
DYSOLVE® RANDOMIZED CONTROLLED TRIAL

2022 - 2025

INTRODUCTION

Dysolve AI is a game-based online program for addressing reading difficulty, also called dyslexia. Users log into their accounts at dysolve.com and engage with language-based games. The games are generated by the AI expert system to locate language processing inefficiencies and correct them. Processing inefficiencies result in difficulties with reading (dyslexia), writing (dysgraphia) and math learning (dyscalculia). These 3 difficulties fall under the "learning disabilities" category.

In the course of Dysolve evaluation and intervention, a user typically goes through thousands of these AI-generated games. Dysolve AI uses a patented method to build these games in realtime during gameplay.

This innovation involves several breakthroughs in the field of dyslexia intervention and special education:

- First method to deliver individually customized programs for each person
- First product to integrate screening/evaluation with intervention
- First AI to provide intervention autonomously without teacher instruction
- First method to locate language processing inefficiencies in the brain

Dyslexia is widely accepted as a language processing disorder. EduNational started testing the Dysolve protocol in 2014. Beta testing of Dysolve AI as a fully automated program began in 2017. The platform for individual subscribers was completed in 2020. The school platform was fully operational by 2023.

As the Dysolve® school platform neared completion, a large-scale experimental study was initiated in late 2022 to answer these questions:

On Efficacy

1. Can Dysolve AI still work if it is subjected to the most stringent stress test?
2. How fast can Dysolve AI work?

On Policy

3. How inexpensive can Dysolve AI be for schools?
4. How convenient can Dysolve AI be for schools?

RIGOROUS STUDY AND STRESS TEST

Research evidence is essential when determining the efficacy of interventions. However, in the case of reading interventions, meta-analytic reviews of studies often have to exclude many due to lack of scientific rigor.

Applying this rigor to Dysolve AI was necessary. Additionally, it was important to find out how well Dysolve would perform under the most challenging circumstances, as explained below.

Thus the following criteria were applied to the Dysolve study:

- Independent evaluator
- RCT study design
- Independent, objective, broad measures
- Pre-registered study
- Large sample size
- Diverse, lowest-performing groups
- Diverse challenging settings
- No teacher intervention
- Field trial

INDEPENDENT EVALUATOR

The Center for Research in Education and Social Policy (CRESP) at the University of Delaware designed and conducted the Dysolve RCT independently. CRESP is nationally recognized for its expertise in impact evaluation and is a regular recipient of Department of Education, National Institutes of Health and National Science Foundation grants. Principal Investigator Dr. Henry May co-authored the DOE's Institute of Education Sciences report on the use of state test scores in education experiments.

CRESP is an independent body that reports its findings objectively. In its \$55m grant study for the US Department of Education in 2017-2021, CRESP reported negative effect from Reading Recovery intervention. For the Dysolve RCT, CRESP stipulated at the outset that it would publish its study results regardless of the outcome.

Many intervention studies in education are not conducted by independent evaluators but by the providers themselves.

RCT STUDY DESIGN

The DOE's Institute of Education Sciences (IES) encourages the use of experimental studies so as to obtain objective, empirical evidence of the efficacy of interventions. However, quasi-experimental and other studies are still used commonly instead.

Meta-analytic reviews of reading or dyslexia intervention studies often end up excluding large numbers of them due to their lack of scientific rigor.

CRESP designed a randomized controlled trial (RCT) for Dysolve, similar to RCTs in medical research. RCTs are not common in education research because they tend to show zero or negative effect. In medical RCTs, controls do not receive any treatment but a placebo. But in educational RCTs, controls still receive intervention from other programs since struggling learners cannot be denied

services. This means that for Dysolve to show positive effect, it has to exceed sufficiently the impact of all other programs that controls are using.

The DOE's What Works Clearinghouse does not contain any RCT with positive effect on reading for struggling readers in grade 3 and up.

INDEPENDENT, OBJECTIVE, BROAD MEASURES

Many studies use providers' own measures aligned with the intervention under investigation. Such studies tend to report bigger effect (teaching to the test).

Moreover, they measure narrow aspects such as alphabetic and phonemic awareness (sensitivity to speech sounds). Studies usually do not aim to show transfer of effect to broader, global skills such as reading comprehension.

In contrast, the Dysolve RCT used state and standardized reading assessments administered by schools themselves. This was done to measure transfer effect from the program's focus on basic language processing to broad reading skills.

It is much harder to show effect on broad outcomes such as reading comprehension. Reading comprehension calls upon numerous skills, any of which may fail and thus compromise outcome.

PRE-REGISTERED STUDY

The Dysolve RCT was pre-registered at the Registry of Efficacy and Effectiveness Studies, Institute for Social Research, University of Michigan. Pre-registration sets study parameters before it starts, preventing later adjustments to produce a more favorable outcome.

Because of this, pre-registered studies tend to report smaller effect sizes compared to those that do not pre-register.

LARGE SAMPLE SIZE AND DIVERSE LOWEST-PERFORMING READERS

A small number of select participants can skew results. Studies should therefore include >100 participants across demographics and settings. They should include economically disadvantaged minority groups, where the reading achievement gap has been hard to erase.

Moreover, research shows that interventions lose their impact after 3rd grade.¹ Thus, the Dysolve RCT focused on students who were primarily in grades 3-8, scoring below the 30th percentile in state or standardized reading

assessments. The 30th percentile has been used as the dyslexia threshold in reading research.² Participants actually scored near the 10th percentile on average.

Few studies in What Works Clearinghouse even focus on students with reading difficulties or disabilities

The Dysolve RCT accepted participants with multiple disabilities. Only physical impairments with vision or hearing were excluded, as these impeded Dysolve gameplay. As can be seen from Table 1, the disabilities present in the participant pool included those that would likely influence impact negatively.

TABLE 1. DYSOLVE PARTICIPANT PROFILE

Criteria	Dysolve RCT
n > 100	n = 848
Grade 3+	22% in Grade 3 77% in Grades 4-8
Reading below 30th percentile in state or standardized assessments	Participants were near the 10th percentile on average 70% of schools had at least 1 student at the 1st percentile (lowest level) Nearly half of schools had 90-100% of students at/below the 10th percentile or reading at least 2 grades below
Ethnically diverse	All major races represented (White, Black, Hispanic, Asian, Native American, Pacific Islander, multiracial) 50% Black, 20% White, 7% Latinx, 16% Asian 17% non-native speakers of English
Economically diverse	>96% economically disadvantaged
Learning and language disabilities	18% classified with Specific Learning Disability or Speech Language Impairment [Many students affected are not diagnosed due to lack of resources at school. ³ Thus, researchers use the 30th percentile as a more reliable threshold for dyslexia. ²]
Other Disabilities	12% classified with ADHD, autism, Other Health Impairment, anxiety and emotional disturbance disorders, Oppositional Defiant Disorder 3 classified with Intellectual Disability 9 listed with "limited major life activity"

DIVERSE CHALLENGING SETTINGS

Dysolve AI is a plug-and-play program that children can use, even when traditional supports are not available, such as trained teachers.

The Dysolve RCT commenced in 2022 during the COVID-19 pandemic and ran through that period. Thereafter, schools faced post-pandemic effects, namely staffing shortages and high turnover, disrupted school schedules and student absenteeism. At several sites, teachers and/or students were absent for long periods for various reasons. Dysolve AI enabled users to pick up where they left off despite intermittent or long absences.

At least 20% of the schools experienced changes in administrative leadership and/or teachers supervising the trial. Dysolve was implemented in a diversity of settings as shown in Table 2.

Unlike other dyslexia screeners and programs, teachers using this plug-and-play program did not receive any orientation or training.

TABLE 2. DYSOLVE IMPLEMENTATION

Descriptors	Dysolve RCT
Number of school districts	20
Types of districts	Rural, suburban, urban
Number of schools	32
Types of schools	Public, private, charter, virtual
States	Mississippi, Illinois, Ohio, Kansas, North Carolina, Wisconsin, Louisiana, New York, New Jersey
Implementation settings	After-school programs, distance learning, pullout programs, differentiated instruction in class, special ed class, resource room
Session supervisors	General ed teachers, special ed teachers, substitute teachers, non-instructional staff
Orientation training	None

NO TEACHER INTERVENTION

Dysolve evaluation and intervention were delivered and managed entirely by the expert system through its game interface. Supervising staff were instructed not to intervene in students’ gameplay so that the AI system received accurate data on the users’ abilities.

The following summarizes the answers to the questions driving this RCT.

1. DOES DYSOLVE AI WORK?

The program ran autonomously and continuously on demand for every participant from 2022-2025.

EVALUATION

For 100% of students who completed the evaluation, Dysolve was able to identify language processing inefficiencies, the source of their reading difficulty. The evaluation took 2 hours on average. The areas evaluated were ones typical in dyslexia screening: phonics, phonological awareness and decoding. These are

considered core literacy areas in research. Other areas evaluated were vocabulary, spelling, listening comprehension, reading accuracy and rapid naming, also common in screening and research.

Most participants had two or more areas at Very High, High or Medium risk on a 5-point rating scale in their Dysolve evaluations (Very High, High, Medium, Low, Minimal).

INTERVENTION

Participants proceeded from Dysolve evaluation to intervention seamlessly without service interruption. Intervention comprised solely of AI-generated games, without any teacher instruction. Supervising teachers reported that they could not intervene even if they had wanted to, as each student was engaged in a different game activity with Dysolve AI.

HOW WELL DOES DYSOLVE AI WORK UNDER STRESS?

The research protocol and study design are described at the [CRESP](#) site.

The general finding was that all statistical analyses produced a positive impact estimate for the Dysolve intervention.

ENGAGEMENT TIME

The recommended protocol was 40 hours for a full school year, i.e., 1 hour/week x 4 weeks/month x 10 months. The minimum gametime for this RCT was 15 minutes/day, 3 days/week for 3 months, i.e., 9 hours (= 9 weeks of engagement). Most participants logged less than 3 hours of total gametime (= 3 weeks).

The figures below are based on Total Gametime, which is the total engagement time for completed games only. Total Gametime is thus less than login time.

Generally, students engaged for 15 minutes/day, 3-5 days/week, totaling ~1 hour/week. The Actual Program Duration reported was based on this 1 hour/week estimate.

Due to the challenging pandemic conditions during the RCT, engagement with the program was restricted considerably.

More than half the participants (>400) were newly recruited in the spring of 2025.

FIELD TRIAL

This RCT was designed as a field trial in which Dysolve was used as a free supplemental program in diverse, real-world settings. As such, students' engagement time was not controlled as would be the case in a lab-like experiment.

STUDY FINDINGS

Study findings are summarized below:

- The intervention produced a positive effect - Dysolve groups made larger reading gains than controls overall.
- Greater Dysolve engagement time was associated with greater impact in general.
- For 90% of the sites, participants who made the biggest gains in reading achievement were Dysolve users. For the remaining 10%, gains were similar or close between Dysolve and control participants

- About 45% of the schools had at least one Dysolve participant attain reading proficiency within the short program duration given.
- At least 7 Dysolve users advanced from below the 10th percentile to above the 50th in less than 10 hours of gametime (= 2.5 months).
- Among the cases with the largest reading growth, a Dysolve participant advanced from the 1st percentile to the 76th in state testing; another from 4th to 91st in standardized assessment. The first participant explained that the teacher's phonics instruction "did not make sense" prior to Dysolve's corrective training on language processing.

2. HOW FAST CAN DYSOLVE AI WORK?

This RCT shows that Dysolve AI can identify students' processing difficulties solely from its own data generated by its games. Students' school records were not fed into the system. Dysolve AI generated Evaluation Reports summarizing risk levels in core literacy areas within 2 hours on average for each person. The schools accessed students' reports from their teacher dashboards.

More importantly, the expert system used its evaluation data to build an individualized intervention program for each student. Even though participants engaged for less than half the recommended time, some of them still managed to attain reading proficiency within this short period.

Speed of improvement partly depended on each person's type and severity of processing difficulties. Although some students started at below the 10th percentile, including at the 1st percentile, they were able to reach the 50th within 2.5 months of using Dysolve. These students in Grade 3 and up had been struggling with reading for several years pre-Dysolve.

3. HOW INEXPENSIVE CAN DYSOLVE AI BE FOR SCHOOLS?

Participating schools implemented Dysolve in a variety of ways. As Dysolve AI does not require teacher instruction, some schools used substitute teachers and other staff to supervise students. At some sites, no additional resources were required, as participants engaged with Dysolve AI in a corner of the classroom while their teachers attended to other students.

Cost analysis has to consider that other interventions are compensatory, meaning that students continue to require special education throughout school. Thus the total cost of special education per pupil is considerably more than a corrective intervention like Dysolve, which is only needed for a limited time in a student's school career.

Dysolve costs less than 2% of total spending per special ed student. Dysolve is designed to minimize the use of school resources. This cuts down on indirect costs because it does not involve integration into schools' IT systems, installations or upgrades at the users' end.

4. HOW CONVENIENT CAN DYSOLVE AI BE FOR SCHOOLS?

Owing to its usability features, a Principal at a participating school described Dysolve AI as "non-intrusive." Implementation at schools involved these steps:

1. Teachers and students watched videos on what to expect (<10 min)
2. Students received login IDs to start playing Dysolve games
3. Teachers received login IDs to monitor students' usage and progress
4. Teachers referred to a 3-page flyer for tech troubleshooting as needed or contacted Tech Support

Throughout the 2022-2025 period, teachers contacted Tech Support on fewer than 10 occasions across all sites. The issues were resolved quickly. The sites did not require any further assistance.

Cost effectiveness and scalability have to be considered for policy implications, namely adoption. The following schema from Kraft (2020) in Table 3 incorporates Effect Size (ES), cost effectiveness and scalability factors in evaluating the statistical results of the Dysolve RCT.⁴

We modify Kraft's schema to project the total cost per pupil over 10 years (grades 3-12), as students with reading difficulties tend to require special services long-term.

Dysolve's ranking in Table 3 is highlighted in blue.

TABLE 3. SCHEMA FOR INTERPRETING EFFECT SIZES FROM CAUSAL STUDIES WITH ACHIEVEMENT OUTCOMES

Based on Cost Per Pupil over 10 Years

Effect Size	Cost-Effectiveness Ratio (ES/Cost)			Scalability
	Cost Per Pupil over			
	Low (<\$5,000)	Moderate (\$5,000 to <\$40,000)	High (\$40,000 or >)	
Small (<0.05)	Small ES/ Low Cost	Small ES/ Moderate Cost	Small ES/ High Cost	Easy to Scale
Medium (0.05 to <0.20)	Medium ES/ Low Cost	Medium ES/ Moderate Cost	Medium ES/ High Cost	Reasonable to Scale
Large (0.20 or >)	Large ES/ Low Cost	Large ES/ Moderate Cost	Large ES/ High Cost	Hard to Scale

POLICY IMPLICATIONS

According to Kraft's criteria, Dysolve® is considered Easy to Scale because it does not have the following factors associated with programs that are unlikely to maintain their effectiveness at scale:

- only effective with a narrow population
- entail substantial behavioral changes to the school system
- require a skill level greater than that possessed by typical educators
- face considerable opposition among the public or practitioners
- prohibitively costly
- depend on a small corps of highly trained and dedicated individuals

KEY FINDINGS

In conclusion, the 2022-2025 Dysolve RCT demonstrated the following:

- Dysolve outperformed other methods
- The longer the Dysolve usage, the greater the reading gain
- Dysolve was independently evaluated at a level of rigor not usually applied to educational interventions
- Dysolve successfully showed positive effect in reading achievement for the lowest-performing students beyond 3rd grade
- Dysolve AI outperformed teacher instruction, dyslexia screeners and interventions and specialist evaluations
- Dysolve AI can find and resolve the sources of reading difficulties fast
- Dysolve AI can be used across a broad range of students with disabilities and settings

Dysolve AI is an economical, feasible scalable solution for the crises facing schools: teacher shortage, low reading achievement, post-pandemic learning loss and budget cuts.

REFERENCES

1. Elliott, J. G., & Grigorenko, E. L. (2014). *The dyslexia debate*. New York: Cambridge.
2. Snowling, M.J. (2000). *Dyslexia*. Oxford, UK: Blackwell. Donegan, R. E., & Wanzek, J. (2021). Effects of reading interventions implemented for upper elementary struggling readers: A look at recent research. *Reading and Writing*, 34, 1943-1977. <https://doi.org/10.1007/s11145-021-10123-y>
3. Cassidy, L., Reggio, K., Shaywitz, B. A. et al. (2023). Prevalence of undiagnosed dyslexia in African-American primary school children. *npj Science of Learning*, 8, 52. <https://doi.org/10.1038/s41539-023-00204-8>
4. Kraft, M. (2020). Interpreting effect sizes of education interventions. *Educational Researcher*, 49(4), 241-253. <https://doi.org/10.3102/0013189X20912798>

[Dysolve RCT Study Design](#)

[Dysolve RCT Technical Report](#)