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Imagination Station (Istation): Universal Screener Realignment for Grades 2-8

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Abstract

In this technical report, we describe the realignment of existing items in the Grade 2 through Grade 8 formative assessment item bank for Imagination Station (Istation) to newly adopted mathematics content standards. The formative assessment item bank is being used to deliver computerized-adaptive universal screeners to support teachers' instructional decision-making. However, the state and national mathematics content standards that inform the mathematical topics underlying the items have been updated creating the need for the items to be realigned to the new mathematics content standards. We describe the process used to realign each item to a revised blueprint representative of the revised mathematics content standards. We also summarize the outcome of the realignment by grade level.

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Imagination Station (Istation): Universal Screener Realignment for Grades 2-8

Introduction

The purpose of the project is to update the item banks for the Imagination Station Indicators of Progress (ISIP) Mathematics universal screeners in Grades 2-8 by aligning existing items with newly adopted mathematics content standards articulated in the Common Core State Standards for Mathematics (CCSS-M), the Texas Essential Knowledge and Skills (TEKS, 2012), and Virginia Standards of Learning (SOL). This formative assessment item bank is used to deliver computerized-adaptive universal screeners designed to identify students' understanding of fundamental mathematics skills and grade level standards.

Between 2010 and 2012, approximately 2,800 items were written using a blueprint aligned to content standards for three states (Texas, California, and Virginia); National Council of Teachers of Mathematics (NCTM) standards; and, in some instances, CCSS-M standards. During the time in which these items were written, mathematics content standards across the country were being revised. In 2014, the existing blueprint was revised to reflect the alignment of the mathematics content standards of CCSS-M, the revised TEKS (adopted in 2012), and the Virginia Standards of Learning (SOL).

The purpose of this technical report is to describe the process of realigning the items used for ISIP Mathematics universal screeners item bank in Grades 2-8 based on the revised blueprint. The item realignment process took place in two phases, in-grade and out-of-grade realignment. During the in-grade realignment phase, reviewers used the revised blueprint to verify the alignment of items to the content standards of the grade level the item was originally written for. Items no longer aligned to current grade-level standards went through an out-of-grade realignment, where they were either matched to mathematical content standards from other grade levels or discarded.

Realignment Process

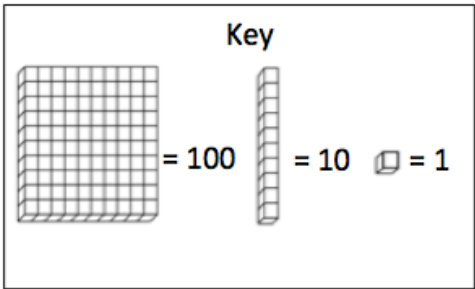
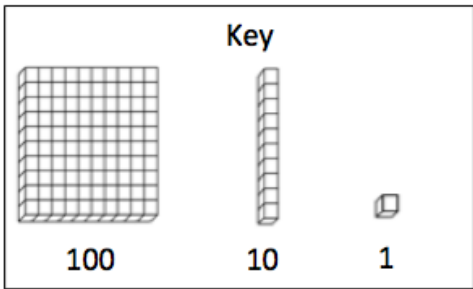
Each item written for the existing ISIP Mathematics universal screeners was considered in the realignment. Each item was associated with one or more content standards from the original blueprint. The content standard most closely aligned to the item was identified as the *primary standard*. If one or two additional content standards could be aligned to the item, they were identified as *secondary* or *tertiary standards* respectively.

Before beginning the realignment process every item that had a mathematical formula associated with it (e.g., area of rectangle= lw) was flagged for an additional final review. Each of these items was further reviewed to verify if the content standard required that students be given a formula. In instances where the content standard referenced students "knowing" a mathematical formula,

it was recommended to Istation that the formula be removed. Additionally, some content standards focused on conceptual understanding of a measurement skill where a given formula might reveal the correct answer without assessing a student’s knowledge of the content standard. In these instances, the mathematical formula was also recommended for removal. In instances where the blueprint referenced students “using” a mathematical formula, it was not removed from the item stem.

Every item that had a key associated with it was also flagged for an additional final review. Current RME standards reflect that it is inappropriate to place an equal symbol (=) between a model and its numerical value (See *Figure 1*) For each item with a key that reflected the previous standard, revisions were made to reflect the new standard.

Figure 1

Previous RME Standard	New RME Standard
	

To begin the realignment process, Research in Mathematics Education (RME) staff (Qualifications for RME staff can be found in Appendix A) sorted the standard codes associated with each item into three categories: *match*, *no match*, and *does not exist (DNE)*. Items containing standard codes categorized as *match* were representative of content standards on the revised blueprint within the same grade level. Items containing standard codes categorized as *no match* were representative of a content standard not included on the revised blueprint. Items containing standard codes categorized as *DNE* represented items removed from the database based on unsatisfactory item performance results from the IRT study.

After sorting the standard codes associated with each item, RME staff (a) verified the *match* standard codes were accurate, (b) eliminated the *no match* standard codes by deleting them from the database and, when possible, (c) identified *secondary* codes within the same grade level that were appropriate for each item with a *match* standard code. Staff then began the in-grade realignment process.

In-Grade Realignment

The in-grade realignment process was completed to identify same grade content standards associated with each item. This process was completed for the items that no longer had a standard code associated with it based on the previous steps completed. Each of these items were either aligned to one or more content standards *within* the grade level or if a content standard was not identified, the item was set aside for the out-of-grade realignment process.

Additionally, in some instances RME staff suggested edits to items. These edits were related to (a) incorrect mathematical content within the item (e.g. the term “equation” was used to describe a mathematical “expression”), or (b) errors within the item (e.g. no correct answer was given). Here again, if only one standard code was identified, an additional content standard was also identified from the revised blueprint. Identifying multiple standard codes associated with an item enhances the item bank because it increases the potential for the item to be used by multiple states or assess multiple standards within one state.

During the verification process, RME staff identified some of the items that were previously assigned *no match* standard codes were aligned to the current grade level. These items were then categorized with an *in grade-level* standard code.

Out-of-Grade Realignment

The purpose of the out-of-grade realignment was to review the remaining items that were not designated as appropriate for the original grade-level placement during the in-grade realignment process. If the item was found to be in alignment with one or more content standards from a different grade-level blueprint, those standard codes were recorded and a comment was added to move the item to the specified grade-level. Items could only be assigned to one grade-level.

During the out-of-grade realignment, RME staff also identified modifications necessary for some items to be appropriate for the new grade-level content standard. For example, the original content standard assessed the greatest common factor of three numbers, but the new standard assessed the greatest common factor for two numbers. In these instances, RME staff provided recommendations for how the item could be slightly modified and still be used in the item bank. A secondary RME staff member verified these recommendations.

A final review served two purposes: (a) reconciling any remaining comments about recommendations necessary to items that were made by RME staff, (b) verifying that the mathematical formulas and keys originally associated with items were still appropriate based on the new content standard(s) selected for items.

As a result of the final review minor modifications were recommended to Istation. In other instances the modifications would have been major (e.g., rewriting the entire item) and the item was discarded. Implementing each of the recommendations suggested by RME staff require the items to be revised prior to the Item Response Theory (IRT) study. Due to the number of items identified to go through the IRT study, RME staff chose to support the facilitation of the study in two phases. Each of the recommendations was labeled as a *Level 1* or *Level 2*. *Level 1* recommendations should be made immediately because the mathematical accuracy or alignment

to the revised blueprint would be impacted. *Level 2* recommendations should occur, but were not identified as a hindrance to students' ability to correctly answer the problem and can be done at a later date.

Realignment Outcome Summary

A summary of the outcomes of the realignment process and recommendations based on these outcomes are described in this section.

Table 1 shows the distribution of the original item bank (Original Grade Level) and the correspondence to the newly aligned (Realigned) grade level. For example, in sixth grade zero items were moved to Grade 2, two items were moved to Grade 3, three items were moved to Grade 4, 19 items were moved to Grade 5, 331 items remained in Grade 7, zero items were moved to Grade 8, and 13 items were removed from the database.

Table 1

		Realigned Grade Level							Removed	Original Total Items
		2	3	4	5	6	7	8		
Original Grade Level	2	398	1	1						400
	3	22	320	5					18	347
	4	7	32	275	2	5	1		20	322
	5		12	53	242	39	6		14	352
	6		2	3	19	331	17		13	372
	7		4	4	14	28	255	24	7	329
	8				38	37	27	156	43	258
Realigned Total Items		427	371	341	315	440	306	180	115	

- Less than 1% of the items in Grade 2 were moved to another grade level, and 99% of the items remained in grade.
- In Grade 3, 6% of the items were moved to Grade 2, 1% of the items were moved to Grade 4, 5% of the items were recommended for removal from the database, and 88% of the items remained in grade.
- In Grade 4, 2% of the items were moved to Grade 2, 9% of the items were moved to Grade 3, 2% of the items were moved to either Grades 5, 6, or 7, 6% of the items were recommended for removal from the database, and 81% of the items remained in grade.

- In Grade 5, 3% of the items were moved to Grade 3, 14% of the items were moved to Grade 4, 11% of the items were moved to Grade 6, 2% of the items were moved to Grade 7, 4% of the items recommended for removal from the database, and 66% of the items remained in grade.
- In Grade 6, 1% of the items were moved to either Grades 3 or 4, 5% of the items were moved to Grade 5, 4% of the items were moved to Grade 7, 3% of the items were recommended for removal from the database, and 87% of the items remained in grade.
- In Grade 7, 1% of the items were moved to Grade 3, 1% of the items were moved to Grade 4, 4% of the items were moved to Grade 5, 8% of the items were moved to Grade 6, 7% of the items were moved to Grade 8, 2% of the items were recommended for removal from the database, and 77% of the items remained in grade.
- In Grade 8, 13% of the items were moved to Grade 5, 12% of the items were moved to Grade 6, 9% of the items were moved to Grade 7, 14% of the items were recommended for removal from the database, and 52% of the items remained in grade.

As a result of this realignment process, Grades 4, 5, 7, and 8 were left with fewer items than the original database. This can be attributed to more than 10% of the items in each of those grade levels moving to a lower grade level. Additionally, approximately 14% of the items originally coded to Grade 8 standards were more closely aligned to content in Algebra 1 and Geometry courses instead of Grades 2-8. The number of items realigned to each grade level during the process described in this report is in the row labeled *realigned items* in Table 2.

Beginning in 2013, an additional 300 items were written per grade level as part of the update to the Istation G2-G8 Universal Screener formative assessment item bank (Hatfield, Ratliff, Axel, Basaraba, & Ketterlin-Geller, 2015). These items are represented in the row labeled *new items* in Table 2.

Table 2

	Grade Level						
	2	3	4	5	6	7	8
Realigned Items	427	371	341	315	440	306	180
New Items	300	300	300	300	300	300	300
Total Items	727	671	641	615	740	606	480

Based on these outcomes, we would recommend writing additional items to address the inconsistencies in the item databases. More specifically, Grades 3, 4, 5, and 7 need between fifty to one hundred additional items while Grade 8 needs about 250 additional items to make the number of items in each database more consistent.

Conclusion

The purpose of this technical report was to describe the realignment of the existing items in a Grade 2 through Grade 8 formative assessment item bank for Imagination Station (Istation) to newly adopted mathematics content standards. We described the process used to realign each item to a revised blueprint representative of the revised mathematics content standards in two phases (in-grade and out-of grade). Finally, we summarized the outcomes of the realignment by grade level.

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Appendix A: Realignment Team Biographies

Realignment Team Member 1 holds a Master's degree in Leadership and Policy Studies and a Bachelor's degree in Mathematics Education. She has 8 years of experience in education as an academic coach, master math teacher, high school algebra teacher, elementary school teacher, middle school teacher, and in her current role as district mathematics supervisor.

Realignment Team Member 2 holds a Master's degree in Educational Administration, a Bachelor's degree in Interdisciplinary Studies with an emphasis in Mathematics, and credentials in Administration (K-12), Mathematics (Grades 4-8), and Conflict Resolution. She has experience as an Elementary Mathematics Specialist and as a mathematics teacher for Grades 4–8. She has also worked on a variety of national, state, and local assessment projects. She is currently an Assessment Coordinator for a mathematics research unit.

Realignment Team Member 3 holds a Master's degree in Special Education and a Bachelor's degree in Environmental Horticultural Science. He has seven years of experience developing alternate assessments for students with significant cognitive disabilities in Grades K-12. He is currently a Research Assistant on multiple mathematics assessment projects for Grades PK-8.