



**Alignment Content Analysis of NAEP 2007 Mathematics Assessment  
Using the Surveys of Enacted Curriculum Methodology**

November 2007

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## CCSSO

### **Alignment Content Analysis of NAEP 2007 Mathematics Assessment Using the Surveys of Enacted Curriculum Methodology**

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The Council of Chief State School Officers (CCSSO) conducted an alignment content analysis of the 2007 NAEP Mathematics assessments for students at grades 4 and 8 using the methodology and mathematics content framework of the Surveys of Enacted Curriculum (SEC) project. The project was supported by the National Center for Education Statistics through the Assessment Division. The results of the alignment analysis are now being reported.

The SEC instruments include a two-dimensional content framework for each subject that was designed to collect, analyze and report data on curriculum that has been taught and analyze curriculum content in relation to standards (intended curriculum) as well as assessments that determine what has been learned. During the summer 2007, CCSSO arranged for mathematics content coding teams to use the SEC method and content framework to analyze the NAEP mathematics assessment items for 2007. CCSSO together with our research contractor Wisconsin Center for Education Research (WCER) conducted alignment analyses using the coding results and we now provide data to demonstrate the alignment of NAEP Mathematics to state standards and assessment.

The Surveys were developed by CCSSO and the Wisconsin Center for Education Research through a collaborative project involving educators, researchers, and subject area specialists (see Blank, Porter, & Smithson, 2001; Porter, 2002). The SEC analysis method has been used previously to analyze standards and assessment in mathematics as well as science and English language arts in over 30 states (see [www.SEOnline.org](http://www.SEOnline.org) for description of the methodology, the content framework, and prior state content analysis results).

We have produced an interactive viewer (using Excel software) that allows any user to examine the NAEP content analysis results (see accompanying file and example charts below). The viewer contains several ways to view the data, including content maps, marginal charts and alignment tables based on results of content analyses conducted on the complete bank of NAEP mathematics grades 4 & 8 assessment items. In addition, results of previous content analyses conducted on the 2005 NAEP Frameworks for grades 4 & 8 are included for comparison purposes. Results for the NAEP 2007 Math Assessments are reported by individual analyst, as well as the averaged result across analysts. Four analysts participated in the content analysis of 2007 NAEP grade 4 assessment items, and 3 analysts (the minimum number recommended) participated in the analysis of NAEP grade 8 assessment items.

Descriptive results can be viewed on the Content Map and Marginals worksheets. Alignment results across all raters and targets can be viewed on the Align worksheet, while detailed alignment results for a given pair of results can be found in the AlignTable

worksheet. The align worksheet shows inter-rater alignment results... providing a basis for describing and summarizing inter-rater reliability. The AlignTable worksheet reports detailed alignment results for the comparison results selected from either the ContentMap or Marginals worksheet.

### **Inter-rater Reliability**

Despite scheduling problems that resulted in much of the analyses being conducted remotely and without the full benefit of team interactions and discussions, inter-rater reliability results are well above-average. While inter-rater reliability is not the preferred measure for judging SEC methodological soundness, it does provide a good indication of how well analysts agreed in their results. Given that these raters did not have the usual amount of opportunity to discuss their results and rationales, the relatively high inter-rater reliability is a good sign that the process did not suffer from a reduced amount of team discussion. It is also likely that utilizing analysts that were veterans to the process helped with this. The average inter-rater reliability across both documents is 0.58. Typical inter-rater reliability is about .50.

### **NAEP Mathematics Assessments by NAEP Framework**

Alignment between the complete bank of assessment items and previous content analyses of the 2005 NAEP Frameworks is relatively high, comparable to the best alignment results seen for state framework/standards to assessment alignment results. Based upon available mathematics alignment data from state documents (n = 59 comparisons, or 118 documents), the mean alignment for state standards/frameworks to state assessments is .26, with a standard deviation of .10, a minimum alignment of .09 and maximum alignment of .49.

The degree of alignment of the NAEP assessment items to the NAEP Framework is .40 for Grade 4, and .36 for Grade 8. Both measures are the equivalent of one standard deviation or more higher than the average state alignment measures. These alignment indices are high. We visually observe in the content maps that all of the content topics in the framework are covered in the assessments although at slightly different levels of emphasis. The primary difference is that the NAEP assessment requires fewer levels of expectations (or cognitive demand) for student performance than the content specified in the NAEP framework.

**We have attached content maps from two states** (Indiana, Wisconsin) to show the alignment with NAEP Math assessment. These examples highlight the kind of analysis that is possible for state level standards and assessments with the NAEP assessments.

On the attached charts, the “alignment index” refers to the degree of consistency or match between the content (2 dimensions) for the document on the left side with the content of the document on the right side. The “coarse grain” statistic refers to the alignment or consistency of the main topics and expectations for the two documents shown in a chart. The “re-centered” statistic (e.g. under the Wisconsin framework to NAEP framework chart for Number sense) refers to the alignment of the two documents content at the fine grain level.

### **Wisconsin grade 4 state mathematics framework by NAEP grade 4 assessment**

The content map below shows the degree of alignment between Wisconsin's grade 4 math framework content and the NAEP grade 4 assessment at .36. The alignment is high. One observation in comparing the content maps is that the Wisconsin framework has strong consistency with the NAEP topics, but the Wisconsin framework is characterized by very heavy emphasis of expectations for learning across all topics at the procedural level (2<sup>nd</sup> column from left). The NAEP assessment has items that were coded at all 5 levels of expectations (Memorize, Perform procedures, Demonstrate, Conjecture/prove, and Non-routine problems).

For the topic area of Number Sense, the NAEP assessment includes items at the Memorize/factual level while the Wisconsin framework does not. The NAEP assessment includes items covering operations, decimals, ratios/proportion, and factors/divisibility, while the Wisconsin math framework for grade 4 does not cover these topics. The Wisconsin framework places stronger emphasis on mathematical properties at grade 4 than the NAEP assessment.

### **Indiana grade 8 mathematics assessment by NAEP grade 8 assessment**

The alignment of Indiana's grade 8 state assessment and the NAEP grade 8 assessment is high at .34. There is high consistency between the assessments on the main math topic areas. The NAEP assessment includes items at all five levels of expectations for learning, while Indiana assessment has no items at the Non-routine level and a small number of items addressing the Conjecture/prove expectation. The Indiana grade 8 assessment places greater emphasis on Number sense than the NAEP assessment.

The charts analyzing the topic of Geometric concepts show that the Indiana assessment emphasizes a small number of topics in Geometry while the NAEP assessment (which includes a greater number of math items in total) emphasized a broader range of topics at grade 8. The "re-centered" alignment statistic for this particular topic is only .11. This rating of alignment confirms the visual evidence that the Indiana assessment does not include a lot of the geometry content called for in the NAEP assessment at grade 8.

### **Summary**

Based on the initial review of data by CCSSO and WCER, we are confident that the content analyses of NAEP assessment items provide a valid description of the content assessed by those items. Moreover, the content analysis results from the NAEP Mathematics content analysis have been posted to the SEC Online system so that teachers may use these results to become better informed about the content focus of NAEP assessments, and as a consideration, in conjunction with state standards and other relevant content targets as they make content coverage decisions for their classrooms.

**Access Online**

The results of the NAEP Mathematics Assessment Grade 4 and Grade 8 Content Analysis are available on the SEC online system at

<http://seconline.wceruw.org/secWebHome.htm>

click on **Content Analysis**; then, See,

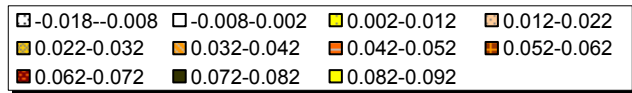
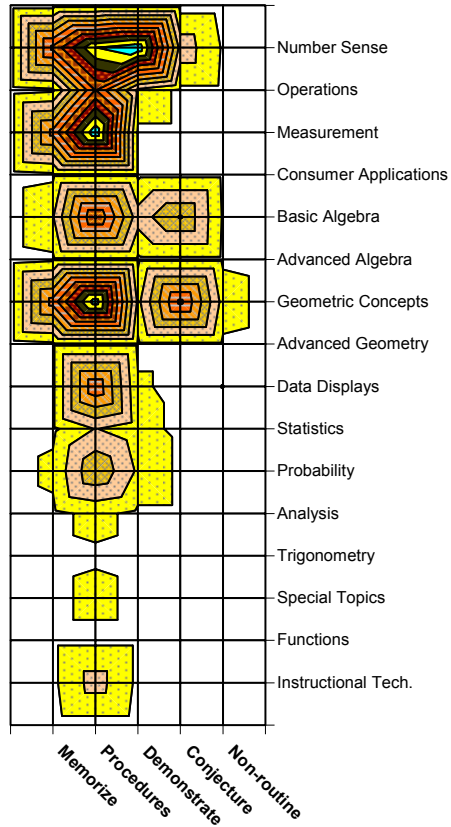
“For access to content maps of Standards and Assessments analyzed thus far,” [click](#)

[here](#);

then **Select Mathematics, K-12, and Submit.**

NAEP 2007 Grade 4 or Grade 8 in left column can be compared to any state standards or other state in the left column.

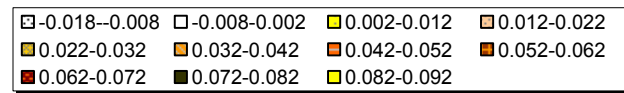
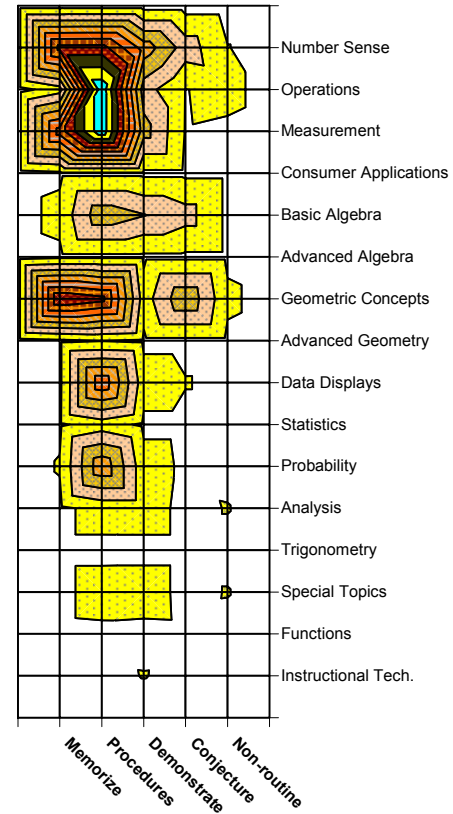
NAEP 05 Frmwrk Gr. 4  
Document  
All Content Areas



Alignment Index 0.34

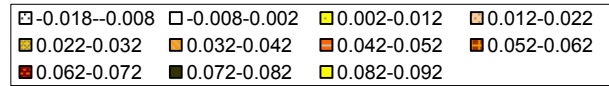
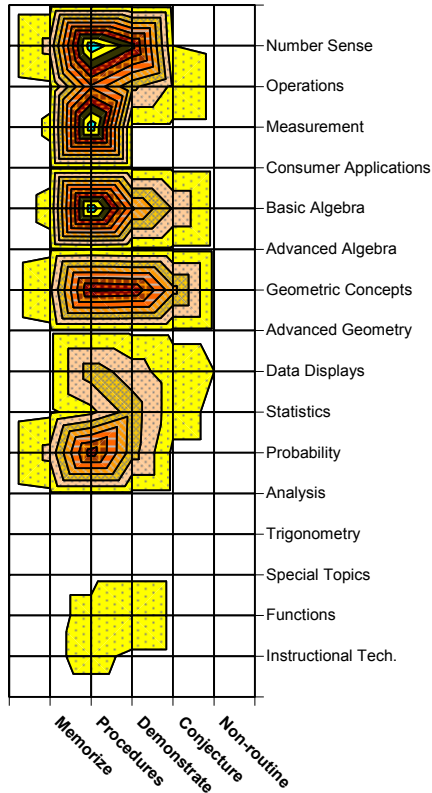
Coarse Grain: 0.71

NAEP Gr.4 Assessment  
Document  
All Content Areas



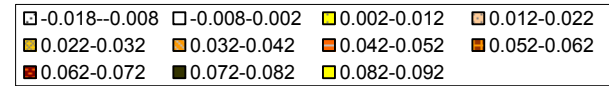
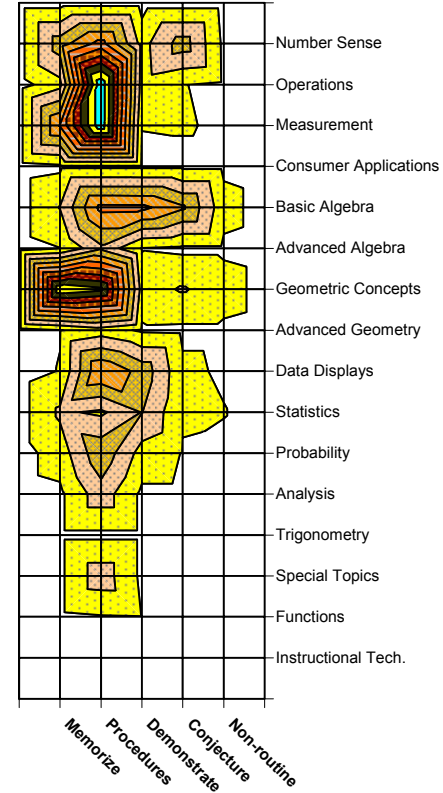
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**NAEP 05 Frmwrk Gr. 8  
Document  
All Content Areas**



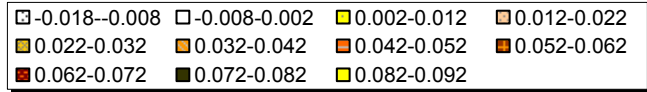
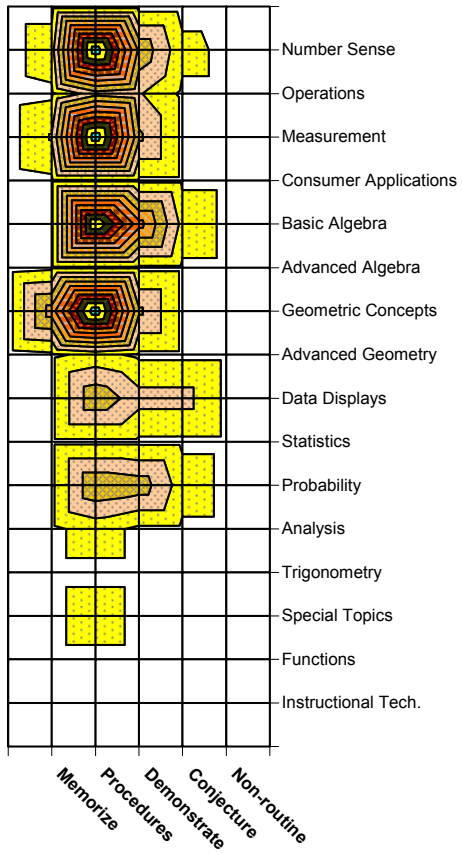
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**NAEP Gr.8 Assessment  
Document  
All Content Areas**



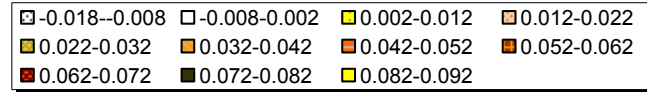
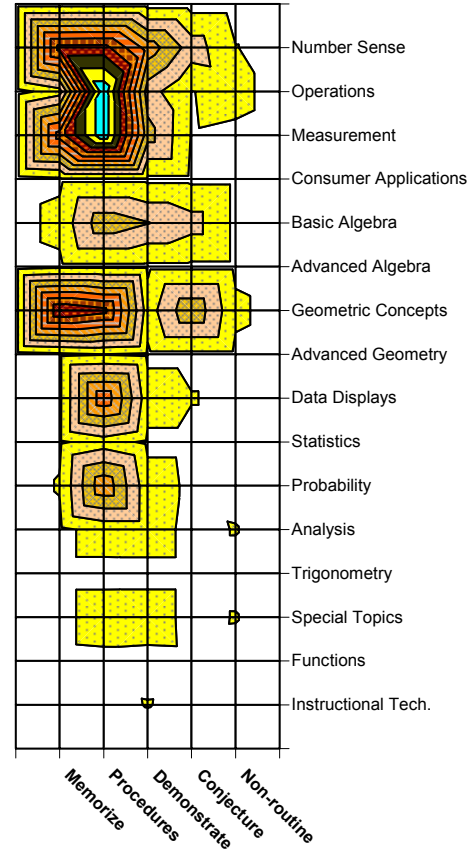
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**WI Gr. 4 Frameworks Document**  
All Content Areas



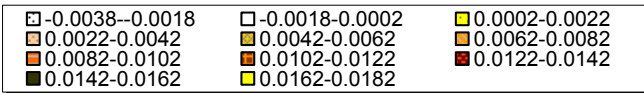
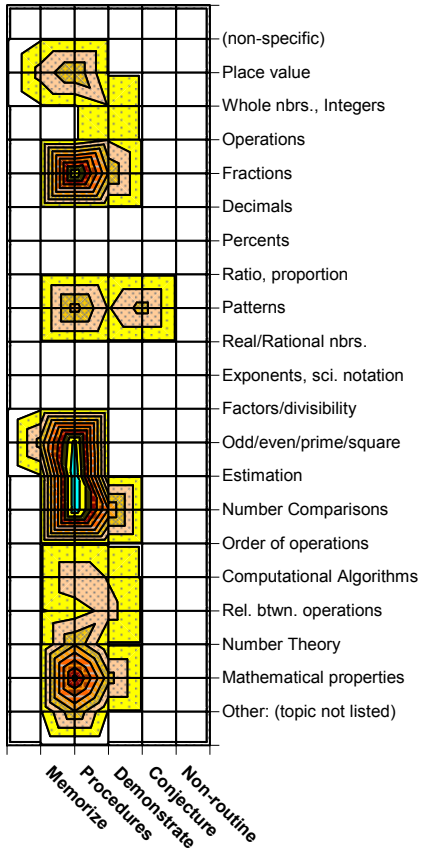
Coarse Grain: 0.55

**NAEP Gr.4 Assessment Document**  
All Content Areas



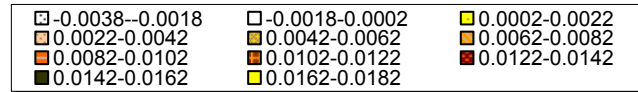
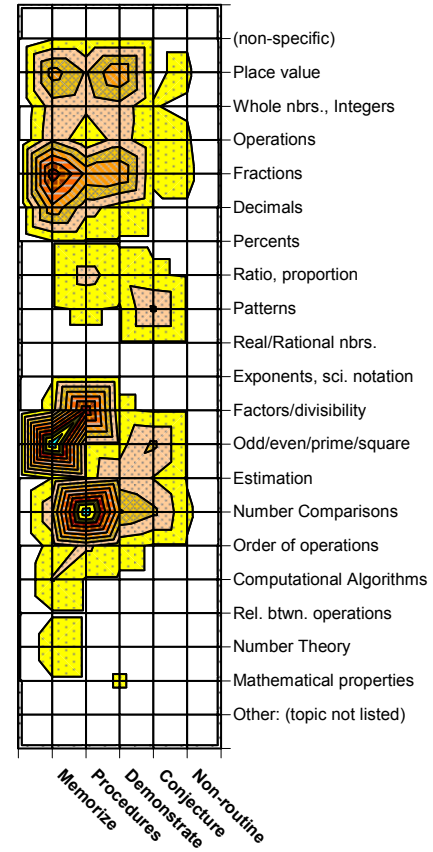
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**WI Gr. 4 Frameworks  
Document  
Number Sense**



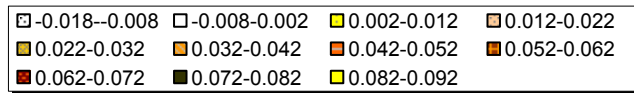
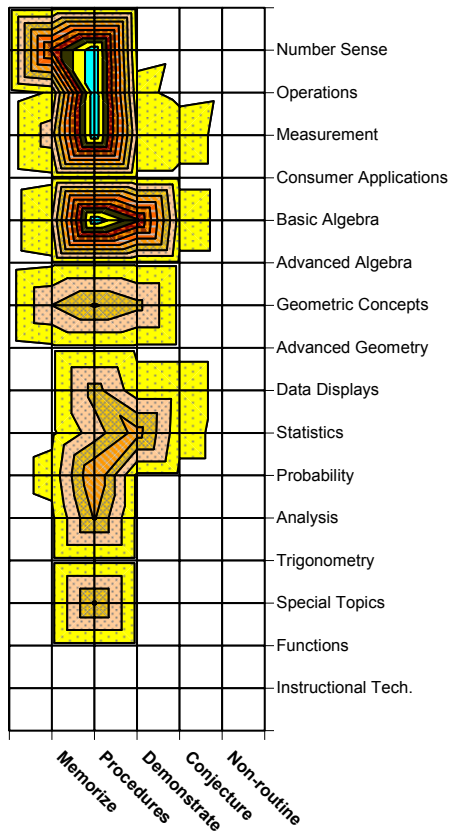
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**NAEP Gr.4 Assessment  
Document  
Number Sense**



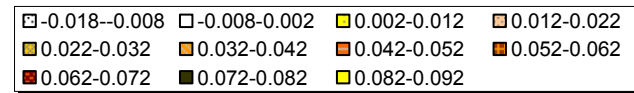
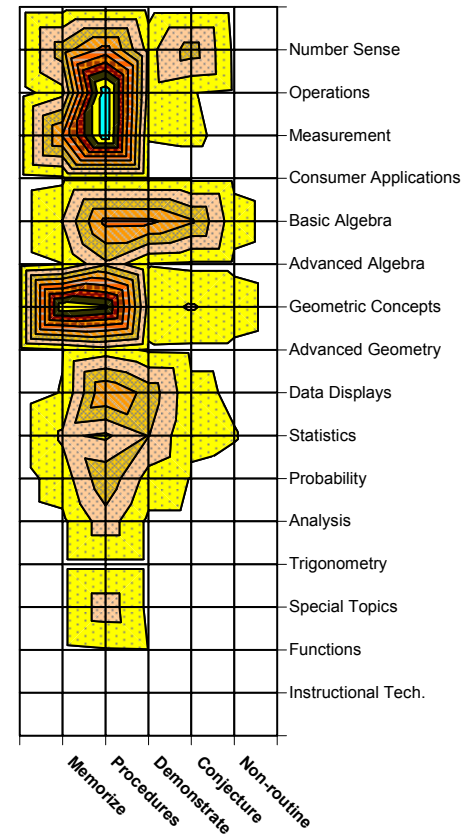
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**IN Gr. 8 Assessment  
Document  
All Content Areas**



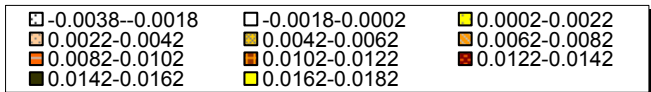
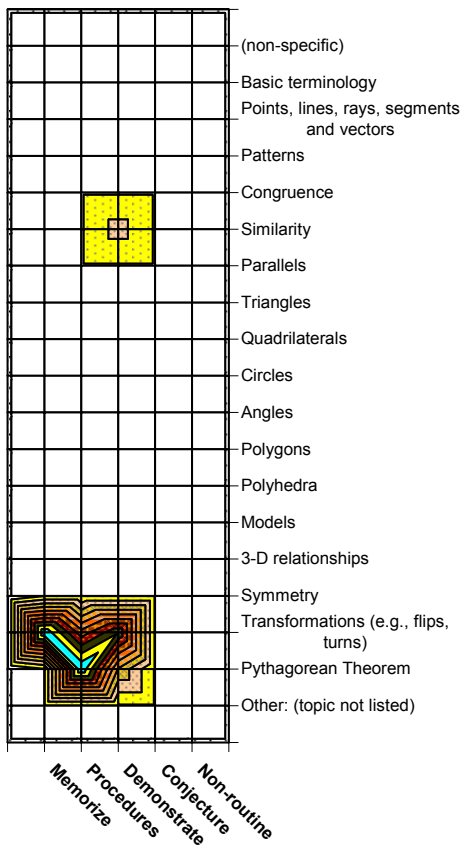
Coarse Grain: 0.66

**NAEP Gr.8 Assessment  
Document  
All Content Areas**



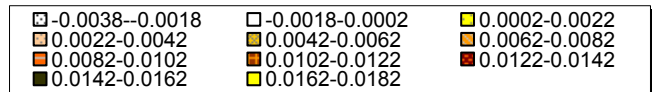
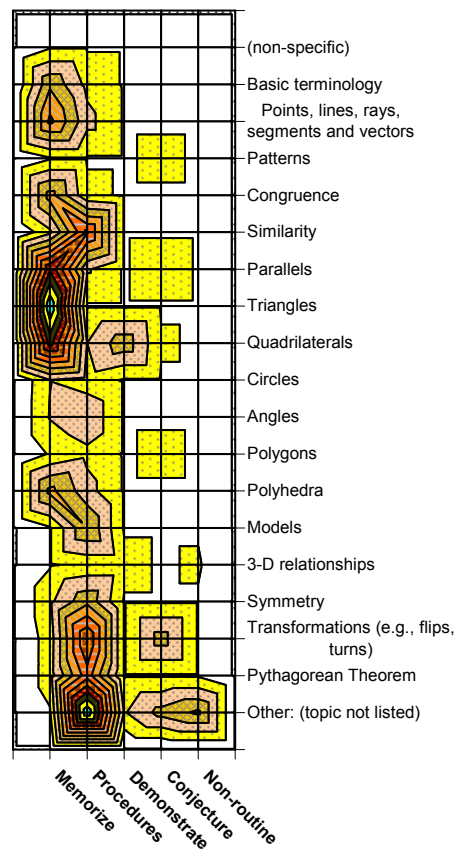
Alignment Index: 0.34

**IN Gr. 8 Assessment  
Document  
Geometric Concepts**



Re-centered: 0.11

**NAEP Gr.8 Assessment  
Document  
Geometric Concepts**



## References

Blank, R.K., Porter, A. & J. Smithson, J. (2001) [New Tools for Analyzing Teaching, Curriculum and Standards in Mathematics & Science: Results from Survey of Enacted Curriculum Project](#), Washington, DC: CCSSO.

Porter, A. (2002) ["Measuring the Content of Instruction: Uses in Research and Practice."](#) AERA Presidential Address, *Educational Researcher*, October.