

Annual Program Evaluation of DoDEA Project – Quantitative Data Example

Background

In 2009, funds were granted to the Red Apple County Schools to support the delivery of research-based, academic enhancements to math programs to a population of targeted military-connected children enrolled in an elementary school serving a predominantly-military population. The project funded through the grant supports implementation of a classroom assessment program, regular and extended-day interventions in mathematics at Red Apple Elementary School. It also delivers professional development to teachers and para-professional staff in utilization of the assessment program and the new materials.

All grade 2-5 classrooms implemented the *First in Math* program, designed to assess the need for and provide differentiated, supplemental math instruction to all students on an ongoing basis. Additional, intensive interventions were provided to a subset of students in an extended-day program that also included other enrichment activities.

The purpose of this report is to analyze year one data in order to make recommendations to the Project Director for process improvement and to fulfill DoDEA reporting requirements on project and evaluation activities. Included in the year one program evaluation is an assessment of the fidelity of implementation of the program elements to date, including professional development modules. Additionally, the relative effectiveness of the individual intervention programs was assessed to inform both process improvements and sustainability plans.

Project Description

Project Goal: Increase student achievement in mathematics

Strategy 1: Professional Development: designed to increase teacher confidence in assessing student skills and in use of classroom intervention program, First in Math.

Strategy 2: Implementation of research-based Math Intervention Programs, DreamBox Learning, and Do the Math, in an extended day setting.

Interim Outcome 1: By June 2010, 85% of our military children Grades 3-5 will score 'proficient' or above on the State Math Assessment (SMA).

Interim Outcome 2: By June 2011, 88% of our military children Grades 3-5 will score 'proficient' or above on the State Math Assessment (SMA).

Project Outcome: By June 2012, 91% of our military children Grades 3-5 will score 'proficient' or above on the State Math Assessment (SMA).

Currently, this project has completed the first year of a three-year plan. Due to the requirements to provide professional development and assess student needs before beginning interventions, outcomes reported reflect only 6 months of direct intervention services on student achievement. Data were collected during the 2009-2010 school year to assess the implementation and outcomes of these programs. State Mathematics Assessments were taken by students in March 2010, with results reported to the school in July.

Evaluation Methodology

Data reported here were collected between August 2009 and June 2010. State Mathematics Assessments were completed by students in March 2010, with results reported to the school in July.

To assess fidelity of implementation of the professional development strategy, information on teacher attendance and course completion was evaluated. The professional development process was evaluated based on end-of-course evaluations. To assess fidelity of implementation of the academic interventions, the amount of time students spent with the intervention programs was compared to program specifications. Classroom observations were conducted to evaluate teacher use of assessment programs used for student placement.

Interim outcomes were assessed to evaluate overall student achievement as compared to goals; outcomes included percentages of students achieving proficiency on both formative and summative tests.

Process analysis of the interventions involved comparisons of students' test scores to 1) time spent in interventions, and 2) assignment to different intervention modules. This allowed an evaluation of the relative impact of the different interventions to inform sustainability plans. Because of the small numbers of students in each intervention group, it was not possible to evaluate military students separately on these formative measures.

Data Analysis and Findings

Fidelity of Implementation

Evaluation Question 1. To what extent were the project strategies (*First in Math*, *Do the Math*, *DreamBox Learning*) implemented as planned?

As Table 1 describes below, five separate interventions were provided to 258 students enrolled in grades 2 through 5 at the Red Apple Elementary School. Enrollment was divided approximately equally among the grade levels. The intervention *First in Math* was provided to all participants in the study, grades 2-5 from December 2009 through July 2010. Some students received additional interventions as shown. The original plan was to provide these interventions only in an Extended Day program. However, some students participated in the *DreamBox Learning* program as a pullout during regular classroom time. *DreamBox Learning* served 25 students, with 16 receiving the program only as an Extended Day intervention. *Do the Math* was provided for a significantly greater number of hours of intervention than *DreamBox Learning*.

Table 1: Indicators of Implementation

Intervention	Implementation Condition	# Participants	Duration (Months)	Intensity (# Hours Provided)	
				Mean Standard Dev	Range
<i>DreamBox Learning</i>	Extended Day	16	5	13.23 5.63	3.4 – 24.1
	During the Day	9	4	12.68 4.73	8.6 – 24.2
<i>Do the Math</i>	Addition and Subtraction	7	5	29.46 5.19	18.8 – 33.8
	Fractions	6	5	29.43 7.73	14.3 – 34.5
<i>First in Math</i>	<i>n/a</i>	258	7	NA	NA
Total		258			

According to program observations conducted by the project manager, all math interventions were implemented within specifications as described by the program developers with respect to target population, incorporation of program features, and minutes of use per day/week.

Professional development for all teachers in Red Apple Elementary School included technology training in September on utilization of the formative assessment program. An additional session was provided in December. All teachers attended at least one of the technology training sessions. All grade 2-5 teachers also attended a summer immersion program in math instructional skills utilizing the *First in Math* curriculum.

At the completion of the second technology training session, teachers completed a survey assessing their confidence in using the assessment program. Ninety-six percent indicated they were 'confident' or 'very confident' in administering the assessments. Only 73% were 'confident' or 'very confident' in utilizing the reports to assign students to appropriate remediation. Further questioning indicated that uncertainty stemmed primarily from lack of information about how *Do the Math* and *DreamBox Learning* were aligned with the *First in Math* program.

Process/Formative Assessment of Interventions

Evaluation Question 2. How effective were *Do the Math* and *DreamBox Learning* in the extended day program in raising math achievement?

Every group with the exception of students receiving the *First In Math/Do the Math-Addition* combination, demonstrated a scale score gain on the Scholastic Math Inventory (SMI) from pretest (November) to posttest (May). The pre-test to post-test correlation was 0.754 ($p < .000$), indicating reasonable consistency in performance. Across all students, the mean change (scale score points) was 112.42 ($SD=149.43$), statistically significant at the 0.000 level. As Table 2 shows, there were significant differences in growth associated with interventions. With pretest score removed as a covariate, the F test for significance of differences among the interventions was significant ($F=3.19$, $p < .008$). The small sample size complicates the interpretation of the data.

Table 2: Student Growth Shown by Math Intervention as Measured by SMI

Intervention	# Students	Scholastic Math Inventory Pretest Scale Score		Scholastic Math Inventory Posttest Scale Score		Difference
		Mean	SD	Mean	SD	
<i>First in Math (FIM)</i>	258	535.89	197.48	649.35	205.75	124.07 (153.06)
FIM + <i>DreamBox</i> Extended	16	233.33	98.04	423.33	211.42	190.0 (159.98)
FIM + <i>DreamBox</i> During Day (Gr 2)	9	255.00	151.39	319.17	103.50	64.17 (79.96)
FIM + <i>Do the Math-Add</i>	7	471.43	104.19	415.71	194.71	- 55.71 247.03)
FIM + <i>Do the Math-Fractions</i>	6	544.17	62.80	694.17	108.87	150.0 (119.03)

An analysis of covariance was performed to determine the influence on posttest scores of participation in a math intervention. Both pretest score and type of intervention provided accounted for significant variance in posttest performance.

Evaluation Question 3. How well does SMI Quantile score predict the SMA state mathematics assessment score?

Table 3 below describes the correlation between performance on the State Math Assessment (SMA), administered annually in early spring, and on the SMI across three administrations: Fall, Winter, and Spring. Not surprisingly, with the exception of grade 5, the correlation between the two scores increased from Fall to Winter because of the closeness in time of the administration of the two instruments. All correlations are statistically significant. The magnitude of the correlations suggests, however, that the SMI is a potentially useful predictor of SMA performance.

Table 3: SMA and SMI Relationships

Grade Level	Correlation Coefficient: SMA Scale Score and SMI Scale Score		
	SMA/SMI Fall	SMA/SMI Winter	SMA/SMI Spring
3	0.441 (N=57)	0.686 (N=59)	0.801 (N=59)
4	0.361 (N=64)	0.536 (N=64)	0.495 (N=64)
5	0.768 (N=65)	0.770 (N=65)	0.751 (N=65)

Evaluation Question 4. How effective was *First in Math* at improving student fact fluency?

Table 4 below displays the performance of students participating in *First in Math* on pre and post measures of fluency in addition and multiplication facts.

Table 4: Growth in Fact Fluency (Paired Samples Statistics)

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Addition Pretest	57.74	274	26.109	1.577
	Addition Posttest	74.32	274	29.688	1.794
Pair 2	Multiplication Pretest	64.82	146	26.82	2.220
	Multiplication Posttest	83.82	146	23.38	1.935

As the table indicates, the percent of addition facts mastered by these students improved by nearly 17 percent from pre to posttest, a difference significant at the .000 level ($t=10.85$, $df=273$). Whereas all students enrolled in grades 2-5 were pre- and post-tested in addition, a much smaller number – 146, mainly students above grade 3 – were also assessed in multiplication. This group experienced a 19 point gain on average, statistically significant at the .000 level ($t = 9.36$, $df=145$).

Because the program includes activities designed for use by students at home and some chose to use it only during the school day, the levels of engagement and participation in *First in Math* varied remarkably. A regression analysis was performed to determine whether posttest performance in multiplication fluency was related to engagement when pretest differences were controlled. This result is reported in Table 5.

Table 5: Regression Analysis Between Growth and Engagement Controlled for Pre Test Scores

Model	Unstandardized Coefficients		Standardized Coefficients	t	Significance
	Beta	Std. Error	Beta		
(Constant)	53.860	4.318		12.473	.000
Multiplication Pretest	.462	.062	.530	7.504	.000
(Constant)	52.324	4.232		12.365	.000
Multiplication Pretest	.400	.063	.458	6.304	.000
Sticker Count *	.004	.001	.220	3.023	.003

*Stickers are awarded for each activity completed. The Sticker Count is an indicator of extent of engagement with the program.

The value of R-square, an index of the amount of variance in the posttest scores accounted for by the predictors, increased from 0.281 to 0.324 with the addition of “engagement” as a predictor. This suggests that student scores are positively affected by the amount of time the student spends engaged in the program.

Evaluation Question 5. How effective is *First in Math* in identifying students who lack fact fluency?

A contingency coefficient was computed to examine the relationship between student proficiency level (met versus not met) as determined by the *First in Math* assessment compared to proficiency level based on the SMI Fact Screener. Of the 210 students who met the SMI performance standard at the end of the year, 156 (74%) also met the *First in Math* end-of-year standard for proficiency in addition. By the same token, of the 27 students who failed to meet the SMI standard, 25 (92.5%) also failed to achieve proficiency in addition on the *First in Math* assessment. The contingency coefficient was 0.407 ($p < .000$), indicating a statistically significant relationship.

Summative Assessment of Interventions

Evaluation Question 6. What percentage of students in grades 3-5 were proficient or above as measured by the State Mathematics Assessment?

Table 6 below displays the number of students enrolled in the school who scored at each of five proficiency levels on the SMA administered in March 2010.

Table 6: Proficiency Levels of Students Grade 3-5: 2010 State Math Assessment

Proficiency Level	% of all students tested	% of military-connected students tested
Advanced	21.7	22.5
Proficient	57.8	61.8
Basic	24.1	15.7
Below Basic	0.9	0.0
All Students at Advanced or Proficient = 79.5		
Military-Connected Students at Advanced or Proficient = 84.3		

Conclusions and Recommendations

Overall, Red Apple County’s DoDEA Project fell just short of its year one interim goal to have 85% of 3-5th grade, military-connected students at the Red Apple Elementary School achieve a level of ‘proficient’ or above on the State Math Assessment in the spring administration of the test. However, significant skill improvement was noted among students overall as measured by formative tests, and for those participating in each of the intensive interventions, with the exception of those participating in the *Do the Math - Addition* module.

An evaluation of fidelity of implementation revealed that, while weekly administration of the intervention services met minimum requirements, the total number of months for which intervention services had been delivered at the time of testing was not optimal. Further, it was evident that the *First in Math* program was not utilized to the same extent by all students participating in the program. Based on the SMI improvements noted in the limited time during which all interventions were fully

implemented, and the strong correlation between SMI and SMA scores, it is anticipated that, after a full year's involvement in the remediation programs, students achieving scores of 'proficient' or above will increase to a greater extent.

Teachers are not yet fully confident in their use of the *First in Math* assessment results in matching students to remediation modules. However, not all of the professional development courses planned for this project were completed prior to the administration of the survey. Another intensive summer math teaching took place in June 2010, and additional on-site technical training was provided by the program publisher in September of 2010. A survey of teacher confidence was conducted after that training session, and results will be included in next year's report.

Recommendations to improve student achievement in mathematics at the Red Apple Elementary School further include:

- A change in the delivery of the *DreamBox* program. In the first year, this program was delivered both during the school day and in an extended day program. Students in the extended day program used *DreamBox* four more hours on average and demonstrated a greater overall increase in math skills as measured by formative tests. We conclude that use of the program only during the regular school day is not optimal. Possible solutions would be greater participation in extended-day programs, or providing alternative times for students to utilize the program, if students are unable to participate in the extended day program.
- *First in Math* was also not utilized consistently by all students. Analysis of engagement with the program (as measured by stickers awarded) indicated that increased engagement was correlated with increases in scores on formative assessments. It is recommended that the school provide more information about the program to parents and include an outreach component to the families of at-risk students to increase the number of students completing the home-based components of the program.
- Although not included in the original evaluation questions, it would be useful to determine what percentage of students identified as needing intensive remediation participated in the extended-day program. Based on the increases in students' math skills that came with additional time in remediation, increasing the numbers of at-risk students in the program would extend these benefits. Current program funds are not sufficient to provide additional extended-day staff. However, maximum enrollment has not been reached in the current program. One potential strategy for increasing extended-day attendance by at-risk students is to increase outreach to parents to emphasize the need for participation. A survey of parents might also determine why students do or do not participate in recommended extended-day programs.