

Investigations 3

EVIDENCE OF EFFECTIVENESS

A Summary of the 2017-2018 Summative Field Test

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Overview

Savvas strongly believes that its programs should be proven through scientific research to increase student achievement. As such, it conducted a 1-year summative field test of its *Investigations 3* program. The study was conducted in 1st and 4th grade classrooms during the 2017-2018 school year. This report summary presents an excerpt of findings from the study, including the evaluation design and methods, a description of program usage and implementation, student performance results, and a discussion of the findings. The full results of the report are available upon request.

Study Design and Research Questions

The primary goal of the study was to conduct rigorous research to support the assertion that, when properly implemented, the *Investigations 3* program effectively increased students' achievement and academic attitudes. The second goal for this project was to collect information on teacher attitudes towards features and aspects of *Investigations 3*.

The study addressed the following overarching evaluation questions:

1. How do teachers implement *Investigations 3* with their first- and fourth-grade students?
2. With what level of fidelity do teachers implement *Investigations 3*?
3. What are teachers' perceptions regarding the quality and utility of *Investigations 3*?
4. Do teachers' self-reported attitudes toward inquiry-based mathematics programs reflect a statistically significant improvement from fall 2017 to spring 2018?
5. Do students demonstrate a statistically significant increase in mathematics competency skills?
6. Do students demonstrate a statistically significant increase in mathematics inquiry skills?
7. Do students demonstrate a statistically significant improvement in their attitudes toward mathematics?

Participants and Setting

Twenty-six teachers (i.e., 1st = 15, 4th = 11) in seven schools from four school districts across three states (i.e., FL, ME and NV) used *Investigations 3* in their classrooms for the 2017-2018 school year. The final analytic student sample was comprised of 264 1st grade students and 244 4th grade students. The final analytic sample was ethnically diverse with a fair amount of students eligible to receive free or reduced-priced lunch and a small proportion of English Learner (EL) students. Table 1 presents the sample demographics.

Table 1. Sample Demographics

Group	Hispanic Ethnicity	White	African-American	Asian	Multi-racial /Other	EL	Free / Reduced Lunch
<i>Investigations 3</i>	19%	64%	10%	7%	19%	9%	25%

Measures

Multiple measures were used to assess student achievement, program implementation, and student attitudes as well as teacher perceptions of the *Investigations 3* program.

Student assessments were administered twice over the course of each study year, once in the beginning (i.e., corresponding to initial training) and at the end of the school year

(i.e., within four weeks of end of school) in order to obtain pre-post data to measure mathematics gains.

The GMADE is a group-administered assessment that assesses overall mathematics skills and competencies. Level 1 is appropriate for first grade, and Level 4 is appropriate for fourth grade. Each level includes mathematics subtests with strands in Concepts and Communication, Operations and Computation, and Process and Applications. The entire assessment takes approximately 90 minutes to complete. Scoring services provided several scores for the GMADE diagnostic assessment, including scale scores, stanines, percentile ranks, normal curve equivalents (NCEs), grade equivalents, and Growth Scale Values (GSVs). Evaluators conducted the main analyses using total test GSVs to analyze overall mathematics competency. Additionally, evaluators conducted exploratory analyses using NCEs for the three mathematics subtests.

Also, a two-item math inquiry assessment, aligned with *Investigations 3*, was developed as part of the study. This pretest and posttest assessment measured students' mathematics inquiry performance and took 5–10 minutes to complete.

Finally, a student mathematics academic attitude survey was administered in the fall and spring of the study year. Students responded to self-report questions regarding general attitude, confidence, motivation and self-perceived aptitude.

Teachers participated in two observations and interviews, completed weekly online logs, completed an attitude survey and attended an end-of-year virtual focus group to provide feedback on perceived impacts of the *Investigations 3* program on student skills and teacher implementation practices. The classroom observations, teacher interviews, weekly online logs, survey and end-of-year focus group provided critical insight into the nature of use and the effectiveness of the mathematics materials used with students.

Student Performance Results

Student mathematics achievement results were analyzed from the GMADE. Additional analysis details can be found in the final report.

Investigations 3 Students: Achievement Gains

Figures 1 and 2 show that first- and fourth-grade students started the year behind most students in the GMADE norming group for their grade level. Each grade improved in their relative standing, with fourth-grade students showing the greatest increase relative to the norming group.

Figure 1. Investigations 3 Students – GMADE Percentile Ranks

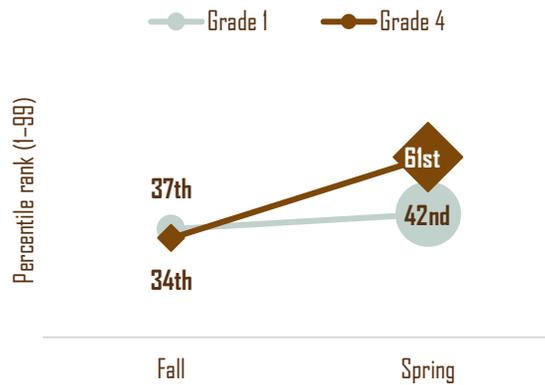
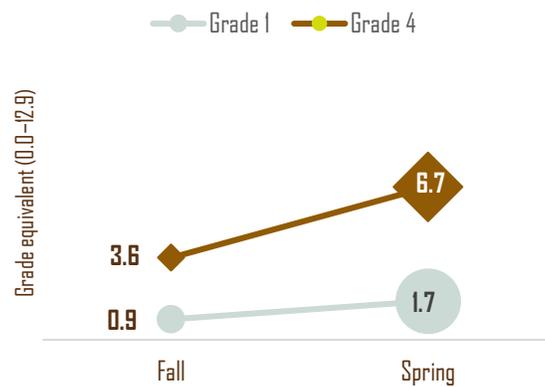


Figure 2. Investigations 3 Students – GMADE Grade Equivalent Scores



Evaluators conducted used multilevel modeling to determine whether *Investigations 3* students’ mathematics competency skills increased from fall 2017 to spring 2018 across grade levels. On average, *Investigations 3* students demonstrated a statistically significant increase in mathematics competency skills from fall 2017 to spring 2018 equalling an effect size of 1.04 for each of 1st and 4th grades (see Table 2), and corresponding to a 0.68 effect size for the total sample of students.

Table 2. Overall, students demonstrated a statistically significant fall-to-spring increase in GMADE Growth Score Value (GSV) scores across grades.

Outcome Variable	Coefficient	Standard Error	t-value	Approx. df	p-value	Effect Size
GSV increase (Grade 1)	9.18	1.73	5.32	13	.00*	1.04
GSV increase (Grade 4)	9.66	0.72	13.48	9	.00*	1.04

* Statistically significant at the .05 level.

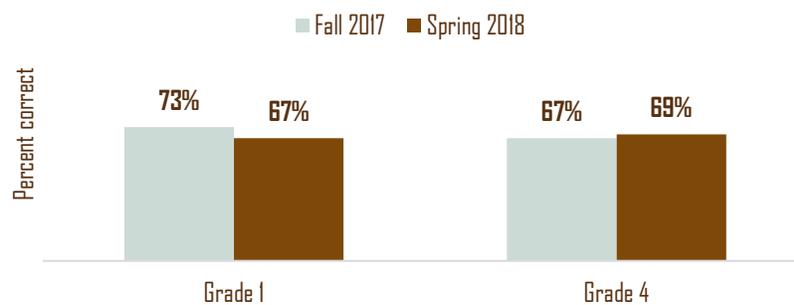
Evaluators also conducted four additional exploratory analyses, using multilevel modeling, to determine whether students demonstrated statistically significant increases in mathematics competency skills from fall 2017 to spring 2018 within four subgroups: high-achieving students, low-achieving students, students eligible for free or reduced-price lunch (FRL), and English learners. On average, *Investigations 3* students within each student subgroup demonstrated statistically significant increases in mathematics competency skills, with effect sizes ranging from 0.28 to 0.82 (Table 3).

Table 3. Each subgroup examined demonstrated statistically significant fall-to-spring increases in GMADE GSV scores, on average.

Outcome Variable	Coefficient	Standard Error	t-value	Approx. df	p-value	Effect Size
GSV increase (High achievers)	8.35	1.49	5.61	15	.00*	0.64
GSV increase (Low achievers)	9.61	1.37	7.02	22	.00*	0.71
GSV increase (FRL students)	9.57	1.60	5.97	13	.00*	0.82
GSV increase (English learners)	4.90	2.02	2.43	12	.03*	0.28

Evaluators examined descriptive statistics for the inquiry assessment. The fall 2017 pretest assessment measured student performance on math content from the previous grade level (i.e., kindergarten or third grade), whereas the spring 2018 posttest assessment measured student performance on math content that was at the students' grade level (i.e., first or fourth grade). As a result, even if students' skills improved, their assessment scores might not reflect gains because the assessment measured higher-level skills in spring 2018 compared to fall 2017. Figure 3 displays the average percentage of items correct by grade level in fall 2017 and spring 2018. Overall, students appeared to perform similarly on the inquiry assessment in the fall and spring, suggesting similar levels of mastery at each time point.

Figure 3. Fall 2017 and spring 2018 math inquiry performance scores for first-grade and fourth-grade Investigations 3 students.



Multi-level modeling confirmed that on average, first- and fourth-grade students did not demonstrate statistically significant increases in math inquiry skills from fall 2017 to spring 2018, suggesting that within each grade level, students demonstrated similar levels of mastery across both time points (Table 4).

Table 4. Overall, neither first-grade nor fourth-grade students demonstrated statistically significant fall-to-spring increases in math inquiry skills.

Outcome Measure	Coefficient	Standard Error	t-value	Approx. df	p-value	Effect Size
Math inquiry increase (Grade 1)	-0.06	0.06	-1.13	13	.28	-0.21
Math inquiry increase (Grade 4)	0.02	0.04	0.47	10	.65	0.08

Investigations 3 Implementation

First and fourth grade study teachers began implementing *Investigations 3* at the beginning of the 2017-2018 school year after training by a curriculum specialist, and *Investigations 3* was implemented as the core mathematics program for the school year. All teachers were provided with Implementation Guidelines as an overview of the expected component requirements for effective implementation.

Investigations 3 teachers were able to implement the program with a 72% average implementation fidelity. Students received *Investigations 3* math instruction for an average of 3.7 days per week and an average of 60-90 minutes per day.

Participant Feedback

Student Attitudes

Students responded to self-report questions regarding general attitude, confidence, motivation, and self-perceived aptitude on a Mathematics Attitude Survey at the beginning and end of the school year. On average, students' maintained positive math attitudes during the course of the study, and there were no statistically significant changes from fall to spring in math attitude scores. Younger elementary students, however, exhibited higher math attitudes than older elementary students.

According to observations and weekly logs, students generally demonstrated average to high engagement in *Investigations 3*. Teachers also provided their feedback on which program components were the most engaging for students. Overall, teachers shared

that *Investigations 3* Activities and Games were the most engaging, but most teachers shared that all program components were *somewhat to very engaging* for their students.

Teacher Attitudes

Opinions about the *Investigations 3* program were systematically collected from teachers with online surveys, as well as, during focus group sessions and teacher interviews. Teachers were asked their opinions on a variety of topics, including: usefulness of program components, their comfort with pacing, teachers' perceptions of whether the program meets student needs, and finally their attitudes toward teaching inquiry-based mathematics.

A teacher survey asked teachers to specifically rate the *usefulness* of the various components of *Investigations 3*. Components that were rated as the most useful included: Teacher Curriculum Unit, Activities, Student Activity Book, Discussion and Games.

In focus groups, teachers shared their views on the utility and quality of the program design and various program resources. First, teachers commented on the intentionality of the program design and the connectedness of components. Second, teachers spoke to program flexibility, particularly within Math Workshops, which allow students to show mastery in multiple ways. Third, teachers commented that Ten-Minute Math/Classroom Routines had improved from previous editions, and shared that these components encourage quick thinking, benefit overall learning, and correlate with the daily activity. Regarding challenges, some teachers spoke to difficulties using digital resources. Some teachers also found the need to supplement the curriculum in order to provide additional intervention and extension activities, as well as to better prepare students for district-wide or state-wide assessments.

In addition to viewing program components as useful overall, teachers viewed the amount of material offered by *Investigations 3* positively but expressed some concerns about the amount of resources to review and prepare. Teachers generally reported, though, that the amount of materials provided by *Investigations 3* for daily sessions was *just right*.

Teachers viewed the program pacing as appropriate overall. In interviews, some teachers shared that the program pacing was too fast for English learners and below-level math students, and too slow for advanced math students. On weekly logs, across most reporting weeks, teachers indicated that the curriculum was *reasonably paced*.

Overall, teachers reported an increase in students' math competency and inquiry skills. For example, teachers shared that students could better understand math concepts because they had multiple strategies and were not simply following steps. Teachers also observed more sophisticated student discussions, good communication of strategies and thinking, and greater student-led instruction.

Overall, the majority of teachers noted that the program was *adequate* or *very adequate* in meeting the needs for all levels of learners, however, most teachers generally viewed the program as most suitable for on-level math students.

On the final weekly log, teachers rated their level of confidence in teaching inquiry-based mathematics in the fall and spring. Teachers also rated their level of comfort in teaching inquiry-based mathematics during the same time periods. On average, teachers reported *statistically significant* improvements in confidence and comfort in teaching inquiry-based mathematics from fall 2017 to spring 2018. Additionally on the weekly final log, teachers reported their willingness to continue using *Investigations 3* the following year and shared whether they would recommend the program to a colleague. The majority of teachers said that they would continue using *Investigations 3* and that they would recommend the program to a colleague.

Conclusion

Teacher responses to *Investigations 3* during focus groups, interviews and through online surveys were overall positive in 2017-18. Teachers reported positively on program components, particularly on the Teacher Curriculum Unit, as well as the amount of daily materials and the program's pacing. The majority of teachers said *Investigations 3* was effective at meeting the needs of all levels of students, however, teachers felt that the program was most suitable for on-level students. Further, teachers reported an increase in students' math competency and inquiry skills. Teachers did report some challenges with the program. Some teachers reported that the digital assets were difficult to use and access. Additionally, some teachers suggested that the program include additional intervention and enrichment resources; teachers said they occasionally supplemented in order to meet needs of below-level, EL and advanced students as well as to better prepare students for district-wide or state-wide assessments.

Additionally, teachers shared that all program components were *somewhat* to *very engaging* for their students—particularly Activities and Games. Students' attitudes towards math—obtained through their self-report—were generally positive. On the Mathematics Attitude Survey, *Investigations 3* students' math attitudes were positive at the beginning and end of the school year. In general, younger elementary students had higher scores than older elementary students.

Students using the *Investigations 3* program had large, *statistically significant* achievement gains over the course of the study—particularly for 4th grade—as measured by the GMADE. These gains represented 5 and 27 percentile points for 1st and 4th grade students, respectively. It is a general rule of thumb that if a student makes a year's growth for a year of instruction, then the percentile rank will remain the same. However, *Investigations 3* students' GMADE percentile rank grew overall more than what would be expected in a typical academic year. Thus, accelerated math gains were observed for these students.

Additionally, *statistically significant* achievement gains on the GMADE were seen for all levels of learners, including: high achievers, low achievers, Free/Reduced Lunch students and English learners.

On the math inquiry assessment, students demonstrated similar levels of mastery in fall 2017 and spring 2018 for both 1st and 4th grades.

This study followed first- and fourth-grade *Investigations 3* students and teachers during the 2017-2018 school year. The summative field test enabled researchers to examine whether *Investigations 3* students' learning increased as they used the program as core math curricula for a full school year. Overall, results for teachers and students were positive and speak to the efficacy and usefulness of *Investigations 3*. It is recommended that a future study use a randomized control design in order to definitively determine the effectiveness of *Investigations 3* at improving student achievement outcomes.

About Academic and Product Research at Savvas

Savvas' Academic & Product Research team conducts formative and summative research that directly informs the development of K-12 instructional programs. The mission of this team is to provide Savvas' product developers with learner-centered insights and scientific data to drive the development of effective, industry-leading learning solutions.

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