comparisons of alignment between states, and states to national assessments and standards, as well as state to local.
- Measures of alignment are highly predictive of student achievement scores; and alignment results can assist schools and teachers in improvement of instructional strategies and focus of curriculum.
- Modest investment in assessment and standards review plus additional modest investment offers reliable, comparable data on instruction from a range of schools.

Achieve:
- In-depth review and analysis of standards and assessments across multiple criteria.
- High inference judgments needed by reviewers.
- Achieve provides extensive secure technical reports; states also may opt for summary reports of findings suitable for sharing with stakeholders, often accompanied by presentation and debriefing session.
- Professional Development, Standards Benchmarking, Augmentation Analysis and Policy Audits are four additional services available to states.
- Completion time and cost depend on the options selected, as negotiated with states.

CBE:
- Criteria used to measure the degree by which standards, curriculum and assessments are aligned include (1) content, (2) content balance, (3) rigor, and (4) item response type.
- Scoring rubrics and exemplars of matches are used to avoid arbitrariness.

- ♦ Calibration of scorers' results and planned random checks ensure scorer reliability.
- ♦ An analysis report on gaps, content match, performance level match, and item frequency is prepared.
- ♦ Analysis is conducted by CBE in-house or by a state-designated team.
- ♦ Process can be used to align and modify an existing test or to select a new test.

Time/Effort Required

Webb:
One-half day to train reviewers; one day per team for matching items and benchmarks and rating depth of knowledge (multiple grades); one month data analysis and production of tables/report.

SEC:
One-half day to train reviewers; one day per team for coding items or benchmarks to matrix (multiple grades); one hour per teacher for survey of instruction; one week for alignment analysis and report development using web-based data and reporting system.

Achieve:
Achieve draws from a pool of seasoned reviewers so training needed to establish a common basis for reviews is minimal; alignment reviews typically require one day/test; time required for report writing depends on the services states select and is negotiated with states.

CBE:
One-half day to train reviewers; three days per content team per test (if multiple tests are examined) for matching; one month for analysis and report preparation.

Comparison/Reference Point

Webb:
A state's standards are compared to same state's assessment; some reference to national standards for panel judgments; statistical measures used provide some comparison.

SEC:
Extent of alignment among content of instruction, assessments, and content standards are directly comparable across states, districts or schools due to use of common content matrix. Model unique among four on this criterion.

Achieve:
State standards compared to same state's assessment; no cross-state or external analysis.

CBE:

State standards compared to state assessment or to specifications for assessments under consideration for selection. For curriculum audits, national and state standards are used, as well as content from NAEP and TIMSS.

NCREL Curriculum Mapping

Through the Curriculum Mapping Website developed by North Central Regional Educational Laboratory (NCREL), educators can analyze mathematics and science curriculum, textbooks, materials, and standards in relation to the international frameworks developed for the Third International Mathematics and Science Study (TIMSS) in 1995. Researchers at the U.S. TIMSS National Research Center at Michigan State University conducted analyses of the curriculum of over 40 participating countries and applied the model to analysis of state standards and curriculum materials.

Results from the TIMSS, which was the most extensive study of international achievement to date, provided overwhelming evidence that topics in U.S. curricula are too numerous and retained too long. Unfortunately, district administrators lack user-friendly methods to make informed decisions about curriculum.

NCREL responded by developing an interactive Web site designed to assist school districts in their reform efforts of mathematics and science curricula. In an ongoing effort to develop accessible data-driven decision-making tools, NCREL has scaled up a TIMSS curriculum survey to allow for online mapping and analysis. Through the site, users can make comparisons of their curriculum materials with the mathematics and science curriculum maps from top-achieving nations.

The TIMSS curriculum frameworks, which provide the basis for the NCREL curriculum mapping website, were originally developed by the Survey of Mathematics and Science Opportunities (SMSO) Research Project, funded by the U.S. Department of Education and the National Science Foundation.

For further information on the NCREL Curriculum Mapping, please link to the website: http://currmap.ncrel.org/about.htm.

Next Steps for State Leaders

As state education leaders identify specific needs for alignment studies and determine an approach that appears to match with your needs, you are likely to need more information. At CCSSO, we can provide further information on these models and assist you in comparing these models with other options you may want to consider or have examined. Some of the alignment analysis work can be carried out through the CCSSO collaborative projects with states (SCASS projects).

Please contact Rolf Blank at CCSSO for further information on these models or for assistance to your state (rolfb@ccsso.org; 202/336-7044). You may also contact one of the four organizations directly at the numbers or email addresses provided in the summary description section.