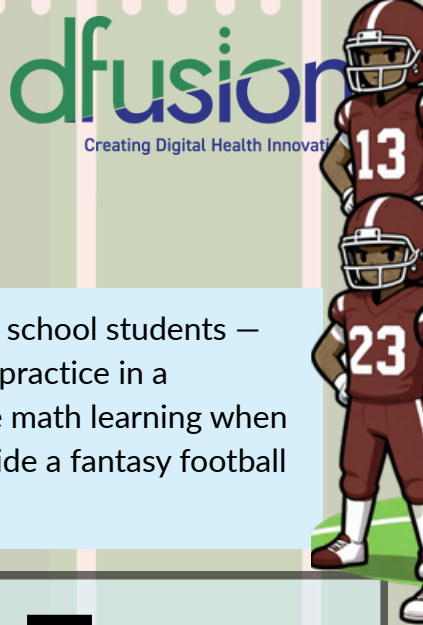




FANTASY SPORTS MATH League

Logic Model



PROBLEM STATEMENT: Fraction fluency is a well-established gatekeeper skill for algebra and STEM access [1], yet national math scores continue to decline [6] and many middle school students — especially those with the lowest baseline skills and confidence — disengage from decontextualized worksheet practice and develop lasting math anxiety [2]. Embedding repeated practice in a personally relevant, real-world context increases interest and performance, especially for lower-confidence students [4], and well-designed digital games can significantly improve math learning when they attend to the cognitive, motivational, affective, and sociocultural dimensions of gameplay [3,5,7]. FSML applies these principles by embedding authentic fraction practice inside a fantasy football game. Evidence to date spans an uncontrolled Fall 2025 pilot and a controlled, DOE-funded Spring 2026 quasi-experimental design (QED) study.

Inputs

What will students do in FSML?

- FSML web-based platform (Chromebook, tablet, computer compatible)
- Real NFL player statistics feed, updated weekly (historical data used off-season)
- Standards-aligned curriculum (fraction operations, PEMDAS, budgeting, problem-solving)
- Educator's Guide and teacher onboarding materials
- COPPA/FERPA-compliant data infrastructure
- Participating teachers and classroom instructional time

- U.S. Dept. of Education IES/SBIR funding (contract #91990023C0025)
- Arroyo Research Services — independent evaluator
- Subscription revenue & grant funding
- Learning-sciences research base on fractions, math anxiety, and game-based learning design [1–5,7]

Assumptions

- Teachers and students have reliable access to Chromebooks/tablets and internet
- Weekly gameplay is sustained at sufficient frequency and duration to produce measurable effects

Activities

What makes FSML special?

- Teacher draft-day setup (~30 min)
- Weekly student scoring activity (10-15 min): compute fantasy points using fraction operations on real NFL stats, embedding practice in a personally relevant context [1,4]
- Automated grading and leaderboard updates; game mechanics designed around cognitive, motivational, affective, and sociocultural engagement principles [7]
- Off-season gameplay reconfigured with historical NFL data to support an out-of-season study window
- In-platform “temperature check” surveys (3x per season)
- Pre- and post-season assessment administration; independent QED data collection (student/teacher surveys, teacher interviews) across treatment and control classrooms
- Teacher support and professional learning community engagement

Outputs

What does data tells us??

Fall 2025 Pilot (n≈325, pre/post, no control group)

- 9 teachers onboarded across 6 states; 15 classes, 4-18 weeks of gameplay per class
- 252 pre-survey; 104 matched pre/post; 144 post-survey respondents
- 9 classes completed all 3 in-platform temperature checks; 9/9 teacher surveys

Spring 2026 QED Study (Arroyo Research Services)

- 6 teachers, 201 students pre-survey (171 post; 133 matched) in PA & CT
- 107 treatment / 26 control students; 4-6 week intervention window
- Student surveys, teacher surveys, and teacher interviews collected for treatment and control groups

Short Term Outcomes

Fall 2025 Pilot

- Fraction confidence +0.50 pts ($p < .001$); fraction anxiety -0.29 pts ($p = .044$) [2]
- Math problems correct +1.38 of 11 ($p < .001$); hardest-problem accuracy 17%→38% [1]
- Low-baseline students (0-5/11 correct) gained +3.19 problems; non-White students showed -0.57 anxiety reduction vs. -0.02 for White students
- 100% of teachers want to reuse FSML; 75% report increased engagement [3,5]

Spring 2026 QED Study

- Treatment scored 13 pp higher than comparison on math postscale, controlling for prescore, gender, grade, race/ethnicity ($p = .004$)
- Significant within-group math gain for treatment ($p = .024$); no significant change for comparison
- Significant gain in fraction-equation confidence for treatment ($p = .05$); no significant change for comparison [2]
- 53% of students rated enjoyment 4-5/5; 52% would recommend FSML to others [3,5]

Long Term Outcomes

- Sustained, recurring classroom adoption: 5 of 6 Spring 2026 treatment teachers plan to continue into Fall 2026 regular season
- Expansion from single-classroom pilots to multi-classroom/school adoption, now spanning 8+ states
- District adoption decisions informed by pilot and QED evidence
- Stronger readiness for fraction-dependent algebra and STEM coursework [1]
- Reduced math anxiety trajectory into high school [2]
- Narrowed math achievement and confidence gaps for historically underserved student populations, sustained across seasons
- Evidence-based math intervention adopted at scale across multiple districts and states



Research Base (rationale for intended impact)

- [1] Siegler et al. (2012). Fractions predict later algebra achievement. *Psychological Science*, 23(7), 691–697.
- [2] Ramirez et al. (2013). Math anxiety, working memory, and achievement. *J. Cognition & Development*, 14(2), 187–202.
- [3] Clark, Tanner-Smith, & Killingsworth (2016). Digital games improve learning (meta-analysis). *Rev. Educational Research*, 86(1), 79–122.
- [4] Hulleman & Harackiewicz (2009). Real-world relevance boosts interest & performance. *Science*, 326(5958), 1410–1412.
- [5] Tokac, Novak, & Thompson (2019). Game-based learning boosts math achievement. *J. Comp. Assisted Learning*, 35(3), 407–420.
- [6] NCES (2024). NAEP 2022 Mathematics Long-Term Trend, ages 9 & 13.
- [7] Plass, Homer, & Kinzer (2015). Foundations of game-based learning. *Educ. Psychologist*, 50(4), 258–83.

External Factors / Risks

- Spring 2026 study shifted from a planned RCT to a QED after recruitment shortfalls; group assignment was not randomized
- Spring 2026 intervention ran off-season on historical data over a shorter 4-6 week window; in-season results may differ
- Fall 2025 pilot used a pre-post design with no control group; implementation context varies by classroom