Abstract Title Page

Title: The Impact of Project GLAD on Students' Literacy and Science Learning: Year 1 Results from a Cluster-Randomized Trial of Sheltered Instruction

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Background

With the increased population of English learners (ELs), educators need programs that help students access academic content while learning to understand, speak, read, and write English (Tharp, Estrada, Dalteen, & Yamaguchi 2000; Echevarria, Short & Powers, 2006). ELs come into U.S. schools needing to learn the same grade-level content as their nonEL peers, but with the additional challenge of learning English—usually the language of instruction—as well. Although some approaches separate the two tasks, many researchers and practitioners call for integrating them, so that students do not miss content area instruction while they are learning English. One way to combine the two is sheltered instruction, which provides intentional linguistic and other supports to ELs to facilitate their learning of grade-level content (Echevarria, Short & Powers, 2008). As a recent review of the research makes clear, however, there is limited evidence to show the effectiveness of sheltered instruction (Goldenberg, 2013).

Since the early 1990s, Project GLAD (Guided Language Acquisition Design) has made claim to be a program that helps teachers meet diverse language and content needs within the mainstream classroom (Brechtel, 2001). Project GLAD is a multi-component K-12 instructional model designed to build academic English and grade-level content knowledge for students at varying levels of English language proficiency. It is billed as an approach that benefits all students, but particularly ELs. Although before this study Project GLAD had not undergone a rigorous evaluation, there is research behind many of the 35 individual instructional strategies that make up the Project GLAD approach, which fall into four broad components (Table 1).

Component 1. Five **motivation strategies** accomplish two goals: 1) they set expectations for behavior and engagement (Arnold, McWilliams, & Arnold, 1998; Bohn, Roehrig & Pressley, 2004; Emmer & Stough, 2001), and 2) they build student interest by connecting to background knowledge, which may be particularly crucial for ELs (August & Shanahan, 2006; Kamil, 2003).

Component 2. Six **input strategies** provide students with new information in multiple formats (images, graphic organizers, etc.) so that they can understand grade-level content, regardless of their level of language development (Behr, Lesh, Post, & Silver, 1983; Lee et al.,2005; Lee & Fradd, 1998; Sowell, 1989; Wenglinsky, 2000).

Component 3. Ten **guided oral practice strategies** are designed to scaffold students' use of key vocabulary and language structures in an accepting environment, often through cooperative learning (Kagen, 1993; Gersten et al., 2007). ELs require additional oral English language development beyond what is provided in standard language arts curricula (August & Shanahan, 2006; Gersten & Baker, 2000), and because oral language proficiency is correlated with the reading and writing ability of ELs (August & Shanahan, 2006; Genesee et al., 2006).

Component 4. There are 14 **reading and writing** strategies to promote instruction in academic language through the deliberate scaffolding of more complex language skills, which can be crucial not only for ELs, but for all students (Davis & Miyake, 2004; Kuhn et al, 2006; Walqui & Van Lier, 2010). Here, as across all four component areas, the strategies intentionally build in opportunities for differentiated instruction, so teachers can meet the needs of students at different levels of English proficiency.

Despite the research supporting particular instructional strategies, there has been no rigorous evidence to date about the impact of these strategies when they are integrated into a package called Project GLAD. This study addresses the need for such evidence.

Research Question

- What is the impact of Project GLAD teacher training on fifth-grade students' reading comprehension, vocabulary, writing and science achievement in the treatment classrooms during the first of implementation, compared to a "business as usual" control group?
- Is the program impact different for ELs?

Setting

We conducted this two-year cluster randomized trial in fifth-grade classrooms from 30 Idaho schools across 21 different districts. Almost half (47%) of our sample schools were classified as rural. The other half were located within towns (23%), cities (17%) or suburban locales (13%). School enrollment varied from 277 to 717, with a mean of 475 students. Table 2 compares school-level characteristics of treatment and control schools (insert Table 2 here).

Participants

We began Year 1 (2011-2012) with 101 fifth-grade teachers across the 30 schools. Most teachers were white, female, and experienced, with an average of over 11 years of experience teaching (17 years for teachers in the control group; see Table 3).

Our analytic sample consisted of 2,253 students. Ten percent were eligible for special education and 65 percent were eligible for free/reduced-price lunch (Table 4). Sixty-two percent of students were white and another third (33%) were Hispanic. Overall, 13 percent of students were current ELs or former ELs who had been reclassified within the prior two years (we combined the two groups because of small sample size and because of the way they were coded in state data). In order to be eligible to participate in the study, schools needed to have at least five ELs in grade five—and did, in the year of recruitment. However, in Year 1, one school had no ELs in fifth grade. The other 29 schools had between 4 and 30 percent current or recently reclassified ELs. While data on primary language was not available for the students in our study, 93 percent of our EL sample was Hispanic and Idaho's EL population is made up primarily of Spanish speakers (Idaho State Board of Education, 2012).

Program

The Project GLAD instructional model consists of 35 well-defined instructional strategies, organized, as noted above, into four broad categories. To learn to use the Project GLAD approach, teachers participate in a highly structured seven-day training sequence with follow-up coaching. There is no standardized amount of coaching; instead, the amount depends on the preferences and available funding of each district. For this study, teachers received three days of coaching spread over the school year, which represented an amount of coaching that many districts might realistically purchase.

The seven days of professional development begin with a two-day workshop, which provides an overview of the approach and an introduction to the instructional strategies in August. A month or two later, teachers attend a five-day demonstration. In Project GLAD demonstrations, one trainer takes over the classroom of a participating teacher every morning for a week and teaches a complete compressed and intensive unit using the Project GLAD instructional strategies. Other teachers sit in the back of the classroom and watch, while a second trainer quietly explains what the trainer is demonstrating and why. In the afternoons, teachers work to plan a unit of their own and address questions and concerns with the trainers. All 42 teachers in the treatment group attended all seven days of the training.

While the Project GLAD professional development provided for this study was in most ways typical of the training that teachers receive when schools or district purchase it, it was different in one important way: it was only delivered to fifth-grade teachers. Typically, all teachers in a school would be trained at the same time, which might provide greater administrative and collegial support for implementation.

All teachers in the treatment group utilized at least some Project GLAD strategies, although the frequency and quality varied substantially. Teachers in the control schools delivered instruction "as usual"; in only five percent of control classrooms did we find any evidence of a Project GLAD (or GLAD-like) instructional strategy in use (Deussen & Nelsestuen, 2013).

Research Design

For our cluster randomized design, we recruited 30 schools with 101 fifth-grade teachers, and then randomly assigned 15 schools each to treatment and control conditions. Most teachers at every school participated, although a small number declined. Teachers in treatment and control schools were similar on most characteristics (Table 2), although teachers in the control schools had more experience (17.2 years compared to 11.6).

Attrition. In Year 1, we lost no schools but 2 teachers left their classrooms for health reasons (one control and one treatment). In Year 1, we pretested 2778 students. The majority of these students also completed the battery of spring posttest assessments (83.1% overall; 83.6% for students in the control condition; and 82.5% for students in the treatment condition). Seven percent of students (6.5% overall; 5.7% for students in the control condition; and 7.3% for the treatment condition) did not complete any posttest assessments and were lost to attrition.

Data Collection and Analysis

Measures. Outcomes include three measures of literacy and two measures of fifth-grade science content (insert Table 5). For the Gates-MacGinitie (GM) reading and vocabulary measures, we had pretests that were different versions of the same test. For writing and science, we used the fall GM comprehension assessment as a covariate in place of a pretest.

Data collection procedures. For each measure, we collected data from all 42 treatment and 50 control classrooms in Year 1. We provided the assessments and detailed instructions, and teachers administered the assessments during a designated testing window.

Analysis. We examined treatment effects for reading comprehension, vocabulary, six distinct writing traits, and science separately using a two-level hierarchical linear model run with HLM6 (Raudenbush, Bryk, & Congdon, 2008). Treatment was included as a dichotomous variable at the school level, the level of assignment, using the formula below. We ran the model to test treatment effects on outcomes for all students, and separately for ELs.

Level 1 [Student]

$Posttest_{ij} = b_{0j} + b_{1j}Pretest_{ij} + e_{ij}$

Level 2 [School]

$b_{0j} = g_{00} + g_{01}Treatment_j + u_{0j}$

$b_{1j} = g_{10}$

Results

Baseline equivalence of treatment and control. Table 6 displays the mean pretest scores for the GM reading comprehension and vocabulary scores. The treatment group started out with

a higher mean score in both reading comprehension and vocabulary (effect size, expressed as Hedge's g = 0.117). We included the GM pretests in our model.

Year 1 impact on all students. Tables 7 through 9 present findings from Year 1 of the randomized controlled trial for all students, EL and non-EL combined. With only small effect sizes and no statistically significant treatment effect, we found no evidence that Project GLAD improved students' reading comprehension and vocabulary in the first year of implementation.

We examined the impact of Project GLAD on students' writing by looking at the six traits of effective writing. There were no statistically significant treatment effects for any of the six traits (Table 8). However, the result for the trait of "ideas" was marginally significant and was the largest effect size of any of the literacy measures (b=0.14, p=.062 and Hedges g= 0.22).

Finally, on the science measures, we did not find any statistically significant impact in terms of treatment effect (Table 9), although the effect size for the end-of-unit science test was the largest of any measure (b=0.50, p=0.101, Hedges g = 0.24).

Year 1 impact on ELs only. Tables 10 through 12 present findings from Year 1 for the EL subgroup only. Both the GM reading comprehension and vocabulary measures had marginal positive effects (b=6.87, p=0.099, Hedges g = 0.24 for comprehension and b=5.72, p=0.092, Hedges g = 0.21 for vocabulary). Of the six writing traits, there was also a marginally significant impact for the trait of "ideas" (b=0.21, p=0.053, Hedges g = 0.32) and "organization" (b=0.15, p= 0.086, Hedges g = 0.27). There was no significant impact for the other writing traits nor for the two science measures.

Conclusions

The promise of sheltered instruction is that ELs' instructional needs can be met by a mainstream classroom teacher. To realize this promise, many districts have invested heavily in professional development for their teachers in various models of sheltered instruction, including Project GLAD. But to date this investment has occurred with only limited evidence of modest impact (Goldenberg, 2013; Echevarria, Short & Powers, 2006).

Our study, like others of similar programs, found no significant treatment effect for the general student population in the first year of implementation. Whether or not additional time to fully implement the program results in a significant effect is something that can be partly answered by our forthcoming Year 2 results. However, we did find marginally significant results for ELs in reading comprehension, vocabulary, and the writing traits of "ideas" and "organization." The size of the effect for reading comprehension is equivalent to about 58 percent of the growth in reading that fifth-grade students can be expected to make, on average, over the year (Bloom, Hill, Black & Lipsey, 2008). Our findings are consistent with those of a study of another approach to supporting ELs within the mainstream classroom, Project QuEST; researchers found no significant impact overall but did find an impact when ELs' outcomes were examined separately (August, Branum-Martin, Cardenas-Hagen & Francis, 2009).

Two limitations to this study deserve mention. First, it assesses impact when only fifth-grade teachers implement Project GLAD, when it is more likely that a whole school would implement at the same time. Secondly, retrospective power analyses with actual (rather than projected) ICC and R-squared values suggest that we were underpowered for some of our analyses. Data from a second year of implementation may help us learn more about the impact on student achievement.

Appendices

Appendix A. References

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Appendix B. Tables and Figures

Table 1
Project GLAD's 35 strategies in four component areas

Focus & Motivation Strategies: Set standards for behavior, build engagement, interest, & prior knowledge	**Input Strategies:** Provide information in multiple formats	**Guided Oral Practice Strategies:** Scaffold student understanding, use of key vocabulary and language structures	**Reading & Writing Strategies:** Scaffold student academic literacy
Three behavior standards/super scientist awards Cognitive content dictionary (CCD) Observation charts Teacher-made big books Inquiry chart	Graphic organizer Pictorial input chart Narrative input chart 10/2 lecture Read aloud/shared book experience Realia	Chants Poetry Found poetry Sentence patterning chart Picture file card sort Exploration report Retells Team tasks Expert groups Mind maps	Story map Team tasks Process grid Cooperative strip paragraph Writers' workshop Group frame ELD retell Clunkers and links Focused reading with personal CCD Ear-to-ear reading Listen and sketch Learning logs Interactive journals Home/school connections

Table 2
School characteristics for treatment and control groups

	Treatment (n=15)	**Control (n=15)**
Percent rural	47%	47%
Percent FRL	59%	58%
Percent white	64%	63%
Percent Hispanic	31%	33%
Average enrollment	487	464

Source: U.S. Department of Education, National Center for Education Statistics. Common Core of Data: Public Elementary and Secondary School Universe, 2010–11, version 2a.

Table 3
Baseline comparison of teachers in the treatment and control groups

	Treatment (n=42)	**Control (n=50)**
Average years experience (SD)	11.6 (8.4)	17.2 (11.7)
Percent female	85%	82%
Percent white	95%	96%
Percent with master's degree	25%	31%
Percent with ESL endorsement	5%	5%
Prior Sheltered Instruction Observation Protocol (SIOP) training	66%	70%

Table 4
Demographic characteristics of students in the analytic sample (n=2,253)

	N	**%**
Female	1093	49%
FRL eligible	1464	65%
Special education	221	10%
White	1403	62%
Hispanic	753	33%
EL (current and reclassified)	297	13%

Table 5

Outcome assessments for Project GLAD cluster randomized trial

Subject	Measure	Pretest administered?
Reading comprehension	Gates-MacGinitie Reading Comprehension (4th edition)	Yes
Vocabulary	Gates-MacGinitie Vocabulary, (4th edition)	Yes
Writing	6+1 Traits writing assessment in response to a science prompt (each trait scored separately)	No
General science achievement	Idaho State Achievement Test (ISAT) grade 5 science assessment	No
Specific science content	End-of-unit assessment from Scott Foresman earth science grade 5 textbook	No

Table 6

Reading comprehension and vocabulary pretest extended scale scores for treatment and control groups

Assessment	Group	N	Pretest	
			Mean	SD
Reading comprehension	Treatment	1060	498.90	35.34
	Control	1025	494.74	35.77
Vocabulary	Treatment	1064	496.11	34.03
	Control	1214	492.11	33.66

Table 7

Two-level model results, Year 1: Gates-MacGinitie reading comprehension and vocabulary

	Reading comprehension					Vocabulary				
Fixed Effects	Coefficient	SE	*t (df)*	*p*	ES*	Coefficient	SE	*t (df)*	*p*	ES*
Treatment	2.72	1.96	1.39(28)	0.177	0.07	2.03	1.50	1.35(28)	0.187	0.06
Pretest	0.81	0.03	31.28(2021)	0.000		0.89	0.01	62.99(2038)	0.000	
Intercept	506.85	1.33	381.65(28)	0.000		511.18	0.93	547.97(28)	0.000	
Random Effects	Variance	SD	χ^2 *(df)*	*p*		Variance	SD	χ^2 *(df)*	*p*	
School	18.59	4.31	75.50(28)	0.000		11.21	3.35	77.63(28)	0.000	
Student	719.92	26.83				425.11	20.62			

* Effect size was calculated using Hedges' g.

Table 8

Two-level model results, Year 1: 6-Traits writing

	Trait 1: Ideas					Trait 2: Organization				
Fixed Effects	Coefficient	SE	*t (df)*	*p*	ES*	Coefficient	SE	*t (df)*	*p*	ES*
Treatment	0.14	0.74	1.94(28)	0.062~	0.22	0.75	0.06	1.21(28)	0.235	0.14
Pretest	0.01	0.00	13.04(2015)	0.000		0.01	0.00	12.95(2015)	0.000	
Intercept	3.97	0.05	82.00	0.00		3.75	0.04	94.87(28)	0.000	
Random Effects	Variance	SD	χ^2 *(df)*	*p*		Variance	SD	χ^2 *(df)*	*p*	
School	0.04	0.20	261.28(28)	0.000		0.03	0.16	244.08(28)	0.000	
Student	0.32	0.57				0.23	0.48			
	Trait 3: Voice					Trait 4: Word Choice				
Fixed Effects	Coefficient	SE	*t (df)*	*p*	ES*	Coefficient	SE	*t (df)*	*p*	ES*
Treatment	0.03	0.06	0.54(28)	0.590	0.07	0.06	0.05	1.37(28)	0.181	0.16
Pretest	0.00	0.00	8.97(2015)	0.000		0.00	0.00	8.95(2015)	0.000	
Intercept	4.08	0.03	127.88(28)	0.000		4.05	0.03	149.06(28)	0.000	
Random Effects	Variance	SD	χ^2 *(df)*	*p*		Variance	SD	χ^2 *(df)*	*p*	

School	0.02	0.15	332.11(28)	0.000		0.02	0.13	274.68(28)	0.000	
Student	0.14	0.37				0.14	0.38			
	Trait 5: Sentence Fluency					Trait 6: Conventions				
Fixed Effects	Coefficient	SE	*t (df)*	*p*	ES*	Co-efficient	SE	*t (df)*	*p*	ES*
Treatment	0.06	0.05	1.20(28)	0.239	0.11	0.04	0.03	1.05(28)	0.301	0.07
Pretest	0.01	0.00	13.70(2015)	0.000		0.01	0.00	14.252(2015)	0.000	
Intercept	3.84	0.03	132.96(28)	0.000		4.02	0.02	169.68 (28)	0.000	
Random Effects	Variance	SD	χ^2 *(df)*	*p*		Variance	SD	χ^2 *(df)*	*p*	
School	0.01	0.12	183.70(28)	0.000		0.01	0.08	98.33(28)	0.000	
Student	0.17	0.42				0.17	0.41			

~ p<.10
* Effect size was calculated using Hedges' g.

Table 9
Two-level model results, Year 1: Science

	Idaho State Achievement Test					Scott Foresman End-of-Unit Test				
Fixed Effects	Coefficient	SE	*t (df)*	*p*	ES*	Coefficient	SE	*t (df)*	*p*	ES*
Treatment	1.27	0.85	1.49(28)	0.148	0.13	0.50	0.30	1.70(28)	0.101	0.24
Pretest	0.56	0.02	33.78(2115)	0.000		0.19	0.00	16.78(2014)	0.000	
Intercept	208.97	0.66	314.43(28)	0.000		6.05	0.13	47.98(28)	0.000	
Random Effects	Variance	SD	χ^2 *(df)*	*p*		Variance	SD	χ^2 *(df)*	*p*	
School	5.12	2.26	286.71(28)	0.000		0.65	0.81	354.47(28)	0.000	
Student	44.40	6.66				3.32	1.82			

* Effect size was calculated using Hedges' g.

Table 10
Two-level model results for English learners, Year 1: Gates-MacGinitie reading comprehension and vocabulary

	Reading comprehension					Vocabulary				
Fixed Effects	Coefficient	SE	*t (df)*	*p*	ES*	Coefficient	SE	*t (df)*	*p*	ES*
Treatment	6.87	4.03	1.71(27)	0.099~	0.24	5.72	3.28	1.75(27)	0.092~	0.21
Pretest	0.66	0.06	11.30(263)	0.000		0.62	0.06	10.85(266)	0.000	
Intercept	474.26	2.65	178.73(27)	0.000		473.95	2.42	195.88(27)	0.000	
Random Effects	Variance	SD	χ^2 *(df)*	*p*		Variance	SD	χ^2 *(df)*	*p*	
School	55.44	7.45	50.01(27)	0.005		25.96	5.10	38.00(27)	0.078	
Student	514.90	22.69				505.31	22.48			

~ p<.10
* Effect size was calculated using Hedges' g.

Table 11

Two-level model results for English learners, Year 1: 6-Traits writing

	Trait 1: Ideas					Trait 2: Organization				
Fixed Effects	Coefficient	SE	*t (df)*	*p*	ES*	Coefficient	SE	*t (df)*	*p*	ES*
Treatment	0.21	0.10	2.02 (27)	0.053~	0.32	0.15	0.08	1.78(27)	0.086~	0.27
Pretest	0.01	0.00	4.78 (256)	0.000		0.01	0.00	5.04(256)	0.000	
Intercept	3.54	0.06	58.92 (27)	0.00		3.41	0.06	59.73(27)	0.000	
Random Effects	Variance	SD	χ^2 *(df)*	*p*		Variance	SD	χ^2 *(df)*	*p*	
School	0.03	0.17	47.13(27)	0.010		0.02	0.14	42.84(27)	0.027	
Student	0.34	0.58				0.26	0.51			
	Trait 3: Voice					Trait 4: Word Choice				
Fixed Effects	Coefficient	SE	*t (df)*	*p*	ES*	Coefficient	SE	*t (df)*	*p*	ES*
Treatment	0.02	0.06	0.36(27)	0.723	0.05	0.10	0.06	1.64(27)	0.112	0.22
Pretest	0.00	0.00	4.80(256)	0.000		0.00	0.00	3.90(256)	0.000	
Intercept	3.94	0.05	86.50(27)	0.000		3.84	0.04	92.29(27)	0.000	
Random Effects	Variance	SD	χ^2 *(df)*	*p*		Variance	SD	χ^2 *(df)*	*p*	
School	0.01	0.10	47.38(27)	0.009		0.01	0.08	34.25(27)	0.159	
Student	0.12	0.35				0.16	0.40			
	Trait 5: Sentence Fluency					Trait 6: Conventions				
Fixed Effects	Coefficient	SE	*t (df)*	*p*	ES*	Coefficient	SE	*t (df)*	*p*	ES*
Treatment	0.03	0.04	0.61(27)	0.545	0.05	0.01	0.07	0.15(27)	0.882	0.02
Pretest	0.01	0.00	6.30(256)	0.000		0.01	0.00	8.59(256)	0.000	
Intercept	3.56	0.02	150.48(27)	0.000		3.76	0.03	122.61(27)	0.000	
Random Effects	Variance	SD	χ^2 *(df)*	*p*		Variance	SD	χ^2 *(df)*	*p*	
School	0.00	0.00	17.40(27)	>.500		0.00	0.07	33.38(27)	0.185	
Student	0.24	0.49				0.20	0.44			

~ p<.10

* Effect size was calculated using Hedges' g.

Table 12

Two-level model results for English learners, Year 1: Science

	Idaho State Achievement Test					Scott Foresman End-of-Unit Test				
Fixed Effects	Coefficient	SE	*t (df)*	*p*	ES*	Coefficient	SE	*t (df)*	*p*	ES*
Treatment	0.88	0.85	1.04(27)	0.309	0.12	0.42	0.40	1.05(27)	0.303	0.19
Pretest	0.44	0.04	10.34(275)	0.000		0.02	0.00	3.34(266)	0.001	
Intercept	201.47	0.65	309.24(27)	0.000		5.32	0.25	21.23(27)	0.000	
Random Effects	Variance	SD	χ^2 *(df)*	*p*		Variance	SD	χ^2 *(df)*	*p*	
School	1.98	1.41	41.20(27)	0.039		0.65	0.81	74.69(27)	0.000	
Student	32.38	5.69				3.93	1.98			

* Effect size was calculated using Hedges' g.