Alignment Alley and Standard Street: The Process of Aligning Vocabulary and State Standards

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In a city with 83,000 people, I'm sure there are many problems. I'm here to address one problem. It is a pressing problem. It is a problem with *magnitude*. It is a problem with many *sides* to it. It is a problem with *weight* and *dimension*, *angles* and *depth*, *scope* and *sequence*, and, of course, many *positives* and *negatives*.

The problem is a wordy one. Discovering this problem, the Hammond, Indiana, Mathematics Initiative Select Cadre teacher mathematicians (yes, I did say mathematicians) set out to resolve the problem of mismatched vocabulary.

Introduction

The Indiana Mathematics Initiative (IMI) is a partnership formed between Indiana University Bloomington and nine school district corporations, of which Hammond is one. A facet of the partnership has been to identify and develop a leadership cadre of teachers in each district. Know as "select cadre," this group is trained to deliver effective standards-based mathematical instruction and to provide quality professional development experiences for their colleagues. The IMI Select Cadre in Hammond has branched off and formed "math leaders," who are trained in the practices of using a reform-minded curriculum, with the intent that they become the experts in their respective schools.

One of the goals of the IMI project was to help teachers to use standards-based practices in their classrooms. Some teachers in Hammond had begun piloting the NSF-funded and standards-based curriculum *Everyday Mathematics* before joining IMI, and while working with these projects, the district adopted the curriculum for use by all of its elementary teachers.

This paper's focus is about how the IMI Select Cadre and the Math Leaders in Hammond addressed the issue of mismatched vocabulary in our district.

School City of Hammond

Being the oldest city in Lake County, Hammond has a rich and varied past. Part of that past is its schools, and one of its undisputed high points is the children of those schools. Without a doubt, today's children are a bright element for Hammond's future.

In the district, almost 8,000 students attend fifteen public elementary schools. The vision for each of those 8,000 students is the same. The School City of Hammond is committed to providing diverse learning experiences and environments to develop high educational attainment for lifelong learners. One of those learning experiences the School City of Hammond committed to was *Everyday Math.* Adopted at every elementary school, the math program appears to have played a role in raising test scores in the corporation.

Testing

Those lifelong learners are not the same learners housed in the walls of the schools of Hammond when statewide standardized testing was introduced in 1988. ISTEP (Indiana Statewide Testing for Educational Progress) originally consisted of both a multiple-choice and a written component. In 1995, minor changes were made, and the test became ISTEP+. The newer version required a norm-referenced test to allow comparisons of achievement with national norms as well as a criterion-referenced component.

Since the inception of ISTEP the racial make-up, transient rates, and median income of Hammond residents has altered. These factors, combined with the mandates of the No Child Left Behind (NCLB) Act of 2002, mean that Hammond is a school system facing unique challenges. While the overall purpose of NCLB is to ensure that each child in America is able to meet the high learning standards of the state in which he or she lives, it allows each state to identify how those expectations will be met. The law states that each child will meet proficiency or better in reading and mathematics by the 2013–2014 school year. Annual Yearly Progress is defined by the school, district, and state and is marching toward the 2013–2014 goal of 100 percent of all students meeting state standards. It is these lofty goals that have led Hammond to the quest for modifications in its curricula.

Low ISTEP+ scores forced Hammond to re-evaluate its assessment practices. Administrators and teachers began to look at test results, analyze the outcomes, and then use the data to determine weak areas, and to consider ways to improve the curriculum. Identifying patterns and trends are a means to developing in-house programs to address commonly found error trends.

Some commonly noted error trends identified at the elementary level were: not answering the questions asked or not responding to all parts of the question, not following the given directions, and not using the appropriate textual clues. This led to the discovery that math terms and vocabulary needed to be revisited, as did computation and problem solving. These trends were then noted on school Comprehensive Needs Assessment (CNA) reports (see Appendix 1). While reviewing past ISTEP+ scores, trends began to emerge and were then noted. The task of developing action plans ensued. Examining students' answers more closely allowed the faculty members to focus on the underlying causes of student errors.

Using the CNA results, research groups were formed to find out why these critical errors were being made. Elementary school teachers who originally administered the ISTEP+ to students in grades 3-5 noted that they were unsure why students failed to answer several test questions on the ISTEP+. They needed to find out what was hindering the students' progress and prohibiting them from responding to the questions asked.

All elementary math teachers in buildings who conducted test analysis began watching their students during problem solving activities and monitoring how the children approached the tasks. They began to modify their own instruction to help students' mark and code directions in order to see what parts of the problems students were struggling with. Students began to learn the marking and coding process themselves, learning to mark key words in directions that would lead them to operational tasks. This coding included marking key numbers and eliminating irrelevant numbers in order to bring to the forefront only those numbers and operation words key to the problem. Additionally, students learned how to "talk" math and explain the procedures they used to solve problems using mathematical terms.

During this analysis, several key discoveries were made. It wasn't so much that students weren't responding to the questions posed; rather, it was more that they didn't understand the vocabulary and terminology of the questions being asked. The students didn't know how to process the components of the questions in order to break them into "parts" they could understand. Teachers doing this analysis began to develop a solution to this new revelation. Students didn't have the vocabulary necessary to read directions and solve problems.

Beginning the Vocabulary Work

Through dialogue, teachers and administrators in several elementary schools reached the conclusion that if vocabulary was the stumbling block to student success, then that was what needed to be addressed first and foremost. As pioneers and volunteers, they forged ahead and began an early vocabulary alignment process. The alignment process proved random at best; incomplete at worst, but it was a beginning.

These early attempts were rudimentary. Committees were formed at elementary schools to "look" into the problem and develop a vocabulary solution. While our standards-based curriculum has a strong vocabulary component, there was not a connection between the programs and the language of the ISTEP+, so teacher teams from several schools set out to remedy that. The curriculum of the adopted math program helped make it easy. At the outset of each lesson, the vocabulary for the lesson and additional teacher vocabulary are identified.

The teacher editions were thumbed through and vocabulary that the committee thought might be on the ISTEP+ was listed, bolded, and then the corresponding classroom and curriculum terms were typed next to it. Oftentimes there was no thought given to the grade level or organization of the terminology, nor were there any guidelines or teachers on how to use these materials. For example, the committees at some schools created "Additional Key Vocabulary" lists specific to each grade level, and teachers were instructed to use the ISTEP+ words on them interchangeably with their classroom terminology. (See Appendix 2 for an example Additional Key Vocabulary list.)

While this approach wasn't ideal, it did get the ball rolling. Talk began of the schools with the "vocabulary plans." Pretty soon, word got out to the right people—the Indiana Mathematics Initiative Select Cadre—that a more comprehensive vocabulary alignment was needed for Hammond.

Creating the Final Document

It was select cadre members and math leaders who met to discuss and try to remedy the vocabulary problem. Raising student test scores and addressing faculty concerns are two of the goals of the cadre. Because of the math leadership group, much has been accomplished to benefit all teachers and students in the district. Benefits include an aligned pacing schedule, a city-wide pre/mid/post test that is used to chart student progress over the year, and monthly content sessions to review the "big" issues in math. Additionally, the cadre provides mentoring and small group training for new teachers during their first year. It is this same group of math leaders who took on the task of aligning the classroom mathematical vocabulary to both the ISTEP+ and the Indiana State Standards.

The process began with a general meeting of math leaders to discuss the feasibility of creating a larger and more useful vocabulary product. Could it be done? Should it be done? Was it worth the time? Was it worth the energy? How could it be organized? What needed to be

included in the final outcome? What should the final product look like? What should be done with the eventual document? Who should create the document? When should the actual process commence? Meetings were a part of the plan outlined and submitted as part of the IMI grant. Time for the Math Leaders to meet was funded by IMI.

It was decided that this was a go-ahead project and would be tackled just after the school year ended. A team of math leaders, including select cadre teachers, were asked to generate the document that would serve as the vocabulary alignment work for the teachers of Hammond. Teacher representatives from each grade level (K–5) were invited to participate and share their expertise. The format was standardized and the writing began.

The process seemed simple. Each Indiana Academic Standard was listed. Because ISTEP is aligned to the Indiana Standards, the test itself did not have to be individually addressed in a separate column. The ISTEP vocabulary was looked at and, if needed, added to the standards column. Beneath that, each grade level's performance indicators (from the Indiana Academic Standards) filled the first column. The second column would allow the writer to list the language of the Indiana standard that corresponded to the indicator and the final column was to be used to highlight the language used in *Everyday Mathematics* for the same indicator. There were many unseen variables that cropped up when many creative minds were working together in one place.

First, there was the sheer magnitude of the task. Grade-level groups worked for days on the task coming up with 14–22 pages of documentation. Every page of every teacher manual had to be reviewed to locate the vocabulary. That was step one. Then each student workbook had to be cross referenced to make sure that no errant vocabulary word went undocumented. Games needed to be referenced next, and if that weren't enough of a work load, study links and home links (EDMath homework) had to be checked for hidden terminology. Many hours were spent on this work.

Secondly, there was the format of the document itself. What seemed simple in theory became interpreted differently by each grade level that used the format. The grids no longer resembled their original forms, which were precise, simple, and easy to read. However, teachers in each grade level interpreted their vocabulary charts in their own way, coded them in their own way, and developed their own way of translating information. What ultimately happened was that none of the vocabulary charts were aligned to each other and none of them had the cohesiveness that was the main purpose of using the standard forms. So, a remedy was in order. The solution came in getting feedback on the samples that had been done.

The sample grids were taken back to schools that had volunteers look them over and offer feedback on the grids and how they could be used. Giving the data to faculties, however, proved faulty. Rather than streamlining the data, it became more fragmented. However, the teachers did spot some positive points on several reports and suggested that the formatting reflect this. It was decided that all of the grade levels needed to format their documents in the same manner. The continuum or progression through grade levels is something that needs to be consistent, so that teachers know where and how to locate the necessary information. It was decided that all new vocabulary would be bulleted, and if the language of the standard was different from the language of the curriculum, it would be bolded. This would provide the cross-grade level consistency the document was designed for, at its inception.

Next Steps

What emerged is a comprehensively aligned document that is waiting to be placed in the hands of the math teachers in Hammond's elementary schools. (See Appendix 3, for an example page

from the School City of Hammond: Indiana Mathematics Standards and Everyday Mathematics Vocabulary Alignment.) While all of the work is relevant, you cannot just hand a document of this size to a colleague and leave it at that. This presented a new issue: how do we introduce the document and provide professional development for the district so that it can be utilized effectively?

It was back to the drawing board for the select cadre and EDMath leaders. Until professional development can take place, giving the teachers the complete vocabulary alignment document is on the back burner.

During the first afternoon set aside for professional development in the upcoming 2008–2009 school year, teachers will have the opportunity to get together to discuss the document and how it can be best used in the classroom to aid in instruction and curriculum development.

Once in the hands of teachers, the document is theirs to use for the remainder of the year. During this trial period, it is the hope of the select cadre that teachers will not only use it but will make it their own. If it is not user-friendly, the cadre wants to know how it can be modified to make it so. We need to know if there are omissions, so they can be added. This is the time to really put the document to use and make it a part of our curriculum. In-service will occur to discuss the documents and any needed tweaks, additions, and changes. This is still a work in process, and we pride ourselves on providing what the teachers ask for. So this task will continue to be revisited until it is complete. This is the hope of the creators who put time, energy, and effort into making what we intend to be a workable document for teachers.

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Appendix 1

Sample Classroom Chart of Key Errors/Grouping for Math

Teacher: _____ Grade: _____ Assessment Number and Date:
Prompt/Problem:

Student number in order listed in grade book or ISTEP+ Report

Key Errors	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Errors related to reading, problem solving, following directions															
Didn't attempt question															
Didn't follow directions															
Didn't answer all ?s															
Didn't answer the ? asked															
Didn't show work															
Didn't answer explain															
Said what did instead of why for "explain"															
Gave # when question asked for decision															
Didn't convert to like measures/fractions															
Didn't use checking strategy															
Errors specific to a math term, concept, process, problem															
Did not know math term:															
Check for Key Strategies															

Adapted from Lew Wallace Elementary in Hammond, Indiana

Appendix 1 (*continued)*

Chart of Key Errors/Grouping for Math

Fifth Grade: Problem Solving
Prompt/Problem: "What's My Rule" and Plotting Points in a 4-Quadrant Grid

Student number in order listed in grade book or ISTEP+ Report

Key Errors – ID students by initial	BA	LA	JB	AB	AB	DD	CE	FF	KG	KH	PH	DJ	JP	JM	DN
Errors related to reading, problem solving, following directions															
Didn't attempt question	√														
Didn't follow directions	√													√	
Didn't answer all ?s	√													√	
Didn't answer the? asked	√									√				√	
Didn't show work	√	√							√		√		√	√	
Didn't answer explain															
Said what did instead of why for "explain"															
Gave # when question asked for decision															
Didn't convert to like measures/fractions															
Didn't use checking strategy	√	√							√		√		√	√	
Errors specific to a math term, concept, process, problem–related to skills. Identify the skill below.															
Computation Errors w/negative numbers		√							√				√	√	
Errors plotting w/negative numbers	√	√								√	√				
Errors plotting-putting wrong number first	√	√								√					
Computational errors		√							√	√	√		√	√	
Check for Key Strategies															
ID students by initial	BA	LA	JB	AB	AB	DD	CE	FF	KG	KH	PH	DJ	JP	JM	DN
Marking/Coding	–	√	+	+	–	+	+	–	√	√	–	+	–	√	–
Graphic Organizer	–	–	+	+	√	+	+	+	–	–	–	+	–	–	+
Performance	–	–	+	+	√	+	+	+	–	–	–	+	–	–	+

Modified on 4/17/08

Appendix 1 (*continued)*

Fifth Grade: Problem Solving
Prompt/Problem: "What's My Rule" and Plotting Points in a 4-Quadrant Grid

Student number in order listed in grade book or ISTEP+ Report

Key Errors – ID students by initial	EP	MR	JS	SW	MW	DL	XC	BH	MK				Total	%	
Errors related to reading, problem solving, following directions															
Didn't attempt question													1/24	4%	
Didn't follow directions							√						3/24	12%	
Didn't answer all ?s													2/24	8%	
Didn't answer the ? asked							√						4/24	16%	
Didn't show work	√	√			√		√		√				11/24	45%	
Didn't answer explain															
Said what did instead of why for "explain"															
Gave # when question asked for decision															
Didn't convert to like measures/fractions															
Didn't use checking strategy	√	√			√		√		√				11/24	45%	
Errors specific to a math term, concept, process, problem–related to skills. Identify the skill below.															
Computation Errors w/negative numbers	√				√				√					29%	
Errors plotting w/negative numbers													4/24	16%	
Errors plotting-putting wrong number first	√	√											5/24	20%	
Computational errors	√	√							√				9/24	37%	

Check for Key Strategies															
ID students by initial	EP	MR	JS	SW	MW	DL	XC	BH	MK	+		√		–	
Marking/Coding	–	√	–	+	–	–	–	+	√	7/24	29%	6/24	25%	11/24	45%
Graphic Organizer	–	–	+	+	√	+	–	+	√	11/24	45%	3/24	12%	10/24	41%
Performance	–	–	+	+	√	+	–	+	√	11/24	45%	3/24	12%	10/24	41%

Modified on 4/17/08

Appendix 2

Additional Key Vocabulary

The terms in bold have been used on the ISTEP+ test. They can and should be used interchangeably with the terms from *Everyday Mathematics* that follow them.

changing fractions — equivalent fractions

English rulers/measurement — US Customary rulers/measurement, Standard rulers/measurement

equation — number sentence, number model, number expression

figure — geometric shape, geometric solid, polygon

inequality — comparison, is equal to, is more than/is less than, is greater than/is less than, is larger than/is smaller than, least/fewer, greatest/most

mental math — Mental Math and Reflexes (MMR), able to verbalize/write what they thought

mystery number — used in the games Monster Squeeze, Number Line Squeeze, What number am I thinking of?

number cube — die, die with numbers instead of dots

partial credit — show your thinking, show your work, show your results

pie chart — pie graph, circle graph

results — answers

same value — is equal to

true sentence — a number sentence that is correct

vertices — plural of vertex

Appendix 3

Sample Page from the School City of Hammond: Indiana Mathematics Standards and *Everyday Mathematics* Vocabulary Alignment

5.4.8 Construct prisms and pyramids using appropriate materials.	• Construct ➢ Prisms ➢ Pyramids	• Construct ➢ Prisms ➢ Pyramids • Geometric Solid • Pattern
5.4.9 Given a picture of a three-dimensional object, build the object with blocks.	• Build • Three-dimensional • Object	• Three-dimensional • Build • Object • Pattern

Standard 5: Students understand and compute the areas and volumes of simple objects as well as measuring weight, temperature, time, and money.		
Performance Indicator:	**Language of the Standard**	**Language of Everyday Math**
5.5.1 Understand and apply the formulas for the area of a triangle, parallelogram, and trapezoid.	• Apply • Formulas • Area of ➢ Triangle ➢ Parallelograms ➢ Trapezoids	• Apply • Formulas (b*h), (1/2b*h) • Rectangle Method • Area of ➢ Triangle ➢ Parallelograms ➢ Trapezoids • Base (b) • Height (h) • Square Units
5.5.2 Solve problems involving perimeters and areas of rectangles, triangles, parallelograms, and trapezoids, using appropriate units.	• Solve • Perimeter • Area of ➢ Rectangles ➢ Triangles ➢ Parallelograms ➢ Trapezoids	• Solve • Perimeter • Area of ➢ Rectangles ➢ Triangles ➢ Parallelograms ➢ Trapezoid