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# Simple Solutions

ESSA Tier 4 Research Report

2023

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Presented By:



# Introduction

## Purpose

This report summarizes how Simple Solutions Learning’s program meets Every Student Succeeds Act (ESSA) Tier Level 4 standards of providing a well-defined [logic model](#) based on rigorous research and a commitment to continuing research to both evaluate and report the impact of its programming.

## Simple Solutions Approach

*Simple Solutions* workbooks, digital material (Star Center), and resources incorporate three powerful strategies that promote mastery, strengthen memory, and increase long-term retention more than any other approach.

- 1) **Retrieval practice** is calling to mind (retrieving) what has been learned. Retrieval requires putting forth effort and really thinking about a concept. This reinforces learning and makes it easier to retrieve in the future.
- 2) **Spaced repetition** is practicing repeatedly *over time*. During short study sessions, students revisit and interact with previously learned skills and concepts. It’s the opposite of massed practice, or “cramming.”
- 3) **Interleaving** is alternating among several different types of problems during a single practice session. It forces students to think about each problem and decide how to solve it, rather than repeating the same steps for every item on a page.



Incorporating these strategies *does not require the teacher to change* the way new material is presented. The strategies *do not require more time*, but rather *a different use* of time. The students *do not do more practice*, but rather space the practice over time.

## Simple Solutions Routine

The Simple Solutions routine is designed, as the name suggests, to be *simple*. By incorporating this simple routine into daily lessons, as the [logic model](#) indicates, students gain improved proficiencies and increased academic achievements.

- 1) **Students complete one lesson per day** as homework or other independent work. The lessons feature retrieval, spacing, and interleaving. Students continually practice what they've learned and "test" themselves in a low-risk setting.
- 2) **Using the Star Center, students self-check their work and, with their teacher, go over items that were challenging.** This process delivers meaningful feedback in a timely manner. It uncovers gaps in learning and provides opportunities for intervention. (Self-checking occurs on the same day or the day after the lesson is completed.)
- 3) **Students take a weekly quiz.** Consistent and ongoing assessment allows students to show what they know. Teachers monitor students' progress and plan future instruction. Over time, students approach quizzes and tests with greater confidence. This, too, increases academic achievement.
- 4) **Students engage in new learning** for the remainder of class. The teacher presents new material using methods and strategies of choice. There is no need to change the way a curriculum is addressed.



# Research Support

In compliance with ESSA's first standard for T4 research to establish a well-defined and research supported logic model, an in-depth review was conducted to obtain empirical research that supports the three learning strategies that the Simple Solutions Approach utilizes. The review was conducted using search terms related to the three learning strategies and it is important to note that the research on these strategies is relatively new (within the last 15 years). The review has found that researchers in this field of education were interested in testing a range of different outcomes when using these strategies. The synthesis of the literature is organized by these outcomes of interest.

## Retention & Proficiency

Learning retention is a student's ability to transfer and store information in their long-term memory, allowing them to recall and apply the acquired information. Student proficiency is the documented evidence that a student has met the required level of skill and knowledge. In much of the literature reviewed, while there was no explicit measure of retention, proficiency was used as a proxy for measuring how well a student retains information when recall strategies were employed.



Formal evaluations (i.e., tests) are typically used to assess knowledge acquisition, retention, and proficiency. The literature found that students better learn and remember information on which they have been tested (Roediger & Karpicke, 2006; Karpicke & Roediger, 2007). Similarly, students benefit from more frequent (yet lower stakes) evaluation, such as quizzes (McDaniel et al., 2011). Quizzed information is consistently retained longer and more accurately than non-quizzed information

(McDaniel et al, 2013; Roediger et al., 2011) and combining spacing and retrieval as learning strategies (distributing retrieval events over time rather than grouping them together) amplifies their respective benefits for learning retention and proficiency (Latimer et al., 2021).

Simple Solutions employs retrieval as a primary learning strategy, allowing students ample opportunity to test their knowledge acquisition, recall, and retention through daily lessons, weekly quizzes, pre-tests, and post-tests, which in turn supports their long-term proficiency (Karpicke & Roediger, 2007; Karpicke & Roediger, 2008). SSL also utilizes spacing and interleaving – learning strategies that emphasize more distributed learning and recall, both of which foster deeper and longer-lasting learning (Hopkins et al., 2016).

## Problem Solving & Inductive Learning

Beyond knowledge acquisition, students must *apply* learned information to novel scenarios to find solutions to problems, in the classroom and in their everyday life. Specifically, they need to cultivate the ability to “identify problems, brainstorm answers, and implement solutions toward the desired outcome” (Fissore et al., 2021). Problem solving is a critical ability that supports inductive learning, in which students generate knowledge through inquiry and observation of prior examples, rather than memorization or direct instruction.

A core strategy that Simple Solutions employs to support problem solving and inductive learning is interleaving - a process where students mix, or interleave, multiple topics while they practice in order to improve their learning (Brunmair & Richter, 2019). This contrasts with blocked practice, where the strategy is to study one topic intensely before moving on to another topic. Interleaving in a mathematics curriculum improved test performance for similar, as well as dissimilar test problems, demonstrating students’ ability to “problem solve” (Rohrer et al., 2014; Rohrer et al., 2007). An advantage of interleaving is that students must discriminate between solutions, searching their knowledge repertoire for the correct strategy to solve a given problem (Rohrer, 2012), as opposed to blocking where only one skill is learned and tested a time (i.e., more rote strategy application).

## Test-Anxiety

Test anxiety is a reaction to an evaluation situation resulting in physical or emotional distress that may interfere with test performance (Ping et al., 2008). The belief that increasing students’ retrieval opportunities (e.g., practice quizzes) results in greater distress has been largely unfounded in the research literature. Instead, giving students more retrieval opportunities has consistently been found to *decrease* nervousness and test anxiety in students (Agarwal et al., 2014). As a consequence of more frequent informal and formal evaluation, students are put in evaluative situations more frequently, which decreases nervousness (i.e., via exposure to stressor) and increases students’ learning and performance, thereby bolstering their self-confidence when they are faced with their final evaluation (Smith et al., 2016; Yang et al., 2021). Simple Solutions use of daily lessons and weekly quizzes reinforces their emphasis on retrieval, as well as spaced testing (i.e., distributed recall opportunities), as core learning strategies which have shown to also reduce test anxiety.



## Research Supported Logic Model

In sum, a substantial body of research supports implementing the three core evidence-based learning strategies (spacing, retrieval, and interleaving) to support student knowledge acquisition, retention, and problem solving. Simple Solutions approach to learning emphasizes the use of the three strategies that were tested in these studies. Additionally, students benefit from increased opportunities to test their knowledge, though evaluative, as well as lower stakes, testing which in turn reduces test-anxiety.

Given the extant literature on the learning strategies the program employs, the [logic model](#) (presented on the next page) provides a visual representation of how the Simple Solutions Approach impacts both teachers and students in teacher professional development and student proficiency outcomes, respectively. Accordingly, Simple Solutions Approach has met the ESSA requirement for Tier Level 4 evidence through a well-defined curriculum design and logic model based on rigorous research.

# Logic Model

In compliance with ESSA’s first standard to establish a well-defined logic model based on rigorous research, Simple Solutions Approach has met the ESSA requirement for Tier Level 4 evidence through a well-defined curriculum design and logic model based on rigorous research.

SIMPLE SOLUTIONS LOGIC MODEL					
Inputs	Activities	Outputs	SHORT	Outcomes MEDIUM	LONG
SS Curriculum (10 product lines for K-8) <ul style="list-style-type: none"> <li>Star Center (Digital)</li> <li>Print (workbooks)</li> </ul> SS Software SS CSM support SS Data system Computers Students Teachers Principals Classrooms Schools Districts	<ul style="list-style-type: none"> <li><b>Teacher training</b> that includes 1-hour virtual training with implementation coach or CSM support representative that provide review sessions and access to Star Center support.</li> <li>Students engage in <b>4-5 lessons a week</b> (15-20 minutes) which utilize evidence-based strategies of:               <ul style="list-style-type: none"> <li><b>Spacing</b> – introduce, reinforce, and recall content</li> <li><b>Retrieval</b> – students have multiple opportunities to retrieve content</li> <li><b>Interleaving</b> – student consistently utilize different strategies forcing active thinking</li> </ul> </li> <li>Daily self-check and teacher support</li> <li>Students submit <b>weekly digital quizzes</b> to monitor progress</li> </ul>	<ul style="list-style-type: none"> <li># of teachers per school</li> <li>% of teacher engagement in resources (instructional and SC)</li> <li>% of teachers engaging with CSM</li> <li># of reach outs to CSM team members</li> <li># of teachers with initial training session completed</li> <li># of teachers with follow-up training sessions completed</li> <li>% participation in webinar</li> <li>Amount of time given to implementation               <ul style="list-style-type: none"> <li>Teacher prep</li> <li>In-class time</li> </ul> </li> <li># of students participating in study</li> <li>% student participation in SS learning (quizzes)</li> <li>Student assessment data:               <ul style="list-style-type: none"> <li><b>Weekly quizzes</b></li> <li><b>Pre and posttest</b></li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Increased <b>knowledge</b> of Simple Solutions practices</li> <li>Increased <b>engagement</b> with SS materials</li> <li>Decreased <b>time</b> in reteaching</li> <li>Increased ability to use data in real-time (standards and quizzes)</li> <li>Improved student <b>engagement</b></li> </ul>	<ul style="list-style-type: none"> <li>Increased <b>integration</b> of SS practices</li> <li>Increased teacher <b>satisfaction</b></li> <li>Increased teacher <b>confidence</b> in ability to make effective instructional decisions for all learners</li> <li>Increased <b>retention</b> and <b>recall</b></li> <li>Increased <b>inductive learning</b></li> <li>Increased <b>problem solving</b></li> <li>Decreased <b>test anxiety</b></li> <li>Increased student <b>self-confidence</b></li> </ul>	<ul style="list-style-type: none"> <li>Improved proficiency in <b>reading, English, math, science, and social studies</b></li> <li>Increased <b>“on level” reading, English, math, science, and social studies</b> achievement</li> </ul>
<b>Assumptions:</b> The learning approach provides a set of research-based instructional strategies for improving reading comprehension, math and science proficiency, and standards-based skills in students K-8th grade; IRB approval; Informed consent; Teachers engage in full intended use of curricular design and implementation into their practice.				<b>Quasi-experimental design</b> assumes a treatment and comparison group from pre to post with matching.	
<b>External Factors:</b> Types of children in the school; Teacher/school/district participation; Teacher or administrative turnover; Participants move or have personal issues which keep them from continuing.				Intervention time is 1 year with implementation fidelity measures.	



# Ongoing Research Commitment

In compliance with ESSA’s second standard for an ongoing research commitment, the Simple Solutions Approach has met the ESSA standards for Tier Level 4 evidence by developing a research program to assess the impact on both teacher practice and K-12 student proficiency in reading, math, and science. For the 2024-2025 academic year, Simple Solutions has selected Elite Research, LLC to conduct a quasi-experimental study that can meet ESSA Tier 2 or 3 level requirements. This study will assess the treatment effect of the Simple Solutions programming on student proficiency in reading, math, and science compared to students using a business-as-usual approach. Simple Solutions and the third-party evaluator will provide the district partner(s) with evaluative reports once the study period has ended to help provide insights for partner(s) to potentially help improve administrative planning and teacher professional learning.

## Simple Solutions Research Agenda

Simple Solutions is in the process of recruiting districts to participate in the future study.

### Single District Implementation Research (ESSA Tier 2 or 3 Evidence Study)

In the 2024-2025 academic year, Simple Solutions will conduct a quasi-experimental study with an individual district.

Research Design	Quasi-experimental design
District	Grades K-12 8 Schools 250 teachers 3,300 Students
Sample Characteristics	Suburban 52% Male 48% Female 39% FRPL
Measures	MAP Math grades 3-5

# References

- Agarwal, P. K., D'antonio, L., Roediger III, H. L., McDermott, K. B., & McDaniel, M. A. (2014). Classroom-based programs of retrieval practice reduce middle school and high school students' test anxiety. *Journal of applied research in memory and cognition*, 3(3), 131-139.
- Brunmair, M., & Richter, T. (2019). Similarity matters: A meta-analysis of interleaved learning and its moderators. *Psychological Bulletin*, 145(11), 1029–1052.
- Hopkins, R. F., Lyle, K. B., Hieb, J. L., & Ralston, P. A. (2016). Spaced retrieval practice increases college students' short-and long-term retention of mathematics knowledge. *Educational Psychology Review*, 28, 853-873.
- Fissore, C., Marchisio, M., Roman, F., & Sacchet, M. (2021). Development of problem-solving skills with Maple in Higher Education. In *Maple in Mathematics Education and Research: 4th Maple Conference, MC 2020, Waterloo, Ontario, Canada, November 2–6, 2020, Revised Selected Papers 4* (pp. 219-233). Springer International Publishing.
- Karpicke, J. D., & Roediger III, H. L. (2007). Repeated retrieval during learning is the key to long-term retention. *Journal of memory and language*, 57(2), 151-162.
- Karpicke, J. D., & Roediger III, H. L. (2008). The critical importance of retrieval for learning. *science*, 319(5865), 966-968.
- Latimer, A., Peyre, H., and Ramus, F. (2021) A Meta-Analytic Review of the Benefit of Spacing out Retrieval Practice Episodes on Retention. *Educational Psychology Review*. 33: 959-987.
- Roediger III, H. L. (2013). Applying cognitive psychology to education: Translational educational science. *Psychological Science in the Public Interest*, 14(1), 1-3.
- Roediger III, H. L., Agarwal, P. K., McDaniel, M. A., & McDermott, K. B. (2011). Test-enhanced learning in the classroom: long-term improvements from quizzing. *Journal of experimental psychology: applied*, 17(4), 382.
- Roediger III, H. L., Putnam, A. L., & Smith, M. A. (2011). Ten benefits of testing and their applications to educational practice. *Psychology of learning and motivation*, 55, 1-36.
- Rohrer, D., Dedrick, R. F., & Burgess, K. (2014). The benefit of interleaved mathematics practice is not limited to superficially similar kinds of problems. *Psychonomic bulletin & review*, 21, 1323-1330.
- Smith, A. M., Floerke, V. A., & Thomas, A. K. (2016). Retrieval practice protects memory against acute stress. *Science*, 354(6315), 1046-1048.
- Yang, C., Luo, L., Vadillo, M. A., Yu, R., & Shanks, D. R. (2021). Testing (quizzing) boosts classroom learning: A systematic and meta-analytic review. *Psychological Bulletin*, 147(4), 399.

# Contact Information

For any questions related to this report or the Simple Solutions approach, please contact **Kara Wolcott** at [kwolcott@simplesolutions.com](mailto:kwolcott@simplesolutions.com).

For general information about Simple Solutions:

- Website: [www.simplesolutions.org](http://www.simplesolutions.org)
- Address: 24755 Highpoint Road, Beachwood, OH 44122
- Phone: 877-382-7537
- Fax: 216-382-5898