



ZEAL Mathematics Alignment Study:

A Review of ZEAL Items in Relation to the Common Core State Standards

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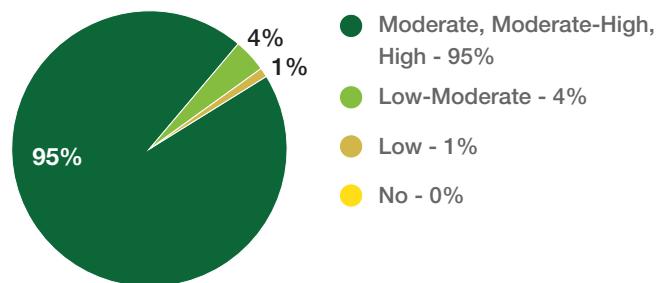
Executive Summary

Zeal Learning Inc. contracted with SRI International's Center for Technology in Learning to conduct an alignment study using a sample of ZEAL mathematics assessment items and the Common Core State Standards (CCSS) for Mathematics. SRI mathematics and assessment experts reviewed over 700 multiple choice items from the ZEAL item bank for kindergarten through eighth grade, and compared them to the expectations described in the Common Core State Standards on two dimensions: process and content. For the purposes of this study, process alignment was defined as the degree to which items provide students with the opportunity to demonstrate skills through the performance of processes (drawing, writing, and explaining) specified in the Common Core State Standards. Content alignment was defined as the degree to which items address the concepts in the Common Core State Standards. Two research questions guided this study: (1) to what extent are the skills described in the Common Core State Standards for mathematics similar to the skills assessed through Zeal mathematics items? (Process Alignment); and (2) to what extent are the concepts, identified in the Common Core State Standards, represented in the Zeal items? (Content Alignment).

Findings revealed that across all grades (K-8), over 95% of Zeal mathematics items were found to have a moderate, moderate to high, or high degree of content and process alignment with the Common Core State Standards. These results support the interpretation of test scores in relation to the expectations described in the Common Core State Standards, and contribute to the accumulation of content validity evidence of Zeal assessments. The table below illustrates these findings.

Table 1: Average Process and Content Alignment Total Across All Grades

	Percentage
High, Moderate-High, Moderate	95%
Low-Moderate	4%
Low	1%
No	0%
Grand Total	100%



Introduction

With the advent of the Common Core State Standards (CCSS), there is a need for valid and reliable evidence of learning that informs instructional decision making and promotes college and career readiness. Alignment between these content standards and assessments is central to demonstrating how closely assessments reflect the performance expectations described in the standards (Webb, Herman, & Webb, 2007). Webb describes alignment as “the degree to which expectations and assessments are in agreement and serve in conjunction with one another to guide the system towards students learning what they are expected to know and do”.

This report describes the methodology used by researchers and mathematics experts at SRI International, to collect the requisite evidence of alignment between a sample of Zeal mathematics items for kindergarten through eighth grade, and the Common Core State Standards for mathematics.

“Alignment evidence is critical to content validity.”



Methodology

SRI researchers randomly selected a sample of approximately 80 multiple choice items for each grade. Table 2 illustrates the number of items in this sample.

A rating scale was developed to determine the degree of match between the assessment items and the standards. The rating scale included the following ratings; No Match, Low Match, Low to Moderate Match, Moderate Match, Moderate to High Match and High Match. SRI mathematics and assessment experts were trained on the use of applying this scale to two dimensions: process and content.

Process alignment was defined as “the degree to which items provide students with the opportunity to demonstrate skills, through the performance of processes (drawing, writing, and explaining)” described in the Common Core State Standards. Content alignment was defined as the degree to which items address the concepts identified in the Common Core State Standards. Items were rated independently by two expert reviewers. Ratings were averaged to determine alignment results. A description of each rating and its interpretation is provided in Table 3.

Table 2: Number of Items Reviewed by Grade

Grade	Number of Items
Kindergarten	77
1st	90
2nd	88
3rd	71
4th	80
5th	89
6th	76
7th	74
8th	72
Total Number of Items Reviewed	717

Table 3: Description of Process and Content Alignment Ratings

Rating	Rubric for Process Alignment	Rubric for Content Alignment
High Match	The item provides students with the opportunity to fully demonstrate the skills identified in the Common Core State Standards for Mathematics.	The item fully addresses the concepts identified in the Common Core State Standards for Mathematics.
Moderate to High Match	The item provides students with an opportunity to almost fully demonstrate the skills identified in the Common Core State Standards for Mathematics.	The item almost fully addresses the concepts identified in the Common Core State Standards for Mathematics.
Moderate Match	The item provides students with an opportunity to moderately demonstrate the skills identified in the Common Core State Standards for Mathematics.	The item moderately addresses the concepts identified in the Common Core State Standards for Mathematics.
Low to Moderate Match	The item provides students with an opportunity to partially demonstrate the skills identified in the Common Core State Standards for Mathematics.	The item partially addresses the concepts identified in the Common Core State Standards for Mathematics.
Low Match	The item provides students with an opportunity to somewhat demonstrate the skills identified in the Common Core State Standards for Mathematics.	The item somewhat addresses the concepts identified in the Common Core State Standards for Mathematics.
No Match	The item does not provide students with the opportunity to demonstrate the skills identified in the Common Core State Standards for Mathematics.	The item does not address the concepts identified in the Common Core State Standards for Mathematics.

Results

Research questions that guided this study include: (1) To what extent are the skills described in the Common Core State Standards for mathematics similar to the skills assessed through Zeal mathematics items? (Process Alignment); and (2) To what extent are the concepts, identified in the Common Core State Standards, represented in the Zeal items? (Content Alignment).

Overall results across all grades (K-8) indicate substantial alignment on both dimensions, between Zeal items and the Common Core State Standards. On average, 95% of Zeal mathematics items were found to have a moderate, moderate to high or high degree of process and content alignment with the Common Core State Standards. Results of the Process and Content Alignment Review are described by grade in Tables 4-20.

Table 4: Content Alignment for Kindergarten

Grade K Content Alignment	Frequency
High	58%
Moderate-High	25%
Moderate	9%
Low-Moderate	8%
Low	0%
No	0%
Grand Total	100%

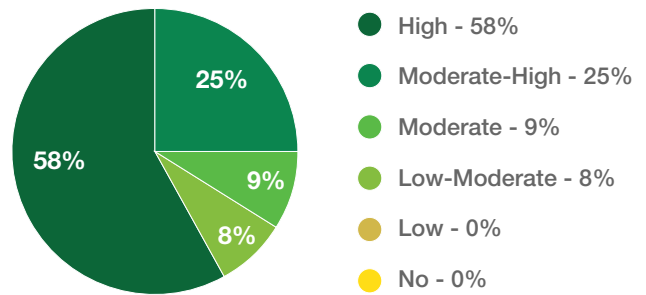


Table 5: Content Alignment for Grade 1

Grade 1 Content Alignment	Frequency
High	70%
Moderate-High	6%
Moderate	9%
Low-Moderate	10%
Low	3%
No	2%
Grand Total	100%

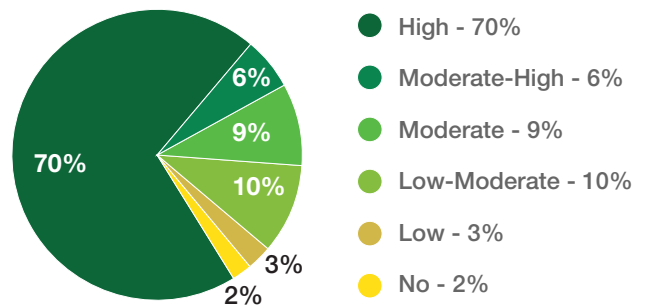


Table 6: Process Alignment for Grade 1

Grade 1 Process Alignment	Frequency
High	79%
Moderate-High	4%
Moderate	13%
Low-Moderate	3%
Low	0%
No	0%
Grand Total	100%

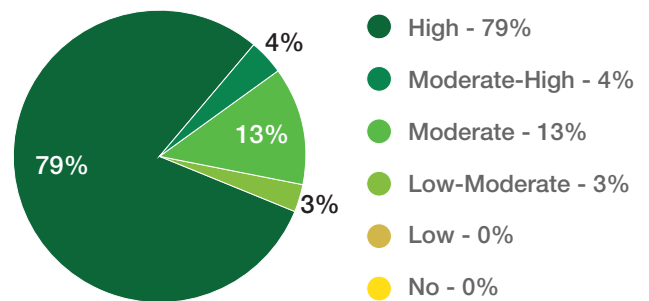


Table 7: Content Alignment for Grade 2

Grade 2 Content Alignment	Frequency
High	64%
Moderate-High	24%
Moderate	9%
Low-Moderate	3%
Low	0%
No	0%
Grand Total	100%

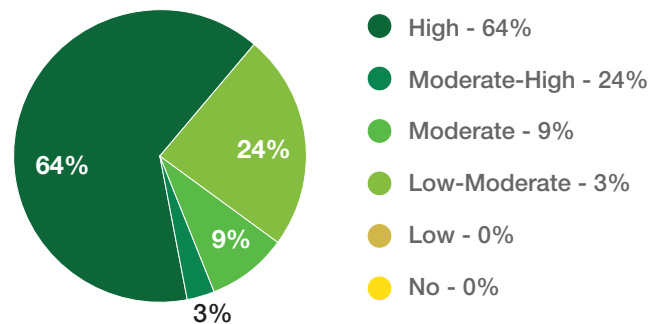


Table 8: Process Alignment for Grade 2

Grade 2 Process Alignment	Frequency
High	27%
Moderate-High	42%
Moderate	20%
Low-Moderate	7%
Low	3%
No	0%
Grand Total	100%

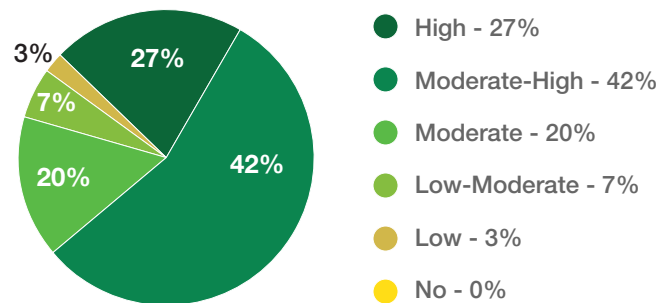


Table 9: Content Alignment for Grade 3

Grade 3 Content Alignment	Frequency
High	83%
Moderate-High	14%
Moderate	3%
Low-Moderate	0%
Low	0%
No	0%
Grand Total	100%

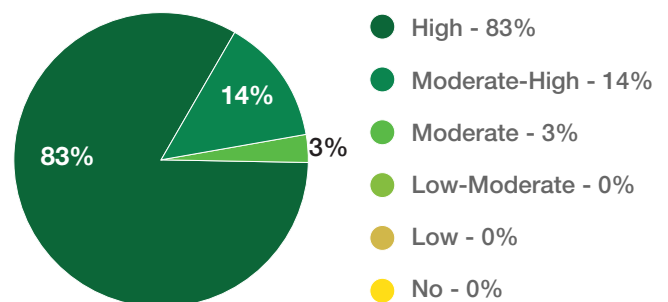


Table 10: Process Alignment for Grade 3

Grade 3 Process Alignment	Frequency
High	41%
Moderate-High	45%
Moderate	11%
Low-Moderate	3%
Low	0%
No	0%
Grand Total	100%

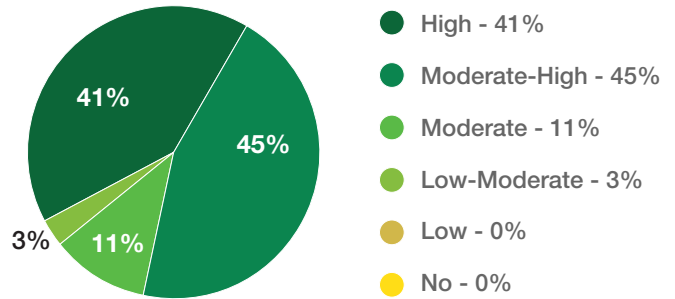


Table 11: Content Alignment for Grade 4

Grade 4 Content Alignment	Percentage
High	91%
Moderate-High	9%
Moderate	0%
Low-Moderate	0%
Low	0%
No	0%
Grand Total	100%

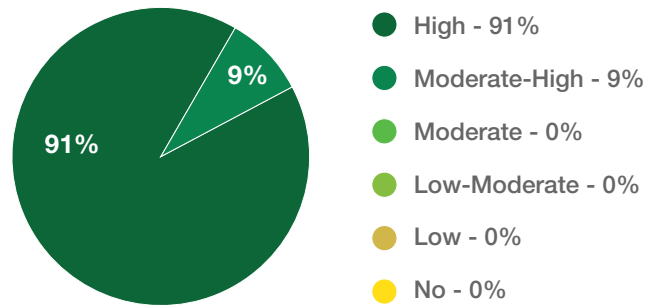


Table 12: Process Alignment for Grade 4

Grade 4 Process Alignment	Percentage
High	56%
Moderate-High	28%
Moderate	16%
Low-Moderate	0%
Low	0%
No	0%
Grand Total	100%

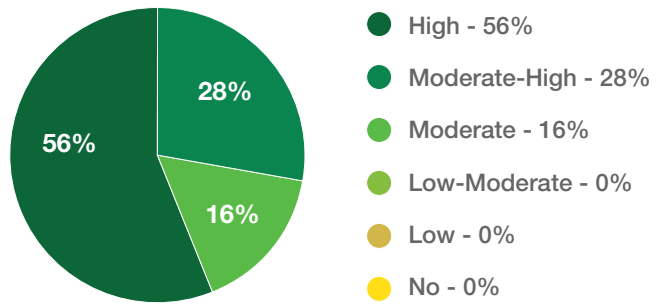


Table 13: Content Alignment for Grade 5

Grade 5 Content Alignment	Percentage
High	87%
Moderate-High	11%
Moderate	2%
Low-Moderate	0%
Low	0%
No	0%
Grand Total	100%

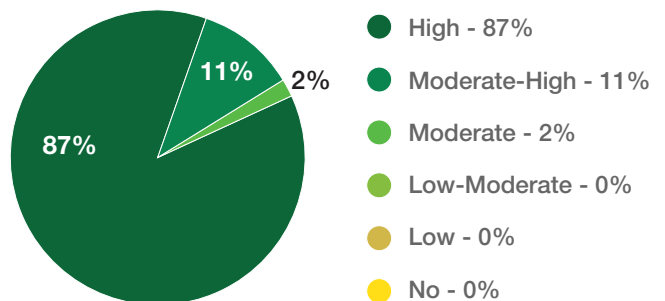


Table 14: Process Alignment for Grade 5

Grade 5 Process Alignment	Percentages
High	73%
Moderate-High	18%
Moderate	8%
Low-Moderate	1%
Low	0%
No	0%
Grand Total	100%

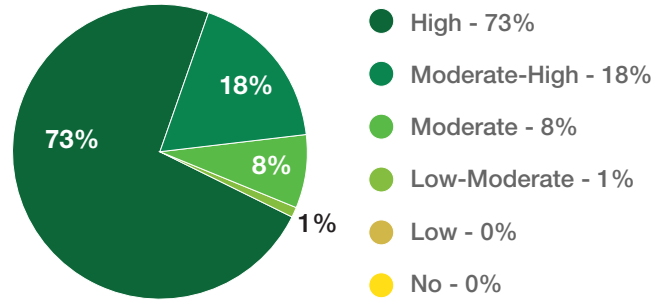


Table 15: Content Alignment for Grade 6

Grade 6 Content Alignment	Percentage
High	67%
Moderate-High	17%
Moderate	13%
Low-Moderate	3%
Low	0%
No	0%
Grand Total	100%

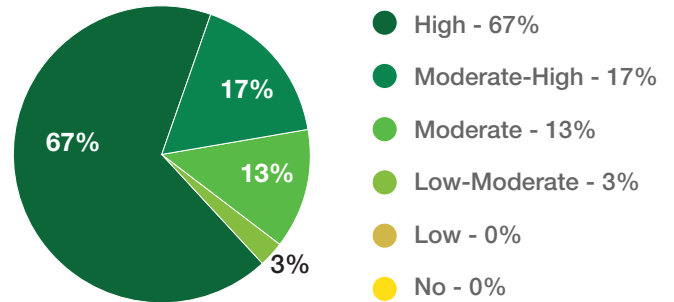


Table 16: Process Alignment for Grade 6

Grade 6 Process Alignment	Percentage
High	76%
Moderate-High	7%
Moderate	16%
Low-Moderate	1%
Low	0%
No	0%
Grand Total	100%

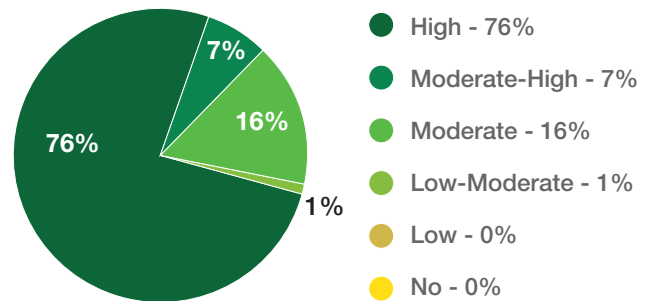


Table 17: Content Alignment for Grade 7

Grade 7 Content Alignment	Percentage
High	61%
Moderate-High	19%
Moderate	16%
Low-Moderate	3%
Low	1%
No	0%
Grand Total	100%

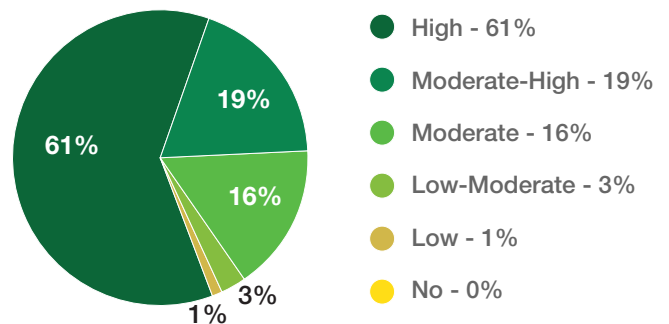


Table 18: Process Alignment for Grade 7

Grade 7 Process Alignment	Percentage
High	82%
Moderate-High	1%
Moderate	15%
Low-Moderate	1%
Low	0%
No	0%
Grand Total	100%

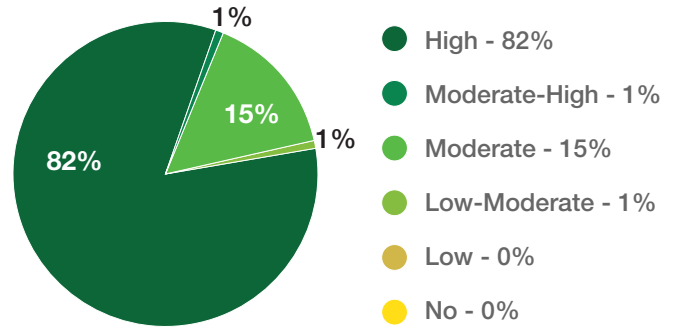


Table 19: Content Alignment for Grade 8

Grade 8 Content Alignment	Percentage
High	79%
Moderate-High	13%
Moderate	6%
Low-Moderate	3%
Low	0%
No	0%
Grand Total	100%

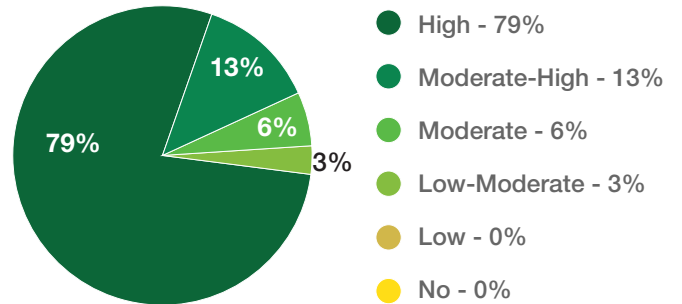
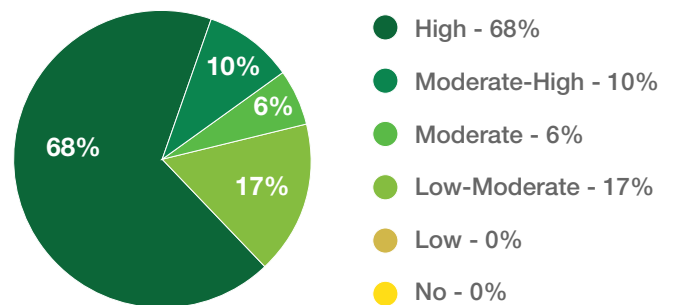


Table 20: Process Alignment for Grade 8

Grade 8 Process Alignment	Percentage
High	68%
Moderate-High	10%
Moderate	6%
Low-Moderate	17%
Low	0%
No	0%
Grand Total	100%



Results of the Process Alignment Review are described in Tables 21 and 22 for each grade.

Table 21: Frequencies of Process Alignment Ratings by Grade

Process Alignment	No	Low	Low-Mod	Moderate	Mod-High	High	Total
Grade K*							77
Grade 1	0	0	3	12	4	71	90
Grade 2	0	3	6	18	37	24	88
Grade 3	0	0	2	8	32	29	71
Grade 4	0	0	0	13	22	45	80
Grade 5	0	0	1	7	16	65	89
Grade 6	0	0	1	12	5	58	76
Grade 7	0	0	1	11	1	61	74
Grade 8	0	0	12	4	7	49	72
Grand Total	0	3	26	85	124	402	(640/717)

*Kindergarten was not reviewed for Process Alignment.

Table 22: Percentage of Process Alignment Ratings by Grade

Process Alignment	No	Low	Low-Mod	Moderate	Mod-High	High	Total
Grade K*							77
Grade 1	0%	0%	3%	13%	4%	79%	90
Grade 2	0%	3%	7%	20%	42%	27%	88
Grade 3	0%	0%	3%	11%	45%	41%	71
Grade 4	0%	0%	0%	16%	28%	56%	80
Grade 5	0%	0%	1%	8%	18%	73%	89
Grade 6	0%	0%	1%	16%	7%	76%	76
Grade 7	0%	0%	1%	15%	1%	82%	74
Grade 8	0%	0%	17%	6%	10%	68%	72
Grand Total**	0%	0%	4%	13%	19%	63%	(640/717)
Average Summarized Total	No, Low, Lo-Mod			Moderate, Mod-High, High			
	5%			95%			

*Kindergarten was not reviewed for Process Alignment. **Percentages may not add up to 100% due to rounding.

Results of the Content Alignment Review are described in Tables 23 and 24 for each grade.

Table 23: Frequencies of Content Alignment Ratings by Grade

Content Alignment Ratings	No	Low	Low-Mod	Moderate	Mod-High	High	Total
Grade K	0	0	6	7	19	45	77
Grade 1	2	3	9	8	5	63	90
Grade 2	0	0	3	8	21	56	88
Grade 3	0	0	0	2	10	59	71
Grade 4	0	0	0	0	7	73	80
Grade 5	0	0	0	2	10	77	89
Grade 6	0	0	2	10	13	51	76
Grade 7	0	1	2	12	14	45	74
Grade 8	0	0	2	4	9	57	72
Grand Total	2	4	24	53	108	526	717

Table 24: Percentages of Content Alignment Ratings by Grade

Content Alignment Ratings	No	Low	Low-Mod	Moderate	Mod-High	High	Total
Grade K	0%	0%	8%	9%	25%	58%	77
Grade 1	2%	3%	10%	9%	6%	70%	90
Grade 2	0%	0%	3%	9%	24%	64%	88
Grade 3	0%	0%	0%	3%	14%	83%	71
Grade 4	0%	0%	0%	0%	9%	91%	80
Grade 5	0%	0%	0%	2%	11%	87%	89
Grade 6	0%	0%	3%	13%	17%	67%	76
Grade 7	0%	1%	3%	16%	19%	61%	74
Grade 8	0%	0%	3%	6%	13%	79%	72
Grand Total*	0%	1%	3%	7%	15%	73%	717
Average Summarized Total	No, Low, Lo-Mod			Moderate, Mod-High, High			
	5%			95%			

*Percentages may not add up to 100% due to rounding.

Summary and Implications

This review determined that a high percentage of Zeal items targeted the knowledge and skills described in the Common Core State Standards for mathematics. Similarly, the mathematics content represented in the Common Core State Standards was found to also be represented in the sample of items reviewed by SRI researchers. Very few items were rated as having low process or content alignment. Findings suggest general consistency between the expectations for student performance described in the Common Core State Standards and the expectations required by ZEAL items for Kindergarten through grade 8.

It is interesting to note that Zeal items are delivered in a multiple choice format that allows for automated scoring and instant feedback. Though this format does not provide a way for students to manipulate the attributes in the item, such as through a drawing tool or a writing tool, Zeal multiple choice items provide an efficient method for capturing what students know and reporting this information without wait time for hand scoring. While some of the Common Core State Standards in Mathematics require students to demonstrate skills and abilities that include drawing, writing, or explaining, which cannot be directly captured through multiple choice delivery, the majority of the Zeal items reviewed were not affected by this constraint.

This study offers initial findings regarding the degree of process and content alignment between Zeal items and the Common Core State Standards. These standards are considered to be rigorous and relevant indicators of college and career readiness (Conley, et.al. 2011). Given the evidence of a high degree of alignment between the Common Core State Standards and Zeal items, inferences about the relationship between students' knowledge, skills and abilities as demonstrated by success on Zeal items can be associated with achieving proficiency on specific, aligned, Common Core State Standards.

“Results indicate that 95% of Zeal items have substantial alignment with the Common Core State Standards.”



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