Learning Experience Design (LXD) Research & Consulting
a division of Charles River Media Group, LLC

LXD RESEARCH ESSA Level 2 Evidence

Frax Foundations Efficacy Study Review

Third-Party, Expert ESSA Evidence-Level Review
by Rachel Schechter, Ph.D., founder of LXD Research

Study Report Reviewed	Conrad, M. (2023). Technical research report: Efficacy analysis of Frax Foundations I, Quasi-Experimental Results of Frax Usage and i-Ready Diagnostic Math Assessment Scores. Explorelearning.
ESSA (Every Student Succeeds Act) Evidence Level	**Moderate (Tier 2):** At least one well-designed and well-implemented quasi-experimental study on the intervention indicates positive effects.
Provider	Explore Learning, more information can be found at www.explorelearning.com or email research@explorelearning.com.

Study Summary

Explore Learning contracted with LXD Research for an independent review of a quasi-experimental study their internal team conducted in partnership with a large school district in Florida: "Technical research report: Efficacy analysis of Frax Foundations I, Quasi-Experimental Results of Frax Usage and i-Ready Diagnostic Math Assessment Scores." The study authors conducted multiple analyses to investigate how Frax Foundations I (Frax) use in grades 3–4 was associated with increased mathematics achievement as measured by iReady. All schools had access to the program, and teachers decided if and how to use the program. Because the study was conducted retrospectively, the author could determine who used the program and who did not and could match Frax users with a statistically similar, matched group for comparison. Over 5,000 students were in the study, and findings support that students with high usage outperformed the control group in both grades. It is important to note that fewer than 260 per grade met the High Usage criteria. Encouragingly, the third-grade Moderate Usage also outperformed the control group on overall test scores by nearly the same margin as the high usage group (N=289). High Usage Frax students outperformed non-users regarding expected growth and reaching on-level benchmarks. We encourage readers to review the study report for detailed information on all analyses and findings.

Product Description

ExploreLearning Frax is a standards-aligned program designed to support fractions learning for students in grades 3-5 using research-proven instructional methods. Game-based and story-driven, Frax invites students to travel through space on engaging and standards-based missions that motivate and incentivize student-driven learning. Students earn rewards and tokens as they play, which they can use to personalize their virtual living quarters on the ship. It uses innovative adaptive technology that delivers different levels of support to different students depending on their progress, making it effective for struggling students and those needing extra practice via a learning path unique to their skills and abilities. Frax also provides real-time data to show teachers when a student is struggling so that they can intervene.

Study Sample and Usage Description

Who was in the study?

The sample was created using all 3rd and 4th graders in a large suburban school district in Florida with 118 schools. The district's minority enrollment is over 60%, and 35% of students are economically disadvantaged. There were 2,530 who used Frax, and the same number that did not use Frax, for a total of 5,060 students. Demographic profiles for each group were similar.

How were they selected to be in the study?

This study was conducted retrospectively, so it was not intentionally decided who would use Frax and who would not. Rather control students were selected from the pool of students who did not use Frax using a case-control matching procedure with those who did use Frax. This matching method is considered scientifically strong for selecting comparison students and includes randomness. Baseline equivalence was established through the matching process per rigorous research standards.

Research Questions and Findings

What did Frax usage look like?

The use of Frax ranged widely among the students, with 59% in the "Low Frax Usage" category, with less than 3 hours spent working on missions and 10 or fewer missions completed. One-fifth (20%) of students were in the "High Frax Usage" category, with about 12 hours spent working on missions and over 20 missions completed. Only the High Frax Usage group is used in the final analysis.

How did students with different levels of Frax usage compare to the non-Frax users on math growth across the year?

- While Low Frax Users made similar gains on iReady Diagnostic, the High Frax Users outperformed the control group (0.23 effect size for third grade and 0.37 for fourth grade). In third grade, Moderate Frax Users also outperformed the control group. An effect size of 0.2 is considered low-medium in educational research, while a 0.4 is considered strong.
- Correspondingly, the same grade and usage combinations also were more likely to meet their math growth projections by the end of the year than non-users.

How did students with different levels of Frax usage compare to non-Frax users on reaching math grade level proficiency?

- This study examined the change in percent of students On-Grade Level from the Fall to the Spring. All groups improved on this metric, treatment, and control.
- High Frax users in both third and fourth grade had statistically higher gains in the percentage of students On-Grade level than the non-users. **Getting to grade level is where being a High User was necessary.**

What other questions do our experts have for the author?

- The High Usage group had a relatively low total time: the average of 9 hours a year is less than 15 minutes a week. The product intentionally paces students to support spaced practice, so getting on the computer for more days of the year would be needed to increase the total time. More information about the range of use and how much weekly time (and number of weeks) would be ideal for maximum outcomes would be a helpful addition to this paper.
- Along those same lines, what was the correlation, or strength of the relationship, between total time (and missions completed) and gains on iReady? Were there a certain number of completed missions that increased the likelihood of reaching grade level? Was there a plateau in the benefit of time, in other words is there such a thing as "too much" time?

What other recommendations do our experts have for the next research study?

- Conducting a smaller, more controlled study using the "recipe for success" identified by answering the above questions is a key next step towards building the evidence base for Frax Foundations.
- Assigning students or schools to treatment and control groups in that smaller, controlled study would provide strong evidence for effectiveness.

Learning Experience Design (LXD) Research & Consulting
a division of Charles River Media Group, LLC

LXD RESEARCH ESSA Level 2 Evidence

LXD Research ESSA Evidence Review

Frax Foundations I, 2023 Efficacy Study

LXD Research determined that this study provides moderate evidence for Frax Foundations I math efficacy in grades 3–4 according to Every Student Success Act (ESSA) levels of evidence provided by the U.S. Department of Education guidelines for the following reasons:

Criteria for Moderate ESSA Level 2

- ✅ The study has compared experimental groups to control groups by matching.
- ✅ Matching/weighting was conducted before posttest collection or during the early stage of intervention implementation.
- ✅ The study demonstrated pretest equivalence.
- ✅ The dependent variable(s) include a quantitative measure of academic achievement.
- ✅ The study lasts at least 12 weeks, from program inception to posttest.
- ✅ The study has at least 2 teachers and 30 students per treatment.
- ✅ The study uses a form of a program that could, in principle, be replicated.

What would have been needed for What Works Clearinghouse to have approved this study with Moderate evidence?

- Even though students were clustered in schools, this paper did not account for that clustering in the analysis which would modify the effect sizes and significance level.
- There may have been differences in how students of different demographic profiles fell into the usage categories (and the corresponding control groups). Controlling for those differences may also modify the effect sizes and significance level.

LXD Research Expert Reviewers

Expert Reviewer	Rachel Schechter, Ph.D., LXD Research, rachel@lxdresearch.com, www.drrachelschechter.com www.lxdresearch.com
	Dr. Rachel Schechter founded Learning Experience Design (LXD) Research and an Edtech Trendsetter Award honoree for her contributions to the edtech industry. An international speaker and writer on literacy product efficacy, Dr. Schechter has published research for companies including Lexia, Houghton Mifflin Harcourt, Engage2Learn, Hatch Early Learning, Labster, and 95 Percent Group. Dr. Schechter has a Master's in Education from Harvard University and a Ph.D. in Child Development from Tufts University. Leading LXD Research, her team's guidance boosts the capacity for education leaders to buy research-proven products and edtech company leaders to measure, communicate, and accelerate learning outcomes for students of all abilities.
Expert Reviewer	Nathaniel Joseph, Pedagogy Non Grata, www.Teachingbyscience.com
	Nathaniel Hansford is a teacher of 11 years, with a specialist in reading and in special education. He is the author of The Scientific Principles of Reading Instruction and The Scientific Principles of Teaching. He is the lead writer and editor for the popular *education* websites: Pedagogy Non Grata and Teaching by Science. Nathaniel Hansford, has conducted almost three dozen case studies, and multiple large meta-analyses, including the largest meta-analysis on phonics instruction in the last 10 years and the only large-scale meta-analysis on reading comprehension that controlled for measurement type. He is passionate about making academic research accessible for teachers.

Learning Experience Design (LXD) Research, a division of Charles River Media Group, is an independent research firm that specializes in evaluating educational programs to support accelerated learning. Learn more at www.lxdresearch.com.