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Impact Evaluation of Twig Science in Le Mars Community School District

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Introduction

Modern science education emphasizes student-centered, inquiry-driven approaches that align with current learning science research literature. The 5E instructional model (Engage, Explore, Explain, Elaborate, and Evaluate) provides a proven framework for promoting active learning and conceptual change by guiding students through a structured process of discovery and reflection (Bybee et al., 2006). Further, the Next Generation Science Standards (NGSS) promote three-dimensional learning which integrates disciplinary core ideas (DCIs), science and engineering practices (SEPs), and crosscutting concepts (CCCs) to help students make sense of complex scientific phenomena (NGSS Lead States, 2013). At the core of these standards is the use of phenomena-based learning in which students investigate observable phenomena in the natural world, fostering deeper engagement and the application of knowledge across contexts (Schwarz et al., 2017). Twig Science from Imagine Learning is a K–8, phenomena-based science curriculum from Imagine Learning that follows the 5E instructional model and supports three-dimensional learning as outlined in the NGSS standards.

This study aimed to evaluate the efficacy of Twig Science by addressing the research question: how does the use of Twig Science impact the development of student science proficiency? To accomplish this, Imagine Learning partnered with Le Mars Community School District (LMCSD), which implemented Twig Science in several middle school classes with the intent to improve student science proficiency. Reported study results demonstrate how this program impacted students' science proficiency by comparing the performance of Twig Science students to a highly similar group of students who did not use Twig Science.

Methods

POPULATION

Imagine Learning partnered with LMCSD in Iowa to evaluate how Twig Science impacted the science proficiency of Grade 6–8 students. LMCSD serves over 2,000 K–12 students in western Iowa. Demographically, students attending LMCSD schools are mostly White/Caucasian (88%) and speak English in the home (85%). Approximately 13% of students qualify for special education services and about 6% of families in the community earn an income below the poverty level (Webner, 2024; NCES, 2022).

During the 2024–2025 school year, three teachers from the same middle school, each assigned to a single grade level (6, 7, or 8), used Twig Science in three of their seven total sections (i.e., classes). Each teacher selected the treatment and control sections at the beginning of the school year and maintained this assignment throughout the school year. Since the utilization of Twig Science varied between sections, comparisons were made at the section level.

RESEARCH DESIGN

This study was conducted during the 2024–2025 school year. It evaluated the difference in science achievement between treatment and control students. The treatment group was comprised of all students that used Twig Science in pre-determined Grade 6–8 sections during the 2024–2025 school year, while the control group included all Grade 6–8 students that did not use Twig Science and instead used the business-as-usual science curriculum already available in the district. Assignment to the treatment and control groups was not random, so this study is a quasi-experimental design, and statistical procedures were used to ensure baseline equivalence of the treatment and control samples and account for group-level differences.

CURRICULUM

Twig Science is a comprehensive, phenomena-based K–8 science curriculum grounded in the 5E instructional model and the principles of three-dimensional learning. It integrates science and engineering practices, crosscutting concepts, and disciplinary core ideas to promote deep conceptual understanding and student inquiry. Key features include scientific investigations with rich multimedia, collaborative problem-solving tasks, and integrated literacy supports. The curriculum is fully aligned with the Next Generation Science Standards, ensuring coherence and progression across grade levels.

MEASURES

Multiple data sources were compiled to describe students and their science proficiency. Baseline academic ability of the study groups was determined using data from the fall administration of the Imagine Galileo science benchmark assessments. Student science outcomes were determined using data from the spring administration of the Imagine Galileo assessment. Student demographic data was shared from the district to provide additional information on student characteristics that may impact the measurement of learning outcomes. These data sources are reviewed in more detail below.

Imagine Galileo: Fall 2024 scores from the Imagine Galileo science benchmark assessment were used to establish baseline equivalence between study groups, and spring 2025 scores were used to estimate the effect of Twig Science on general science proficiency. The Imagine Galileo science benchmark assessments were independently developed by Assessment Technology Incorporated (ATI) prior to their affiliation with Imagine Learning. The assessments are not typically coupled with the implementation of Twig Science, as the Twig Science curriculum includes its own embedded assessments. Thus, to avoid possible over-alignment of the Twig Science curriculum and the embedded Twig Science assessments, the Imagine Galileo science benchmark assessments were used to assess student growth in science proficiency.

Iowa Statewide Assessment of Student Progress (ISASP): Spring 2024 scores from the ISASP Reading and Math tests were included in primarily analytical models to account for potential baseline differences in academic ability between study groups. The ISASP is a summative assessment administered to students in Grades 3 and above throughout the state of Iowa. The inclusion of the spring 2024 ISASP Math and Reading assessments in analytical models provides additional assurance that any observed differences in science proficiency outcomes between study groups were due to the treatment and not due to pre-existing differences in academic performance.

Student Demographics: Data was shared from the district on individual student demographic characteristics including grade level, Individualized Education Plan (IEP) status, English language learner status, ethnicity, and gender. This data was utilized in analytical models to account or control for potential differences in study groups.

Results

To ensure that the baseline characteristics of treatment and control students used in analyses were comparable, 1:1 nearest neighbor propensity score matching with replacement was used to create a statistically equivalent analytical sample at the beginning of the 2024–2025 school year. A total of 196 control students were matched to 196 treatment students based on their fall 2024 Imagine Galileo science benchmark scores and all demographic factors. Exact matches were made within grades to eliminate the possibility of cross-grade comparisons. Some attrition was observed due to incomplete spring Imagine Galileo science assessments. The resulting analytical sample included 187 users of Twig Science and 195 non-users which translates to 2.6% overall attrition and 4.1% differential attrition (WWC, 2022). Matching statistics revealed that the final treatment and control groups were statistically comparable. **Table 1** below describes the characteristics of the analytical sample.

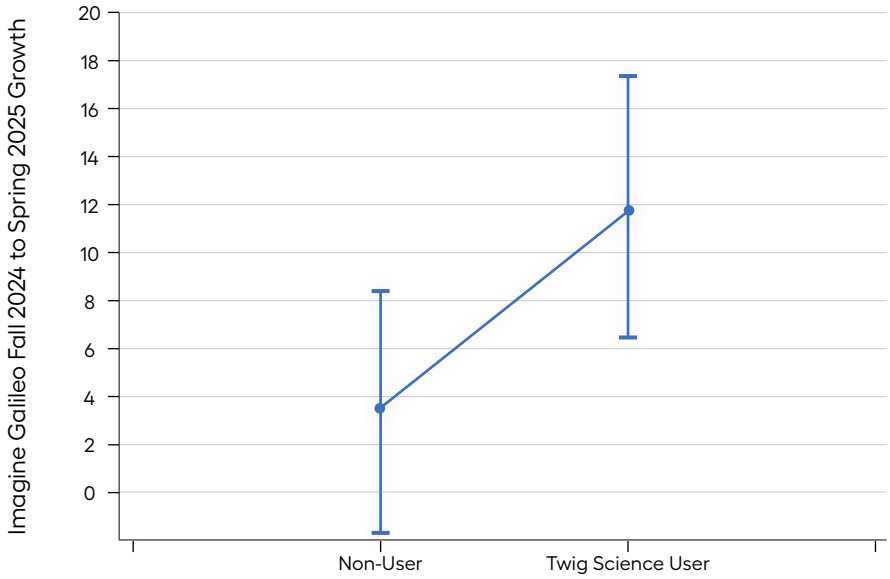
Table 1. *Student Characteristics of the Analytical Sample*

Group	Subgroup	Twig Science Users	Non-Users	Standardized Mean Difference (SMD)
n		187	195	
Average (SD) Fall 2024 Imagine Galileo Score		1280 (39.6)	1272 (41.9)	**.19**
Average (SD) Spring 2024 ISASP Math Score		486.9 (52.0)	486.8 (49.3)	**<.01**
Average (SD) Spring 2024 ISASP Reading Score		486.9 (46.7)	489.4 (44.9)	**.05**
Grade (%)				**.02**
	6th grade	31.6	32.3	
	7th grade	36.9	36.9	
	8th grade	31.6	30.8	
Gender (%)				**.08**
	Female	47.1	51.3	
	Male	52.9	48.7	
IEP (%)				**.06**
	IEP	12.8	14.9	
	No IEP	87.2	85.1	
Hispanic (%)				**.09**
	Hispanic	19.8	16.4	
	Not Hispanic	80.2	83.6	
English Language Learner (%)				**.06**
	ELL	5.3	6.7	
	Not ELL	94.7	93.3	
Free or Reduced Lunch (%)				**.10**
	Paid	63.6	59.0	
	FRL Qualified	36.4	41.0	

Multi-level generalized linear modeling accounting for section-level effects was subsequently employed to evaluate the differences in fall-to-spring 2024–2025 Imagine Galileo science benchmark score growth between Twig Science users and non-users, controlling for fall 2024 Imagine Galileo science benchmark scores, spring 2024 ISASP Math and Reading scores, and demographic covariates. An indicator of whether a student was a control or treatment student was included in the model as the primary predictor variable.

Overall, the use of Twig Science was found to be positively and statistically significantly associated with fall-to-spring score growth on the Imagine Galileo science benchmark assessment. Twig Science users achieved 8.81 points higher growth than students that did not use Twig Science (*B* = 8.81, *p* = .022; see **Figure 1** and **Table 2**).

Figure 1. *Overall Impact of Twig Science on Fall 2024 – Spring 2025 Imagine Galileo Science Benchmark Score Growth; Grades 6–8*



Note: Error bars denote 95% confidence intervals

Table 2. *Overall Impact of Twig Science on Fall 2024 – Spring 2025 Imagine Galileo Science Benchmark Score Growth; Grades 6–8*

Coefficients	Estimate	Standard Error	*p*-value
Twig Science User Indicator	8.81	3.86	.022
Intercept	608.27	66.35	<.001
Fall 2024 Imagine Galileo Science Benchmark Score	-.72	.06	<.001
Spring 2024 ISASP Math Score	.21	.07	.004
Spring 2024 ISASP Reading Score	.43	.09	<.001
Grade Level			
6th (reference)			
7th	25.87	4.95	<.001
8th	15.34	6.54	.019
Hispanic	-1.44	5.10	.777
English Language Learner Indicator	.026	8.66	.998
Male Indicator	-6.86	4.03	.089
IEP Indicator	3.00	6.23	.630
FRL Qualified Indicator	-3.07	4.16	.460

Conclusion

This study provides evidence of the efficacy of Twig Science on student science proficiency for students in Grades 6–8 by comparing students who used Twig Science with those who did not during the 2024–2025 school year. A limitation of this study is that it was conducted in a single middle school. Therefore, the results must be interpreted within the context and scale of the implementation setting. However, the use of a quasi-experimental design and the application of propensity score matching and multi-level modeling serve to substantiate the observed results. Ultimately, this study shows that students who used Twig Science achieved higher science proficiency growth than did statistically similar comparison students. Thus, this study provides evidence that the use of Twig Science supports students' science achievement.

References

Bybee, R. W., Taylor, J. A., Gardner, A., Van Scotter, P., Powell, J. C., Westbrook, A., Landes, N. (2006). The BSCS 5E Instructional Model: Origins, Effectiveness, and Applications. Colorado Springs, CO: BSCS.

National Center for Education Statistics. (2018-2022). ACS dashboard: Le Mars Community School District, Iowa. U.S. Department of Education. https://nces.ed.gov/Programs/Edge/ACSDashboard/1916530

National Research Council. 2013. Next Generation Science Standards: For States, By States. Washington, DC: The National Academies Press. DOI: 10.17226/18290.

NGSS Lead States. 2013. Next Generation Science Standards: For States, By States. Washington, D: The National Academies Press

Schwarz, C. V., Passmore, C., Reiser, B. J. (2017). Helping Students Make Sense of the World Using Next Generation Science and Engineering Practices. NSTA Press.

Webner, S. (2024). Le Mars Community School District 2023–2024 Annual Progress Report to the Community. Retrieved from: https://www.lemarscsd.org/plans-and-reports

What Works Clearinghouse. (2022). What Works Clearinghouse procedures and standards handbook, version 5.0. U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance (NCEE).

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