

Assessing the Academic Learning of Utah Students in Dual Language Immersion (DLI) Programs

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This research uses data made available through a Data Share Agreement between the Utah State Office of Education and the UEPC. The views expressed are those of the authors and not necessarily the USOE's nor endorsed by the USOE.



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Utah Dual Language Immersion

- State-funded in accordance with SB 41, 2008
- One-way, and two-way (Spanish)
- 50/50 two-teacher model
- Currently 118 schools with DLI programs in 22 districts
- Currently five languages:
 - Spanish (63)
 - Chinese (33)
 - French (14)
 - Portuguese (6; started 2013)
 - German (2, started 2014)



DLI Schedules: Math, Science/Social Studies & Literacy Grades 1-3

Taught in English	Monday - Thursday	Friday	Total
Math, Science, Social Studies Reinforcement*	40 minutes/day	20 minutes	180 minutes/week
Literacy	140 minutes/day	100 minutes	660 minutes/week

Taught in Target Language	Monday	Tuesday	Wednesday	Thursday	Friday	Total
Math	70 minutes	70 minutes	70 minutes	70 minutes	50 minutes	330 minutes/week
Science/Social Studies*	50 minutes		50 minutes		30 minutes	130 minutes/week
Literacy	60 minutes	60 minutes	60 minutes	60 minutes	40 minutes	280 minutes/week

*Interconnections: Integrated science/social studies curriculum

DLI Math and Science Time Allocation

Grades 4 & 5

Taught in English	Monday	Tuesday	Wednesday	Thursday	Friday	Total
Math	60 minutes	60 minutes	60 minutes	60 minutes	60 minutes	300 minutes/week
Social Studies/Science*	30 minutes		30 minutes			60 minutes/week
Literacy	90 minutes	90 minutes	90 minutes	90 minutes	60 minutes	420 minutes/week

Taught in Target Language	Monday	Tuesday	Wednesday	Thursday	Friday	Total
Math	30 minutes	30 minutes	30 minutes	30 minutes	30 minutes	150 minutes/week
Science/Social Studies*		30 minutes		30 minutes		60 minutes/week
Literacy	90 minutes	90 minutes	90 minutes	90 minutes	60 minutes	420 minutes/week

Academic Outcomes of Immersion Students: English Language Arts

French (Lazurak, 2007)

- After receiving formal English instruction, students receiving 80% instruction in L2 performed as well or better than non-immersion students by third/fourth grade.
- Students with 50% instruction did not surpass non-immersion peers.

Mandarin Chinese (Padilla, Fan, Xu, and Silva, 2013)

- 2nd grade two-way immersion students scored significantly lower than their non-immersion cohorts.
- By 4th grade, non-immersion students scored higher; in 3rd and 5th grade, the two cohorts scored similarly.



Academic Outcomes of Immersion Students: Math & Science

French (Bournot-Trites and Reeder, 2001)

- Fourth grade French immersion students received either 80% (treatment) or 50% (comparison) math instruction in L2.
- By sixth grade, the treatment group outperformed the comparison group in ELA and math.

Mandarin Chinese (Padilla, Fan, Xu, and Silva, 2013)

- After performing similarly in 2nd and 3rd grade, immersion students outperformed non-immersion students in math.
- Differences between immersion and non-immersion students in 5th grade science were not statistically significant.



The Current Study

This study aimed to answer the following questions:

- What were the demographic characteristics of DLI students?
- How did DLI students perform academically?
- What impact might DLI participation have on academic performance?

These questions were addressed through:

- Analysis of 3rd grade English Language Arts (ELA) and math Criterion Referenced Tests (CRTs) results
- Analysis of 4th grade ELA, math and science CRT results
- Analysis of DLI pilot group



3rd Grade Study: Overview

- In a 2012 study, we analyzed 3rd grade DLI student test data and found that DLI students did as well in math (taught in the target language) as they did in ELA (taught in English).
- Through collaboration with the Utah State Office of Education, we can now better classify students as participating in DLI.
- Using the new classification technique, we replicated the previous study.



3rd Grade Study: Methods

- Students were included in the sample if they were in third grade, not mobile, and took ELA and math CRTs in 2012.
 - Sample included
 - 1,231 DLI students,
 - 1,515 non-DLI students from DLI schools, and
 - 41,355 students from non-DLI schools
- Math scores of DLI and non-DLI students were compared using multi-level regression with school, demographic characteristics and ELA scores used as covariates.



3rd Grade Study: Demographic Characteristics of DLI Students

- DLI students were more likely to be female or Hispanic than non-DLI students.
- DLI students were less likely to be from low income families, in special education, or from non-Hispanic minority groups than non-DLI students.
- Demographics of the sample were similar to the previous study.

3rd Grade Study: DLI Students' Academic Achievement

	ELA CRT	Math CRT	Percent Chronically Absent
DLI Students	170	170	3%
Non-DLI Students in DLI School	166	167	7%
Non-DLI Students in Non-DLI School	167	168	7%

On average, DLI students had higher ELA and math CRT scores and were less likely to be chronically absent than non-DLI students.

These results confirmed results from the previous study.

3rd Grade Study: Impact of DLI Participation on Academic Performance

- When ELA scores and demographics were held constant, **DLI students performed no differently in math** than non-DLI students.
 - DLI students who were in special education (N=81) performed significantly better on the math CRT than other students in special education who were not in DLI.
- Neither target language (Chinese, French, or Spanish) nor program type (one- or two-way) predicted math scores when demographics were accounted for.
- These results confirmed those from the previous study.



4th Grade Study: Methods

- Students from the replication study were retained for this sample if they attended the same school in 3rd and 4th grade, took CRTs in 2013, and were not mobile.
 - Sample included 1,147 DLI students, 1,255 other students from DLI schools, and 34,982 students from non-DLI schools
- Science scores for DLI and non-DLI students were compared using the same methods used in the 3rd grade study.
- Growth of DLI students in ELA and math was compared to growth of non-DLI students using two-stage propensity matching.

4th Grade Study: Demographic Characteristics of DLI Students

- Demographics were similar to those in the 3rd grade study with DLI students more likely to be female or Hispanic and less likely to be from low income families, in special education, or from non-Hispanic minority groups.

4th Grade Study: DLI Students Academic Performance

	ELA CRT	Math CRT	Science CRT	ELA SGP	Math SGP	Percent Chronically Absent
DLI Students	171	172	165	51 st percentile	55 th percentile	2%
Other students in same schools	167	168	164	47 th percentile	49 th percentile	6%
Other students in state	168	169	165	49 th percentile	50 th percentile	6%

- On average, DLI students had higher ELA and math CRT scores and were less likely to be chronically absent than non-DLI students.
- DLI students had similar science CRT scores as non-DLI students.
- Student Growth Percentile (SGP) of DLI students was higher than that of non-DLI students' in both ELA and math.

4th Grade Study: Impact of DLI Participation on Academic Performance

4th Grade Outcome	Differences attributable to DLI participation	Significance level
Growth in ELA	DLI students grew the same as propensity matched non-DLI students.	p=.446
Growth in Math	DLI students experienced significantly more growth than propensity matched non-DLI students.	p=0.004

4th Grade Study: DLI Impact (continued)

- When ELA scores and demographics were held constant, **DLI students scored about one point lower** than non-DLI students on science CRTs.
- Students in special education who participated in DLI performed similarly to propensity matched students not in DLI.
- Neither target language (Chinese, French, or Spanish) nor program type (one- or two-way programs) accounted for differences in DLI student performance when demographics were accounted for.



DLI Pilot Program: Overview

- Prior to the program's 2009 inception, nine Utah schools piloted DLI in 2008; these students' 5th grade scores are available.
- We were not able to run multilevel models, but:

We used the data and descriptive statistics to get an idea about what to expect in 5th grade and to support the findings from our 3rd and 4th grade studies.



Pilot Program: DLI Students Academic Performance

	English Language Arts			Math			Science	
	3 rd Grade	4 th Grade	5 th Grade	3 rd Grade	4 th Grade	5 th Grade	4 th Grade	5 th Grade
DLI students	168	170	169	168	170	172	164	167
Other students in the same schools	167	169	168	169	169	171	166	168
Other students in the state	167	168	167	168	168	170	165	167

- Overall, DLI students did better in ELA and math than non-DLI students.
- In 4th grade, DLI students did significantly worse in science than non-DLI students.
- In 5th grade, DLI students scored the same in science as non-DLI students statewide.

Pilot Program: Impact of DLI Participation on Academic Performance

	English		Math		Science
	4 th grade SGP	5 th grade SGP	4 th grade SGP	5 th grade SGP	5 th grade SGP
DLI students	50 th	50 th	58 th	54 th	54 th
Other students in the same schools	50 th	50 th	51 st	49 th	51 st
Other students in the state	49 th	50 th	50 th	50 th	50 th

- In 4th and 5th grade, DLI students showed similar growth as non-DLI students in ELA, and more growth in math.
- In 5th grade, DLI students' growth in science was greater than non-DLI students'.

Research Questions and Summary of Results

What were the demographic characteristics of DLI students?

DLI students were fairly similar to non-DLI students although there were a little more likely to be female or Hispanic, and less likely to be from low income homes or in special education.

How did DLI students perform academically?

DLI students did great—they scored above the state average on ELA and math CRTs and around the state average in science. They were significantly less likely than other students to be chronically absent.



Research Questions and Summary of Results (continued)

What impact might DLI participation have on academic performance?

- Participation in DLI did not seem to have an impact on ELA scores or on 3rd grade math scores.
- The students appeared to learn more math in 4th grade, surpassing their non-DLI peers.
- DLI appeared to have some negative effect on 4th grade CRT scores in science,
- Preliminary results provide some evidence that DLI students greater growth than non-DLI students in 5th grade.

Implications and Questions for Future Research

- Additional exploration is necessary to understand why DLI students outperform non-DLI peers in math, but not in science.
- We will investigate whether reduced chronic absenteeism rates of DLI students have an impact on academic achievement.
- We will conduct a follow-up 5th grade study; however, new statewide achievement tests replaced CRTs in 2014.



Implications and Questions for Future Research

- Comparison of instructional times and curriculum structure may contribute to better understanding of our findings.
- How might we increase instructional time for science? For example, might literacy & science be more integrated?

Works Cited

Bournot-Trites, M., & Reeder, K. (2001). Interdependence Revisited: Mathematics Achievement in an Intensified French Immersion Program. *Canadian Modern Language Review/ La Revue Canadienne Des Langues Vivantes*, 58(1), 27-43.

Lazaruk, W. (2007). Linguistic, Academic, and Cognitive Benefits of French Immersion. *Canadian Modern Language Review/ La Revue Canadienne Des Langues Vivantes*, 63(5), 605-627.

Padilla, A., Fan, L., Xu, X., & Silva, D. (2013). A Mandarin/English two-way immersion program: Language proficiency and academic achievement. *Foreign Language Annals*, 661-679.

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Questions?



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Additional Slides for Curriculum Information



Math (4th Grade)

Instruction Template

English classroom	Materials/Resources Needed	Target Language classroom	Materials/Resources Needed
Introduce concept: <ul style="list-style-type: none"> • Conceptual understanding • Representational understanding • Abstract understanding 	Grade level Common Core State Standards Any district-adopted math program <ul style="list-style-type: none"> • Student book • Teacher Edition • Formative and Summative assessments 	Review concept: <ul style="list-style-type: none"> • Conceptual understanding • Representational understanding • Abstract understanding 	Grade level Common Core State Standards Language specific materials: <ul style="list-style-type: none"> • Reteach and Practice Pages • Vocabulary cards • Daily Spiral Review: (includes computation and word problems) Non-Language specific materials: <ul style="list-style-type: none"> • Computation fluency practice (available online through a variety of free resources) Free Printables for Math Fact Fluency http://www.mathfactcafe.com/ http://www.kidzone.ws/math/basicfacts.htm http://www.superkids.com/aweb/tools/math/ http://donnayoung.org/math/drills.htm
I do-we do-you do		I do-we do-you do	
Reteach, Practice, and Extend		Reteach and Practice	
Vocabulary		Vocabulary	
Problem solving		Problem of the Day	
Daily Homework		Daily Spiral Review	
Unit/Chapter/Topic tests		Computation fluency practice	
Benchmark tests			
Daily Math Schedule: (60 minutes)		Daily Math Schedule: (30 minutes) -Reteach page (self-starter) 5-10 minutes -Daily Spiral Review (together as a class)– 5-10 minutes -Vocabulary (together as a class) – 5-10 minutes -Fluency Practice (independent work)- 5 minutes	



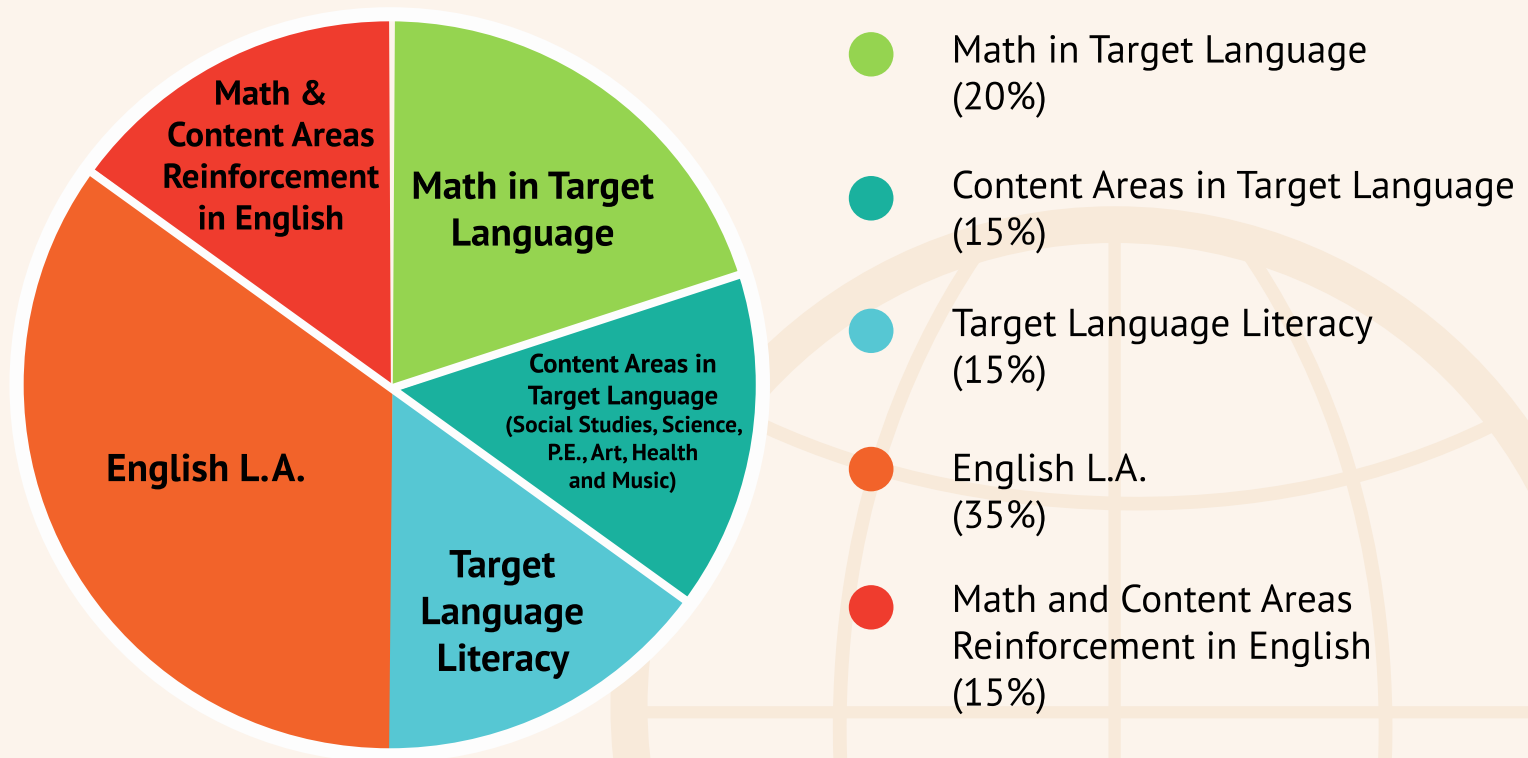
Science Lesson Plan Template

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Grade (Put the grade i.e. 2 nd , 3 rd)	Lesson: (Name lesson with terminology that links it to the terminology in the Standard i.e. The Water Cycle Part 1)
Science Standard(s): (List the science standard from the Utah Core)	
Content Objective(s):	Language Objective(s):
Teacher objective <i>Student objective [posted]</i>	Teacher objective <i>Student objective [posted]</i>
Essential Questions:	Required Academic Vocabulary for Word Wall: Listen: Speak: Read: Write: Sentence Frames:
Materials:	Additional Lesson Vocabulary:
Lesson:	Instructional Time:
Opening: (minutes) Introduction to New Material (Direct Instruction): (minutes) Guided Practice: (minutes) Independent Practice: (minutes) Closing: (minutes)	
Assessment:	
Extra Ideas:	



CURRICULUM: GRADES K-3



- Math in Target Language (20%)
- Content Areas in Target Language (15%)
- Target Language Literacy (15%)
- English L.A. (35%)
- Math and Content Areas Reinforcement in English (15%)

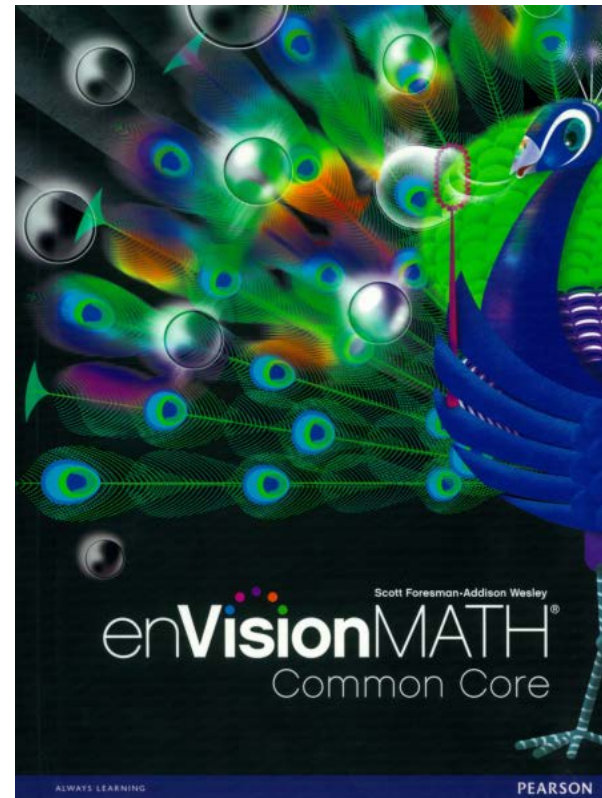


MATH CURRICULUM: GRADES K-3



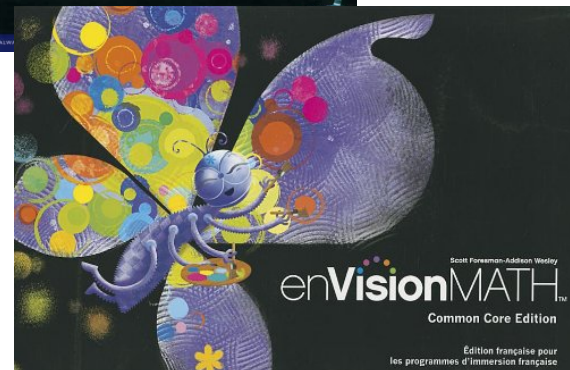
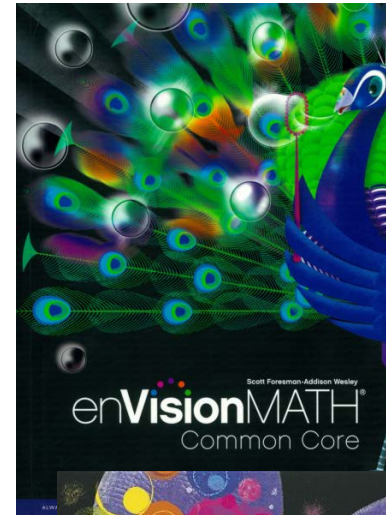
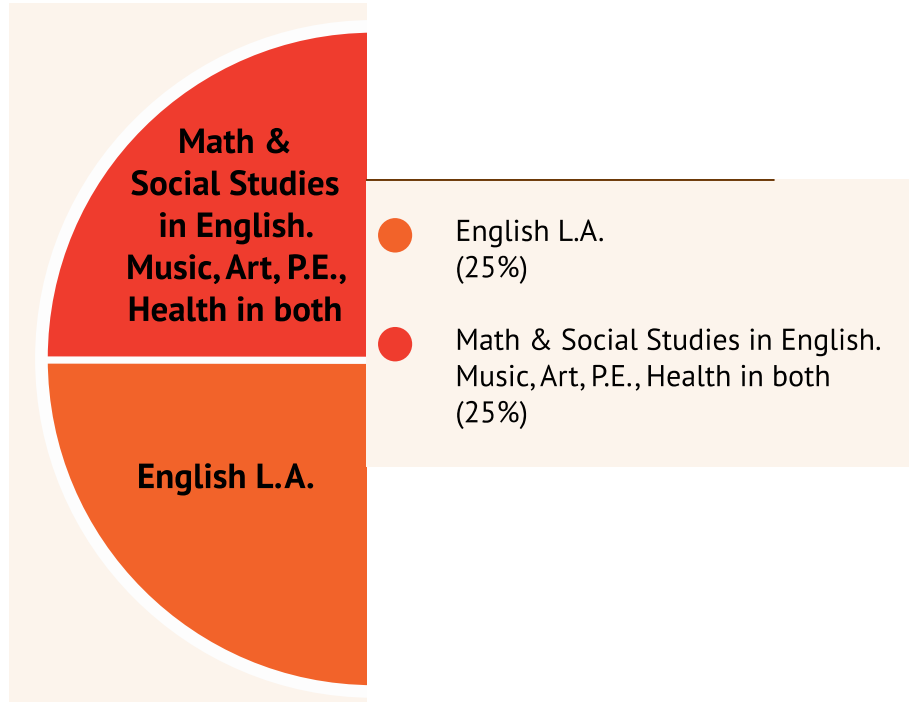
EVERYDAY COUNTS CALENDAR MATH

PEARSON enVision MATH,
Grades K-3, Target Language Editions



MATH CURRICULUM: GRADES 4-5

PEARSON enVision MATH,
Practice Sheets in the Target Language



INTERCONNECTIONS: SOCIAL STUDIES AND SCIENCE

GRADES 1-3

- Interconnections combines social studies and science lessons.
- There is no textbook for Interconnections; teachers receive scripted lesson plans written by the Utah State Office of Education dual language immersion teams.
- Interconnections isn't taught every day, and some lessons can take several days to complete.
- Interconnections is the curriculum area where teachers have more opportunity to give students social language, an important part of L2 language learning and literacy.



INTERCONNECTIONS: SOCIAL STUDIES AND SCIENCE

GRADES 4-6

- Interconnections separates science and social studies in Grades 4-6.
- In grades 4 and 5, only science is taught by the target language immersion teacher
- In grade 6, only social studies is taught by the target language immersion teacher.



UTAH'S CURRICULUM SUPPORT

- **TEXTBOOKS and WORKBOOKS**
 - Math, Target Language Literacy
- **SCRIPTED LESSON PLANS**
 - Math, Interconnections, Target Language Literacy

