Evaluation of the First In Math® Online Mathematics Program

National School District, San Diego, CA

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INTRODUCTION

This report presents findings from WestEd's evaluation of the First In Math® (FIM) Online Mathematics Program in the National School District (NSD) in San Diego County. The evaluation focused on three research questions:

- Does participation in FIM have a positive effect on students' attitudes?
- Do teachers use students' performance on FIM to make instructional decisions?
- Does the amount of time students spend on FIM (dosage) affect their mathematics skills?

The evaluation drew upon multiple data sources to answer the evaluation questions posed above. Evaluators interviewed teachers regarding their use of the FIM program and surveyed students on their attitudes toward FIM and mathematics in general. Evaluators also analyzed quantitative data from secondary sources, including FIM usage data provided by Suntex International, Inc., the creator of FIM, and student achievement data as measured by the California's Standardized Test and Reporting Program (STAR).

This report begins with a brief overview of the FIM program and a description of specific program elements as they relate to the data analysis. This section also briefly discusses findings from evaluations of earlier versions of the program. Next the report describes the analytic approach taken to evaluate the program, including a specific description of the dependent variables used to define FIM usage and mathematic skills. Finally, we present the evaluation findings, organized by the research questions posed above.

Overview of FIM

The First In Math® (FIM) Online Mathematics Program is an online version of the 24® Game, created by Suntex International Inc. in 1988. In the 24® Game, students use numbered cards and the four arithmetic operations to arrive at the target number. Because the end result is always 24, students focus on learning the patterns and processes used to arrive at the answer, rather than worrying about or even guessing the answer each time. Subsequent editions of the 24® Game introduced factors, variables, fractions and algebraic expressions.

In 2002, Suntex launched the online version of the 24® Game, known as First In Math®. The online program allows students to play the game through any internet connection. While FIM retains the same features as the 24® Game, the online application

allows students and teachers to measure usage. Students earn "stickers" as they move through games and Skill Sets® (Currently, FIM includes eight Skill Set® groups, which parallel the skills that students should learn in grades 1 through 8.) Teachers and administrators can track student progress through Assessment Reports, which graphically display time spent on FIM and the Skill Set® level attainment for individuals, classrooms and schools.

Since 2002, National School District in San Diego County has implemented FIM in all 10 elementary schools. Earlier evaluations of the 24® Game in National School District found that teachers and students were enthusiastic about the 24® Game program. Teachers reported that their students enjoyed playing the 24® Game and they believed the Game would reinforce and provide practice in basic computation skills. An analysis of achievement data found that students using the 24® Game displayed statistically significant gains on scores of mathematics procedural ability compared with students not using the program. Further, these gains were stronger for students whose baseline scores were below the 50th percentile.[1]

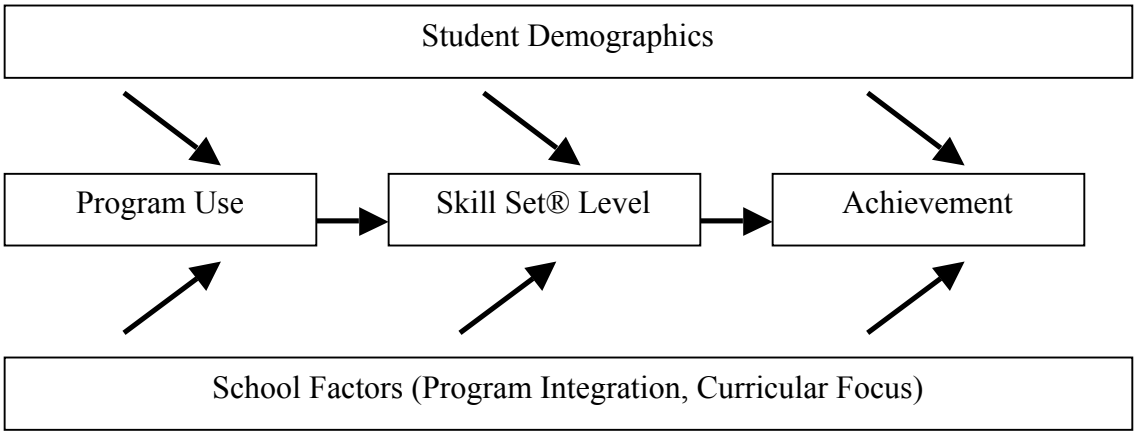
This evaluation examined similar outcomes– student attitudes, teacher use and student achievement – as the program was implemented online as part of the FIM Online Program. The online implementation offers new ways for students and teachers to use FIM, and also provides additional variables to use in analyzing data. Specifically, we asked teachers how they utilized the online assessment reports as they assessed FIM usage and planned their mathematics curriculum. Further, we gathered web usage data – available through Suntex and the FIM website – to more precisely measure student use of FIM (previous evaluations asked teachers to estimate student use) and to compare how achievement scores varied by usage patterns.

[1] Holtzman, Deborah J. and Madfes, Tania, J. 2002. *San Diego County 24® Game Evaluation 2000-2001: Final Report*. San Francisco: WestEd.

EVALUATION DESIGN

Exhibit 1 explains WestEd's approach in assessing FIM program use and the impact of FIM on student achievement outcomes. Student program use is expected to contribute to the Skill Set® level attained by students using the program. Frequent or extended student program use, as measured in time spent using the program, is expected to lead to higher Skill Set® Level Attainment. However, program use may depend in part upon the demographic characteristics of the students as well as school factors such as program integration. If FIM is expected to influence student achievement, there should be a relationship between the Skill Set® level attained and student achievement scores. FIM use, as measured by Skill Set® level attainment should help to predict student achievement scores, once differences between schools and student demographics have been taken into consideration.

Exhibit 1: Logic Model to Guide FIM Evaluation



Data Collection and Analysis

WestEd drew upon multiple qualitative and quantitative data sources to answer the evaluation questions. The data collection methods and samples for each are described below.

Teacher Focus Group

In June 2004, WestEd evaluators interviewed nine teachers from four elementary schools in the National School District. The teachers taught grades three to six. The focus group interview lasted approximately one hour, during which time evaluators asked teachers how they used FIM in the classroom and their perceptions of the program's impact on

students. Evaluators asked specific questions about how teachers used the online assessment reports and the type of information they gleaned from the reports. We also asked teachers when they used the program (i.e., during class as one station or after students completed the "regular" coursework), and whether participation in the program counted toward student grades.

Student Survey

WestEd administered surveys to a sample of students from three participating schools to assess attitudes toward the FIM program, and mathematics in general, and to determine if students used the program at home as well as during school hours. A total of 238 students in grades three to six completed surveys. The survey was adapted from the *Test of Science-Related Attitudes* (TOSRA) and included item-scales to measure enjoyment of mathematics lessons, leisure interest in mathematics, career interest in mathematics and attitude toward mathematics inquiry.

Analysis of Student Achievement

Evaluators used data from California's Standardized Test and Reporting Program (STAR) as the measure of student achievement. Officials from the National School District provided WestEd with STAR data for students in participating schools. In addition to achievement scores, this data file contained demographic information for each student, allowing us to examine differences in usage and achievement across various student characteristics.

Analysis of FIM Usage

A database provide by Suntex included information on FIM usage and program achievement. Specifically, the file noted each students' GYM time (designed for fact practice), Skill Set® time and Skill Set® Level Attainment. The original datafile included data for 3,937 separate students, or cases. This analysis draws upon a subset of this dataset with a cohort size of 2,412 students. Several reductions in original datafile were necessary due to invalid student identification numbers in the FIM and STAR datasets as well as the presence of cases with incomplete data. The cases used in this report include only those cases with pre- and post-test STAR achievement scores and valid FIM use.

The reduction in number of students does not appear to substantially bias our analyses. The evaluation group is comparable to the demographic composition of the National School

District in terms of student ethnicity. Nearly 8 of 10 students in our evaluation group (78.6 percent) are identified by the STAR data as Hispanic. Because only cases with valid data were selected for analysis, there is a discrepancy between the proportion of English Learners in the entire district and the proportion found in the evaluation group (46.1 vs. 58.2). We were unable to compare the students in our evaluation with the district across gender or with regard to the proportions of students identified as learning disabled or gifted because these data were not available at the district. Exhibits 2 and 3 display the demographic composition of the cohort of students used in the usage, Skill Set® attainment and academic achievement analyses. Nearly 21 percent of the evaluation group are 3rd grade students, 26.5 percent are in 4th grade, 25.5 percent are 5th graders, and the remaining 27.2 percent are 6th grade students.

Exhibit 2: Demographic Characteristics of FIM Participants (n=2,412)

Characteristic	***Percent***
Gender	
Male	52.1
Female	47.9
Ethnicity	
Caucasian	3.0
African American	2.6
Hispanic	78.6
Asian/Pacific Islander	15.8

Exhibit 3: Percent of FIM Participants with Special Academic Characteristics of FIM Participants, by Grade

Characteristic	***Total***	***Grade 3***	***Grade 4***	***Grade 5***	***Grade 6***
English Learner*	46.1	61.0	53.0	43.2	30.9
Learning Disabled	8.8	8.9	7.5	7.9	8.3
Gifted*	12.5	2.6	9.2	15.3	20.5

* Statistically significant differences between grades ($p<.001$).

Analytic Method for Quantitative Analyses of Usage, Skill Set® Attainment and Achievement

We used analysis of covariance modeling techniques to examine characteristics that were associated with program use, Skill Set® attainment, and student achievement. This enabled us to statistically control for student demographics and previous year achievement, as well as school related factors. Analysis of covariance allows evaluators to detect the unique effect of a particular variable. For example, we could parcel out the effect of FIM participation on student achievement once other variables such as student demographics had been taken into consideration. Furthermore, this technique allowed us to compare the magnitude of effects of particular factors on program use, Skill Set® attainment, and student achievement. Exhibit 4 provides a brief description of the variables used in this analysis:

Exhibit 4: Variables from FIM and STAR databases used to measure

Variable	***Description***
Independent Variables	
Gender	Sex of student as defined in the STAR database
Ethnicity	Recoded STAR variable into 4 categories: Caucasian, Asian/Pacific Islander, African-American, and Hispanic
English Learner	Recoded STAR variable into 2 categories: English Learners and Native English/English Proficient Students
Learning Disabled	Recoded STAR variable into 2 categories: non-disabled or disabled (identified as having a specific learning disability, mentally retarded, hard of hearing, speech or language impaired, emotional disturbed, orthopedic impaired, or having other health impairments)
Gifted Student	Identified by school officials as gifted and talented as defined in the STAR database
Grade	Grade level of the student in 2004
School	School student attended in the National School District
Dependent Variables	
Skill Set® Time	Amount of time in minutes students spent using FIM for Skill Set® attainment based on Suntex data files
GYM Time	Amount of time in minutes students spent using FIM practicing skills in workout GYMs based on Suntex data files
Level Attainment	Skill Set® Level (0-8) a student reached in 2004 based on Suntex data file
CAT/6 Score	Total Mathematics Score (in 2004) on a Norm Referenced Test reported as a Normal Curve Equivalency Score (NCE). Scores from 2003 are used as statistical controls. Both pre and post-test measures were extracted from the STAR database
California Standards Test	CST scaled score on a standardized mathematics test (in 2004) designed to measure progress toward California's state-adopted academic content standards. Scores from 2003 are used as statistical controls. Both pre and post-test measures were extracted from the STAR database

FINDINGS

In the next section of the report we present findings according to the three evaluation questions posed above. The Appendix at the end of the report presents additional data specific to FIM usage and achievement.

Student Attitudes

Previous evaluations of the 24® Game reported that teachers liked the program because their students enjoyed it. Further, teachers postulated that the program's strongest positive effect was on student enthusiasm about mathematics. For this evaluation of FIM, we surveyed students directly about their attitudes toward FIM and mathematics.

Enjoyment of Mathematics

Students scored highest on the scale of "enjoyment of mathematics lessons." Nearly three-quarters of the students surveyed (72 percent) agreed with the statement "math lessons are fun." Further, 58 percent of the students said they looked forward to math lessons and 57 percent believed that math was one of the most interesting school subjects.

Teachers overwhelmingly agreed that students enjoyed the program and sought out time to use the FIM website (see Box 1). Teachers reported that students were excited about the game format and motivated to accumulate the award stickers and help their class "team" achieve higher rankings. Because students are grouped in a "team" with their fellow classmates, they helped one another learn by discussing and sharing strategies for solving the problems, the teachers reported.

BOX 1:
This is the first time I've had so many kids do so well and have such a good buy-in. Usually I have maybe four or five kids that really like something like that. The rest are like, 'oh, do I have to.' But if I say you can do First in Math game, it's like, 'yay!' You know, it's everybody now.

We have to almost take numbers or do first-come-first-served. I have seven computers at lunchtime, and whoever gets in there first, the first seven people get on. They love it.

Teachers also reported that the program seemed well-suited for their underachieving or disadvantaged students. In previous evaluations of the 24® Game, teachers believed that the game might be more effective with higher-performing students. When asked about the online application, however, several teachers noted that lower-achieving students were drawn to FIM. They speculated that because students used FIM alone (as opposed to playing the 24® Game with peers) that students were more likely to explore the games using the computer. They also noted that these students, while spending more time on FIM, favored the practice games such as "Show What You Know," which does not include "24-style" games, over the Skill Sets® (see Box 2).

> ***BOX 2:***
> *I have a class that has had a lot of turnover this year. I have a student that's only been here three weeks. And some of these new kids are from Mexico and have difficulty with English. And they've taken right up with (FIM). They want to come. That's all they want to do. They want to sit there and do that. One of the students never went to second grade anywhere, and they put her in third grade here, and she's improving. She keeps plodding away and doing it.*
>
> *I have noticed that some kids that have done really well on First in Math were the low-achievers, which to me is a big thing, because they were struggling with math before.*
>
> *I first started noticing my high students were achieving a lot on FIM, and my lower kids were kind of lagging. But now I'm seeing them going on (the website). They really like to do "Show What You Know."*
>
> *For my less motivated math students, I find them opting out of the Skill Sets and going instead to the "Show What You Know" areas.*

Mathematical Inquiry

Students also responded positively to survey items measuring attitudes toward scientific or mathematical inquiry. Specifically, 77 percent of students believed that it was better to "solve a math problem myself" than to ask the teacher for the answer, and 67 percent said they liked trying to solve hard math questions on FIM without their teachers help. Several teachers interviewed during the focus group believed that the FIM program fostered this problem-solving attitude in their students. The teachers reported that FIM encouraged students to try problems on their own, even those problems not yet covered in class (see Box 3).

BOX 3:
With some of my students (progressing through the Skill Sets) is taking a long time. But the fact is they're trying. I mean, there's no way my kids would venture into (the textbook) like that. And they do it to try something new. And wow! Just trying it. Think about when they get to that in class. They're going to go, 'wait a minute, I've seen this.' Because if you get a third grader going through FIM, by the time they get to sixth grade, they're solid in math.

I'd say that's true too for my kids, but after the student is clicking the mouse, it's clicking in their brain. And they're catching on. The highest student in my class is a low achiever, historically. But she just took off, and she just clicked and clicked, and it took a long time for each Skill Set, but she's finished every one of them. And she is proud of the fact that she's at the top of the class. But she taught herself. That wasn't me teaching her. And that's what math is, looking for the patterns and doing that work over and over again, figuring out your own algorithms. That's going to stick with her longer than what I say.

Interest in Mathematics

Teachers reported that FIM increased student's interest in mathematics, especially those students who were previously not engaged in the classroom (see Box 4). Student survey data also revealed that students found mathematics interesting and relevant beyond the classroom. Forty three percent of students agreed that a job as a mathematician would be an interesting career. Further, only 18 percent thought a job using math skills would be boring, and only 14 percent agreed that they would not want to become a mathematician because it would require too much education. Nearly one third of students said they would like to belong to a math club at their school and nearly half of the students surveyed (49 percent) said that they would like to do math equations or problems at home.

BOX 4:
I've noticed that kids that weren't as interested in math take more of an interest in math now. And I saw them improving in class because they had worked on their skills in (FIM).

There are certain kids that were really reluctant math students and it's really been obvious how much (FIM) has helped them, or really helped them into math. That's really exciting, if we can get kids to really buy into math.

Access to FIM

The FIM program is a web-based application that can be accessed from any computer with an internet connection. Therefore, students with login privileges can connect to the program's website at any time from home or their local library. Sixty percent of the students surveyed said they had a computer and internet access at home. While data on where students accessed the website from were unavailable from Suntex at the time of the evaluation, the survey data provided some clues about the student usage patterns of students. Sixty nine percent of students reported that they mostly used FIM during math class at school. Another 40 percent said they used the program mostly before or after school, although it was unclear if the students used school computers or other computers to access the program during this time.

Teachers suspected that few students used the program outside of school. One teacher noted that several students could not access the website at home, and believed that parental control settings on the home computer inadvertently prevented the student from connecting properly to the website. Teachers knew of those students using FIM outside of school because of their dramatic increase in Skill Set® time and GYM time. Most commonly, teachers noted that out-of-classroom exposure to the program came between classes and before and after the school day (see Box 5).

BOX 5:
I noticed my kids were definitely doing it at home, especially the ones that were competing for the high score. They were on at home quite a bit. I could see the overnight turnover of stickers.

I have a few students, but only a few, that have a computer at home, and do it at home. But mostly they are here. There's a few – five or six of them – that are diehard, and they've got to be on it every morning. And they've got to come in at noon. I mean, (student name) is really bummed if I don't let him play anytime that we're not in class to work. And he's completed everything. And he keeps going back through it to get more and more points.

I probably have like three kids that I know that they do it at home. But I also have a few of them going the National City public library. But it's very few of them.

Teacher Use of FIM

All teachers agreed that their students enjoyed the FIM program. According to teachers, many students saw FIM as a game and wanted "play" it as often as possible, including during recess and lunch period. However, most were unable or unwilling to make FIM a central part of the curriculum because they were required to cover other district-mandated materials and they believed making the program a required task would dampen students' enthusiasm for FIM. Further, while some teachers tracked student progress on FIM using the online Assessment Reports, they rarely altered their instruction based on the data in those reports.

FIM in the Classroom

The FIM program is used as a supplement to the district-wide mathematics curriculum in the National School District. As such, many teachers provide regular access to FIM during non-instructional hours (before or after school, or during recess or lunch), as mentioned above. As designed, the initial FIM training for teachers focused on accessing the FIM website and introducing students to the program. When and where teachers and students use the program however, is up to teachers and schools to decide.

Data from classroom observations and teacher interviews showed no consistent pattern of FIM use across or within schools (although as reported later, program data showed that students in some schools and in some grades spent more time on the program). Most schools had several computers in their classroom to allow a group of students to access FIM at a time, while one school sent students to the computer lab to use the program. Teachers reported that they primarily used the program to extend instructional time – sometimes at the

request of students who liked FIM so much – and provide computational practice for students. One teacher incorporated FIM into the classroom rotation system, whereby students used FIM and then rotated to another activity as specified by the teacher. The students we observed using the program in the classroom or computer lab worked at their own pace, with little direct instruction from the teacher. This was consistent with how teachers described using the program.

Nearly all teachers noted that they used the program to motivate students. Students were allowed to use the program after using their "regular" classwork, which prompted students to finish their assigned work on time (see Box 6). No teacher interviewed used FIM for grading purposes. They felt tying FIM to grades would negatively impact students' motivation and enthusiasm for the program.

BOX 6:
In my classroom it's mostly a before school, during recess, during lunchtime, after-school kind of thing, because we have all the other things they have to do.

During my math warm up, sometimes I would do review lessons that some of the students needed. I know which students don't need that review, so those students, they get to go do First in Math and then I work with the rest of the my class.

I use it usually just as a supplement. I would say we do it weekly, usually in the lab, because they can do all 32 at the same time. I also use it as a motivational tool, as a reward sometimes. It is an extra piece to what we're doing in math, but it's not a major portion.

Once the students got it – all got bought into it – and I knew everybody was using the program, I kind of dropped back, just using it in the lab as kind of a motivational tool.

Online Assessment Reports

Some teachers interviewed said they used the FIM assessment reports to track student progress through the FIM program and to see which Skill Sets® their students completed. If necessary, teachers would use the Assessment Report to motivate and encourage students to move to the next Skill Set® level. Two teachers posted the reports in the classroom so students could see how they ranked compared with their peers. Another used the Assessment Report certificates as an additional reward for students once they reached the next level. Only one teacher cited a change in instruction based on the assessment report data. In this case, the teacher would hold impromptu "mini-lessons" for students who lagged behind or were stuck on certain games or Skill Sets® (see Box 7).

BOX 7:
Halfway through the year I noticed some kids were way up there and some kids were still at Skill Set 1. And of course they were my lower students. So then I started printing reports out and putting them up and saying, okay, you need to be at Skill Set 3. I want you at Skill Set 3.

I downloaded the certificates they did and color-coded them, so I made copies depending on the different Skill Set. I have a different color system for each set, and I actually awarded my kids once they mastered one of the Skill Sets. And I noticed they started working even harder.

My team partner, who retired in December, actually did start to tailor her instruction to First in Math. She'd noticed kids hitting a plateau in it and she'd pull them over for a mini lesson. She'd say "Okay. This is what the little two above the number means. Okay got it? Way to go." So she would actually give specific support. But since she left, I haven't really done that.

FIM Student Usage

In order to fully understand program effects for FIM, it is important to determine how program use may vary across different recipient characteristics and how participants may use the various portions of the program differently. The first step of our analysis was to determine whether there were significant differences in FIM usage across schools and students. We employed several techniques, including analysis of variance and testing for mean differences, to assess which demographic factors influenced usage and to calculate exact usage levels according to demographic characteristics.

Except for English Learner status, all student demographic variables had extremely small but significant effects on program use. The school had the largest impact on program use. However, statistical conventions maintain that this effect is quite small as well[2]. Differences in school policies and norms with regard to program use appear to influence program use more than student demographics. Exhibit 5 presents results from the examination of factors that influence program use[3]. (Similar tables by grade level and for GYM use are presented in Exhibits A-1 and A-2 in the Appendix.) The effect of school on program use is largest for 4th and 5th grade students, which may point to larger differences in usage between schools in these grade levels.

[2] Effect sizes below 0.20 are considered to be small effect sizes but are common within educational research.
[3] Program use is defined as the amount of time students spent on Skill Set® Levels in this model.

Exhibit 5: Effects of Demographic Characteristics on FIM Skill Set® Usage

Characteristic	*Effect Size*
(Constant)	0.560 *
Sex	0.003 *
Ethnicity	0.005 *
English Learner	0.002
Learning Disabled	0.003 *
Gifted Student	0.020 *
School	0.050 *
Grade	0.015 *

*Significant effect on Usage

Program Use and Student Demographics

Our initial model indicated that student demographic characteristics have small, but significant effects on program use. Subsequent analyses examined how program use might differ according to student demographics. Males, on average, spent nearly 30 more minutes than females using the program for Skill Set® attainment. The most substantial demographic differences in usage were found across ethnicity. Caucasian students spent the least amount of time using the program for Skill Set® attainment (1.7 hours), while Asian students spent the largest amount of time using FIM (2.9 hours). There were relatively small differences in the time students spent in workout GYMs across gender and ethnicity. Students spent an average of 30 minutes practicing their skills in workout GYMs. Exhibits 6 and 7 display FIM use by gender and ethnicity.

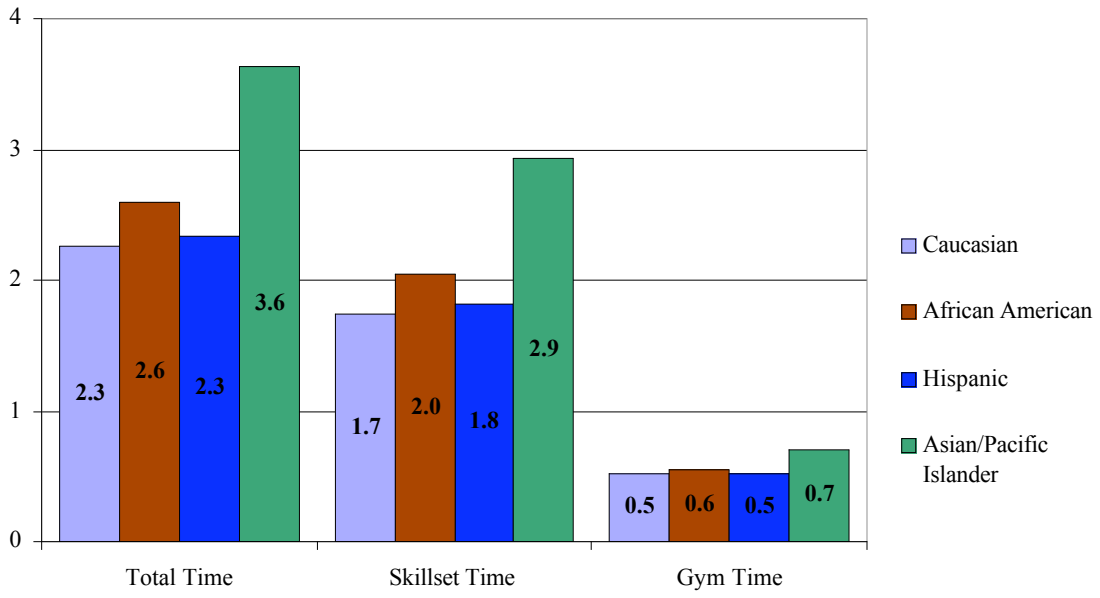
We also found significant differences in usage between English learners and native speakers, gifted and non-gifted students, as well as between learning disabled and non-disabled students. Native English speakers spent nearly 25 more minutes using the program for Skill Set® attainment compared with English learners. Gifted students and students with no learning disabilities spent about 10-15 minutes more using FIM compared with their counterparts. (Differences in program use by special academic characteristics are presented in Exhibit A-3 in the Appendix.)

Exhibit 6: Average FIM Usage in Hours, by Gender and Ethnicity

	Total Time	*Skill Set® Time*	*GYM Time*
Total	2.5	2.0	0.5
Gender*			
Male	2.8	2.2	0.6
Female	2.3	1.8	0.5
Ethnicity*			
Caucasian	2.3	1.7	0.5
African American	2.6	2.0	0.6
Hispanic	2.3	1.8	0.5
Asian/Pacific Islander	3.6	2.9	0.7

* Statistically significant usage differences.

Exhibit 7: Average FIM Usage in Hours, by Ethnicity



Program Use and School-Related Factors

Our model indicates that both grade level and school attended significantly affect FIM use. The impact of school attended on program use was larger than that of grade level. These findings point to differential usage patterns according to these school level factors. Further analyses indicated significant differences in the level of FIM use across both grade and school. Some schools used the program more frequently and, within some schools, particular grades seemed to have more frequent FIM exposure. Differential usage patterns across grade and school are most likely due to internal factors such as program integration, time allotted for program use, and/or a focus on alternative types of mathematics instruction. Exhibits 8 and 9 present the program use comparisons by grade and school.

Depending on their grade, students spent different amount of time using FIM to attain Skill Set® levels or to practice their skills in workout GYMs. Fifth graders, on average, used the program more than any other grade level. Third and 6th grade students used FIM at about the same average rate, while 4th graders used the program for the least amount of time.

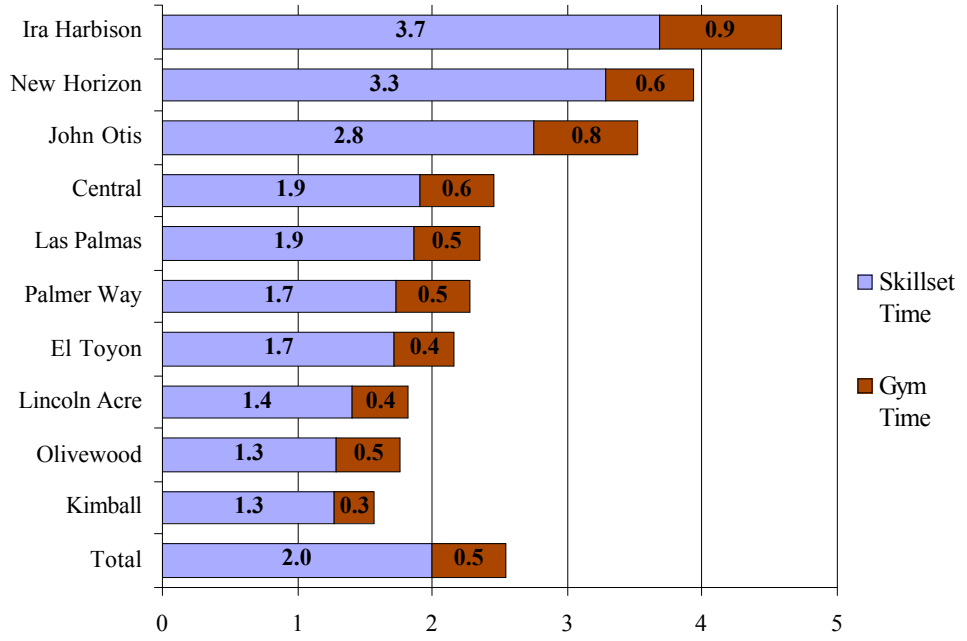
Exhibit 8: Average FIM Usage in Hours, by Grade

	Total Time	***Skill Set® Time***	***GYM Time***
Total	2.5	2.0	0.5
Grade 3*	2.6	2.0	0.5
Grade 4*	2.2	1.7	0.5
Grade 5*	3.0	2.4	0.6
Grade 6*	2.5	2.0	0.5

* Statistically significant differences between grades ($p<.001$).

We also found significant differences in Skill Set® and GYM time by school attended. The average usage level was about 2.0 hours using the program for Skill Set® attainment and 0.5 hours practicing mathematics in workout GYMs. The amount of time that students attending Ira Harbison spent on the program was nearly twice the average amount for each type of program use. Students at Kimball Elementary and Olivewood Elementary used the program at about half the average rate.

Exhibit 9: FIM Usage in Hours, by School and Type of Use



We also examined how program use differed in each school by grade level (Exhibit 10). We found that some schools used the program for Skill Set® Level attainment only in certain grades, while others used the program in every grade to varying degrees. For example, only 3rd graders used FIM at New Horizon Elementary. Schools that did not use the program in certain grades for Skill Set® attainment also did not use the workout GYM portion (see Exhibit A-4 in the Appendix).

Exhibit 10: Average Skill Set® Time in Hours, by School and Grade

	Total	*Grade 3*	*Grade 4*	*Grade 5*	*Grade 6*
Total	2.0	2.0	1.7	2.4	2.0
Central	1.9	1.4	1.2	1.5	3.2
El Toyon	1.7	—	1.9	2.1	1.1
Ira Harbison	3.7	2.8	4.9	4.3	2.5
John Otis	2.8	2.4	1.8	4.0	3.0
Kimball	1.3	1.9	0.4	1.2	1.5
Las Palmas	1.9	2.0	1.6	1.0	2.3
Lincoln Acre	1.4	1.6	1.3	1.3	1.4
New Horizon	3.3	3.3	—	—	—
Olivewood	1.3	1.2	0.7	1.8	1.6
Palmer Way	1.7	1.1	1.2	2.9	1.7

FIM Level Attainment

The FIM program allows both teachers and students to track students' progress as they complete successive mathematics Skill Sets®. The program contains 8 levels that target specific mathematics skills that roughly correspond to grade levels 1 through 8. The following provides brief descriptions of each Skill Set® level:

Level 1:	One Step Operation: Addition and Subtraction
Level 2:	Two-Step Operation: Addition and Subtraction
Level 3:	One-Step Operation: Multiplication and Division
Level 4:	Two-Step Operation: Multiplication and Division
Level 5:	Three-Step Operations and One Step Operation: Fractions
Level 6:	Three Step Operation Decimals, Pre-Algebra, One to Two Step Operation: Fractions
Level 7:	Three Step Operation: Fractions; Integers: Beginning Algebra
Level 8:	Three Step Operation: Exponents, Algebra

Students move through the 8 levels at their own pace. As such, their level attainment reflects both the amount of time they are able to access and use the program and their own mathematic ability. Our analysis of FIM level attainment indicates that the amount of time students accessed the program had a larger effect on their Skill Set® attainment than did any demographic characteristic, including grade level and school. However, demographic characteristics also had small but significant effects on Skill Set® level attainment. Exhibit 11 presents results from the examination of factors that influence Skill Set® attainment. Exhibit A-5 in the Appendix presents a similar table by grade level.

Exhibit 11: Effects of Demographic Characteristics and FIM Usage on Skill Set® Attainment

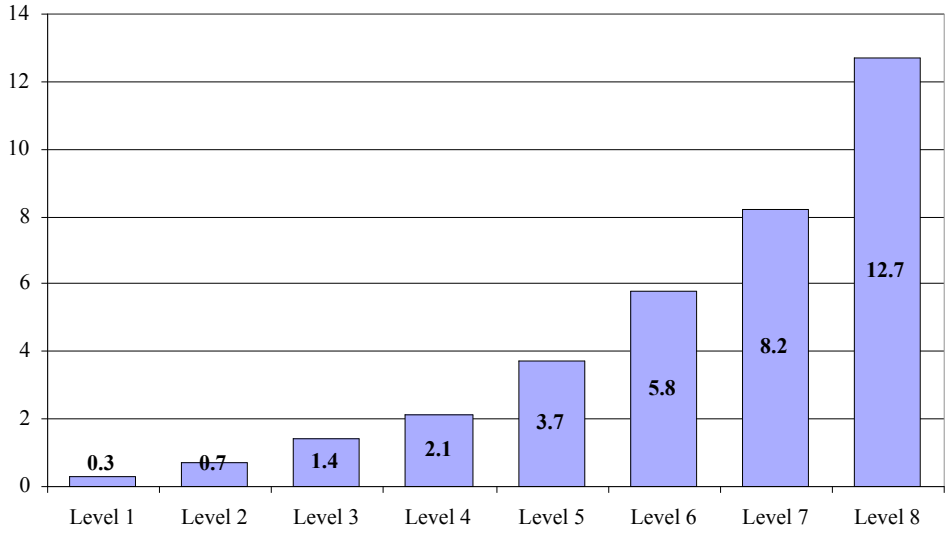
Characteristic	***Effect Size***
(Constant)	0.03*
Sex	0.01*
Ethnicity	0.02*
English Learner	0.00*
Learning Disabled	0.00*
Gifted Student	0.03*
School	0.06*
Grade	0.10*
Usage	0.74*

*Significant effect on Skill Set® Level Attainment

Skill Set® Attainment and Level of Program Use

The amount of time students spend on the program working towards Skill Set® Level Attainment strongly relates to the their Skill Set® level attainment. Students who reached higher Skill Set® levels spent considerably more time using the program to reach successive Skill Set® levels. For example, students who reached Level 8 took an average of 12.7 hours to complete the program. Exhibit 12 displays the relationship between Skill Set® level attainment and the amount of time using FIM.

Exhibit 12: Average Amount of Hours Spent on Skill Sets®, by Level Attainment



Students who attained higher levels also spent more time using the workout GYM portion of the program. Students who reached Levels 5 and above spent an average of 1.0 or more hours in GYMs, while those reaching lower levels spent about 40 minutes or less practicing their skills in the workout GYMs (see Exhibit A-6 in Appendix). Students who did not attain any Levels spent less than 5 minutes using the program and did not practice their mathematics skills within workout GYMs at all.

Skill Set® Attainment and Student Demographics

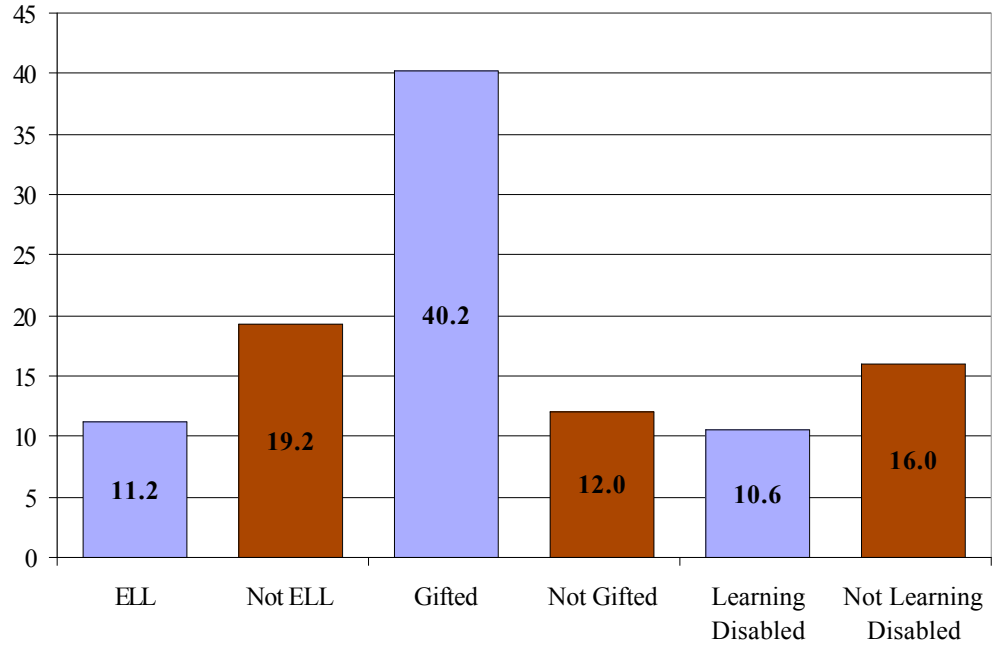
Our initial model on predictors of Skill Set® attainment indicated that student demographics significantly influenced Skill Set® attainment. Subsequent analyses examined Skill Set® level attainment differences by these characteristics. Significant differences in Skill Set® attainment were evident across gender, ethnicity, English learner status, learning disability status, as well as school related characteristics such as school and grade level.

Demographic differences in Skill Set® attainment are presented in Exhibits 13 and 14. Higher proportions of males reached Levels 5 and above compared with females (18.8 vs. 11.9 percent). Over 25 percent of Asian/Pacific Islander students attained Level 5 or above, compared with 19.4 percent of Black students, 13.0 percent of Hispanic students and 15.1 percent of White students. Differential program use by ethnicity may explain why Skill Set® attainment also differed by student demographics. Differences in Skill Set® attainment were also evident across students' disability, gifted and English learner status. Lower proportions of English learners and learning disabled students reached Level 5 or above compared with their counterparts, while higher proportions of gifted students reached Level 5 or above.

Exhibit 13: Percent of Students Reaching FIM Skill Set® Levels, by Gender and Race/Ethnicity

	Genders		***Race/Ethnicity***			
	Male	***Female***	***White***	***Hispanic***	***Black***	***Asian/ Pacific Islander***
Level 1	18.8	19.6	15.1	21.5	12.9	9.4
Level 2	18.8	26.2	26.0	22.6	27.4	19.4
Level 3	17.7	19.6	23.3	18.3	17.7	19.4
Level 4	24.8	21.7	17.8	23.5	17.7	23.9
Level 5	6.7	5.4	6.8	5.6	4.8	8.1
Level 6	5.3	2.6	2.7	3.4	8.1	6.3
Level 7	3.4	1.5	2.7	2.1	3.2	4.2
Level 8	3.4	2.5	2.7	1.8	3.2	8.7
No Level Reached	1.2	1.0	2.7	1.0	4.8	0.5

Exhibit 14: Percent of Students Attaining Levels 5 or Above, by Special Student Characteristics.



Skill Set® Attainment and School-Related Factors

Given the successive nature of mathematics education, we would expect significant grade-level differences in Skill Set® level attainment as well. Generally, more 6th grade students should reach higher FIM levels compared with students in lower grades. While our analyses indicated that there are significant differences in Skill Set® attainment by grade level, these differences were not as sizable as expected. Although there were large differences in the percentage of students reaching Level 1 by grade, differences between grades generally fell within a range of a few percentage points for Levels 2 through 4. Exhibit 15 presents Skill Set® level attainment according to grade level.

Several interesting patterns emerge from our analysis of the relationship between grade level and Skill Set® attainment. Assuming Skill Set® Level corresponds to grade level, there is an inverse relationship between grade level and the proportion of students who are achieving at or above the Skill Sets® associated with their grade. For example, nearly 49 percent of 3rd graders performed at or above their grade level compared with 33.3 percent of 4th graders, 19.9 percent of 5th graders, and 14.0 of 6th graders. This pattern may be attributable to a number of factors, including the amount of time allocated for FIM use,

misalignment of the program content with the skills students are expected to know at each of these levels, instructional factors or motivational factors.

Exhibit 15: FIM Skill Set® Level Attainment, by Grade

	Grade 3	*Grade 4*	*Grade 5*	*Grade 6*
No Level Reached	0.6	1.4	1.0	1.2
Level 1	25.0	23.4	13.7	15.8
Level 2	25.5	24.7	20.0	19.8
Level 3	19.6	17.2	20.7	17.2
Level 4	20.6	22.3	24.8	25.0
Level 5	4.2	4.4	8.3	7.0
Level 6	2.2	2.8	3.7	6.7
Level 7	1.0	1.6	3.6	3.5
Level 8	1.4	2.2	4.2	3.8

*Statistically significant Skill Set® attainment differences by grade.

Our analyses also point to a threshold phenomenon in that relatively few students reached Levels 5 through 8, regardless of their grade. Students in grades 5 and 6 were about twice as likely as those in lower grades to reach these levels (19.9 and 21.0 vs. 8.8 and 10.9, respectively). Of particular note is that both 3rd and 4th graders and 5th and 6th graders reached these upper levels at comparable rates, with larger gaps occurring between the 4th and 5th grades. The threshold effect may be a function of the types of content presented at Levels 5 and above and students' readiness for these skills. For example, students are first exposed to three-step operations with double digits and fractions in Level 5.

Our analyses also showed significantly differences in Skill Set® level attainment by school. More than 25 percent of students attending Ira Harbison and John Otis reached Levels 5 or above (37.0 and 26.0 percent respectively). These findings may reflect the differential patterns of FIM usage or demographic compositional differences between schools. For example, students attending Ira Harbison spent more time using FIM than students attending any other school. Exhibit 16 presents the Skill Set® attainment by school.

Exhibit 16: Percent of Students at each FIM Skill Set® Level, by School

	Central	*El Toyon*	*Ira Harbison*	*John Otis*	*Kimball*	*Las Palmas*	*Lincoln Acre*	*New Horizon*	*Olive-wood*	*Palmer Way*
No Level Reached	2.2	1.1	0.4	0.4	0.0	0.9	2.6	0.0	0.4	1.3
Level 1	18.5	14.1	7.5	18.9	29.9	20.4	22.4	9.6	26.2	22.6
Level 2	19.4	24.3	13.6	11.0	33.0	18.5	29.5	23.3	28.8	23.0
Level 3	16.3	24.3	17.7	14.5	15.5	21.3	16.8	17.8	18.5	20.4
Level 4	27.9	26.0	23.8	29.1	12.4	19.9	20.9	34.2	21.0	20.9
Level 5	5.3	4.2	9.8	7.5	4.1	9.0	5.6	9.6	3.7	5.2
Level 6	5.0	2.8	7.5	7.9	2.1	5.2	1.5	2.7	0.7	3.9
Level 7	2.5	2.5	6.4	4.4	1.0	2.4	0.7	2.7	0.0	2.2
Level 8	2.8	0.6	13.2	6.2	2.1	2.4	0.0	0.0	0.7	0.4

FIM and Effects on Student Achievement

The FIM program was designed as a vehicle through which students' understanding as well as interest in mathematics could be enhanced. By attending to the successive nature of students' mathematics skill development and presenting material in an entertaining format, FIM provides educators with a unique educational supplement to their mathematics curriculum. To better understand the impact of FIM on student achievement, we used analysis of covariance to parcel out the effect of FIM on student achievement scores on the CAT/6 and full California Standards Test (CST), as well as individual CST content subscales.

As our logic model and previous sections indicate, there is link between the amount of time students spent using the program and their Skill Set® attainment. As such, we have designated the Skill Set® level attained as the independent measure to assess the impact of FIM on student achievement. The first step of this analysis was to assess whether there was a relationship between Skill Set® level attainment and student achievement scores. We found significant associations between Skill Set® level and all student achievement measures. While this finding points to a relationship between the FIM content and items on standardized achievement measures, it does not speak to what the effect of FIM use may be on student achievement.

Our subsequent analyses indicated that FIM has small, but significant effects on student achievement across both achievement measures and grades. The following sections present the results of our analysis assessing the impact of FIM on student achievement

Effect of FIM on California Standards Test (CST)

The CST is a standardized assessment measuring students' progress in meeting state adopted academic content standards. The test is administered to all students in California in grade 2 through 11 and designed to reflect the skills and knowledge students are expected to have at each of these grade levels. We examined the impact of FIM on scores for both the total mathematics CST as well as each of the 5 content area subscales administered to students in grades 3 through 6. We found that FIM has small but significant effects on CST student achievement scores across each grade level. There was a differential effect of the program by grade level, with 3rd grade students benefiting the most from program exposure. The effect of FIM on 3rd grade CST achievement was twice the amount observed for 4th grade students and nearly three times the amount for 5th and 6th graders (effect size=. 11, vs. .05, .04. and .03, respectively) (Exhibit 17). Program exposure had larger impacts on CST achievement than other student demographic variables, except for school effects and students' CST pre-test score.

Exhibit 17: Effects of Demographic Characteristics and Program Exposure on CST Scaled Scores, by Grade

	Grade 3	*Grade 4*	*Grade 5*	*Grade 6*
(Constant)	0.14 *	0.29 *	0.08 *	0.28 *
Sex	0.00	0.00	0.00	0.01
Ethnicity	0.01	0.00	0.01	0.01
English Learner	0.00	0.00	0.03 *	0.02 *
Learning Disabled	0.02	0.02 *	0.01	0.01
Gifted Student	0.00	0.00	0.04 *	0.03 *
School	0.27 *	0.15 *	0.18 *	0.12 *
CAT/6 Pre-test Score	0.49 *	0.48 *	0.37 *	0.46 *
FIM	0.11 *	0.05 *	0.04 *	0.03 *

* Significant effect on achievement score.

Our analysis also provides the average CST achievement scores, adjusted for the variables outlined in Exhibit 17. Because CST tests are tailored to match the content taught at each grade level, these mean scores are presented by grade and Skill Set® level attained. The general pattern of achievement scores indicates that as students progress through Level 7, their CST mathematics achievement increases. Controlling for students' previous achievement record, students at each grade level who complete higher FIM Skill Set® levels

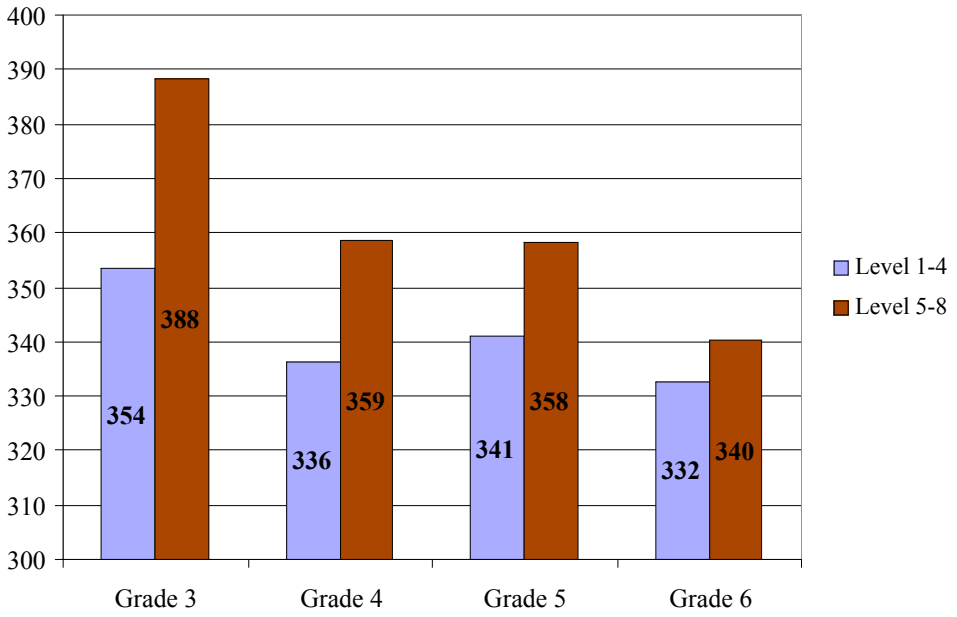
also have higher CST achievement scores. However, there appears to be a decrease in achievement scores between Level 7 and 8, with the largest decrease occurring in 3rd grade (Exhibit 18).

Exhibit 18: Adjusted Mean Scaled CST Total Mathematics Scores of FIM Participants

	Grade 3	*Grade 4*	*Grade 5*	*Grade 6*
No Level Reached	356.7	316.8	338.4	341.3
Level 1	340.0	333.1	331.2	325.2
Level 2	348.3	333.6	338.2	331.4
Level 3	365.2	335.6	337.8	334.8
Level 4	365.2	343.1	350.8	336.2
Level 5	380.7	358.8	352.6	328.4
Level 6	395.5	354.7	346.4	345.2
Level 7	432.1	362.9	371.1	348.8
Level 8	369.5	360.4	368.5	345.6

In previous section of this report, we noted that smaller proportions of students completed Skill Set® Levels 5 and above. In an effort to assess whether there are achievement benefits associated with completing these higher levels, we also compared the CST mathematics scores of students reaching skills sets Levels 1 through 4 with those completing Levels 5 and above. The mean scores presented in Exhibit 19 were adjusted to factor in the student's previous achievement levels. In other words, the adjusted means account for pre-existing achievement differences between students in each of these groups. Students competed Levels 5 through 8 had higher CST achievement scores than students who complete Level 1 through 4, further substantiating the idea that extended FIM use is related to higher mathematics achievement scores.

Exhibit 19: Adjusted Mean Scaled CST Total Mathematics Scores, by FIM Skill Set® Level Group



The largest difference between these groups was within the 3rd grade, where students reaching Levels 5 and above had CST scores that were nearly 35 points higher than that of students completing Levels 1 through 4. Differences between groups were smaller in grades 4, 5, and 6 (22, 17, and 8 points, respectively).

In addition to estimating the effect of FIM on CST total mathematics scores, we examined the impact of FIM on CST content area subscales. Differential effects of FIM on particular content area subscales may point to areas in which FIM is particularly helpful in boosting student achievement and also those areas that the program may not target as effectively. The CST is administered in grades 3 through 6 and is comprised of 5 question clusters that are organized by particular content areas and contain items relevant for each grade. Exhibit 20 provides a brief overview of the topics covered in each cluster and grade level:

Exhibit 20: Content of CST Question Clusters, by Grade Level

Cluster	***Grade 3***	***Grade 4***	***Grade 5***	***Grade 6***
1	Place Value, Fractions and Decimals	Decimals, Fractions and Negative Numbers	Estimation, Percents, and Factoring	Ratios, Proportions, Percentages, and Negative Fractions
2	Addition, Subtraction, Multiplication and Division	Operations and Factoring	Operations with Fractions and Decimals	Operations and Problem Solving with Fractions
3	Algebra and Functions	Algebra and Functions	Algebra and Functions	Algebra and Functions
4	Measurement and Geometry	Measurement and Geometry	Measurement and Geometry	Measurement and Geometry
5	Statistics, Data Analysis, and Probability	Statistics, Data Analysis, and Probability	Statistics, Data Analysis, and Probability	Statistics, Data Analysis, and Probability

The results from our examination of the impact of FIM on particular CST question clusters revealed differential effects of FIM on CST question clusters in each grade (Exhibit 21). Further, the program has small but significant effect on particular CST content areas. For example, FIM had the largest effects in Clusters 1-3 for 3rd graders. FIM seems particularly beneficial in facilitating 3rd graders understanding of basic number sense, operations, and algebraic relationships. California content standards around algebraic relationships state that 3rd graders should be able to "select appropriate symbols, operations, and properties to describe and solve simple number relationships". In Skill Sets® 1-3, students practice basic operations, including the selection of appropriate mathematic symbols. As such, mastery of the skills represented in Skill Sets® 1-3 of FIM would be reflected in students' knowledge of the material CST Clusters 1-3. Perhaps FIM assists these students in carrying out the unit conversions and operations needed to answer the measurement and statistical content questions in the 3rd grade CST assessment.

Exhibit 21: Effects of FIM on CST Content Area Question Clusters, by Grade Level

	Grade 3	*Grade 4*	*Grade 5*	*Grade 6*
Cluster 1	0.13 *	0.03	0.06 *	0.04 *
Cluster 2	0.12 *	0.06 *	0.04 *	0.04 *
Cluster 3	0.13 *	0.04 *	0.07 *	0.04 *
Cluster 4	0.07 *	0.04 *	0.05 *	0.01
Cluster 5	0.05 *	0.03 *	0.03 *	0.08 *

The pattern of program effects was different for 4th grade students. FIM had a slightly larger effect on the operations and factoring CST content cluster. The California content standards around factoring for this grade level pertain to students' understanding of how whole numbers can be broken down in varying ways. The basis of the FIM game is facilitating students' understanding of this concept, so that is seems reasonable that FIM would have its largest effects on 4th graders achievement in this area.

FIM seems to be particularly effective for 5th grade students in reinforcing concepts that are introduced at Skill Set® levels 5-8, including estimation, percents, factors, algebra, and functions. For 6th grade students, FIM has the largest effect on statistics, data analysis, and probability. The California content standards for 6th graders in this area for this grade level include students' understanding of how to use fractions and percentages to compare data. Placing this finding in the context of both underlying concept of FIM and its' focus on fractions and decimals, provides one explanation of this large effect.

Effect of FIM on California Achievement Test (CAT/6)

Our evaluation of FIM includes multiple achievement outcome measures to ensure that program effects are not limited to a single measure, but are consistent across different types of achievement tests. Our confidence in program effects is improved when multiple outcome measures are used. In addition to the examination of program impacts on students' CST total and subscale scores, we also examined the effect of FIM on the California Achievement Test (CAT/6). FIM has small but significant effects on student CAT/6 scores across all grade levels. Program exposure had larger impacts on student achievement than student demographic variables, except for students' CAT/6 pre-test score (in all grades) and the effect of attending a particular school (in some grades) (Exhibit 22). Program effects were larger for 3rd and 4th grade students compared with the effects seen for 5th and 6th graders. This pattern is similar to the impact of FIM on CST total scores, although the magnitude of

program effects varied across student outcome measures. FIM had a slightly smaller impact on CAT/6 scores for students in the 3rd and 4th grades, comparable effects for 5th graders, and slightly larger effects for 6th graders compared with the effects seen with the CST total mathematics scores.

Exhibit 22: Effects of Demographic Characteristics and Program Exposure on CAT/6 Mathematics Scaled Scores, by Grade

	Grade 3	*Grade 4*	*Grade 5*	*Grade 6*
(Constant)	0.14 *	0.16 *	0.07 *	0.13 *
Sex	0.00	0.00	0.00	0.00
Ethnicity	0.01	0.00	0.00	0.00
English Learner	0.00	0.00	0.03 *	0.02 *
Learning Disabled	0.02 *	0.01	0.02 *	0.01
Gifted Student	0.00	0.01	0.01	0.01
School	0.12 *	0.06 *	0.02	0.08 *
CAT/6 Pre-test Score	0.30 *	0.27 *	0.37 *	0.35 *
FIM	0.08 *	0.08 *	0.05 *	0.06 *

* Significant effect on achievement score.

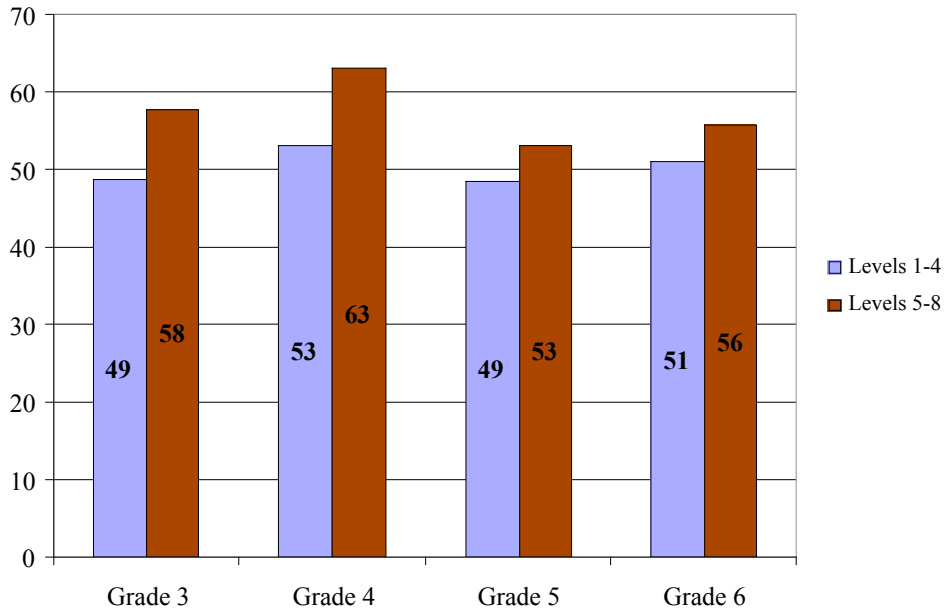
Exhibit 23 provides the average CAT/6 achievement scores, adjusted for the demographic control variables outlined in Exhibit 22 above. Because CAT/6 tests are designed to be grade-level specific, these mean scores are presented by grade and Skill Set® level attained. Controlling for students' previous achievement record, students at each grade level who complete higher FIM Skill Set® levels had higher CAT/6 achievement scores. As with the CST scores, there was a decrease in achievement scores between Level 7 and 8, but only in the 3rd and 4th grades.

Exhibit 23: Adjusted Mean Scores on CAT/6 of FIM Participants, Reported as Normal Curve Equivalency Scores

	Grade 3	*Grade 4*	*Grade 5*	*Grade 6*
No Level Reached	47.78	41.67	42.44	46.27
Level 1	45.02	48.43	44.00	45.48
Level 2	47.26	52.52	47.21	50.93
Level 3	52.48	57.29	49.05	51.52
Level 4	51.69	55.03	51.72	54.47
Level 5	51.16	58.72	52.88	52.60
Level 6	63.58	61.46	48.80	57.55
Level 7	68.22	74.25	54.79	56.22
Level 8	60.95	65.85	55.62	57.49

The largest differences between these groups were within the 3rd grade and 4th grades, where students reaching Levels 5 and above had CAT/6 scores that were 9 and 10 points higher than that of students completing Levels 1 through 4. Differences between groups were smaller in grades 5 and 6 (about 5 points) (Exhibit 24).

Exhibit 24: Adjusted Mean CAT/6 Total Mathematics Scores by FIM Skill Set® Level Group, Reported as Normal Curve Equivalents

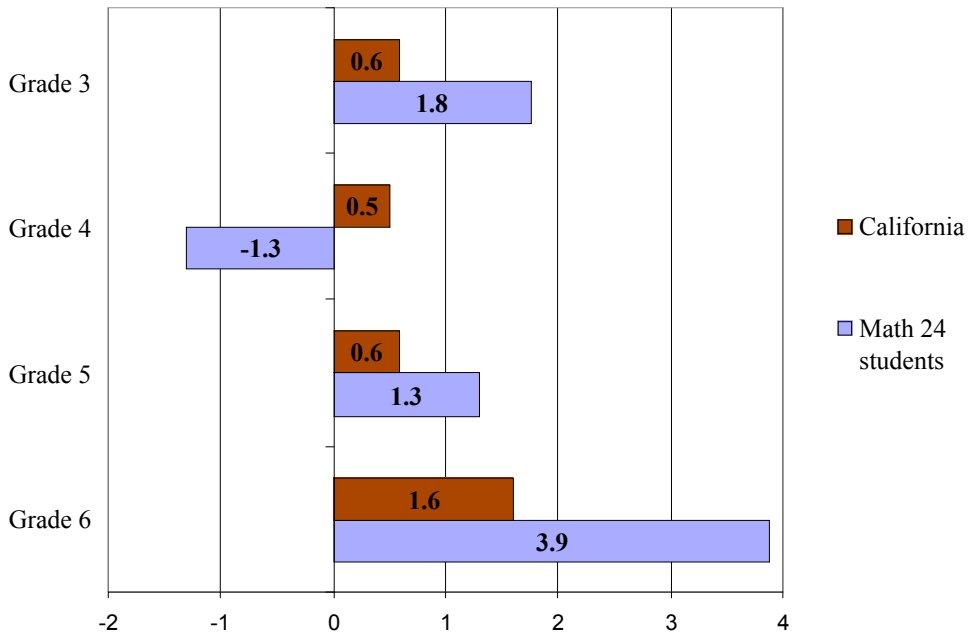


FIM CAT/6 Achievement Gains in State Context

Placing our achievement findings in a broader context may help to show how FIM effects translate into achievement gains. We computed the CAT/6 achievement gains from the 2002-03 to 2003-04 school year for the students in the evaluation. The scores are reported in Normal Curve Equivalents, making them appropriate for both cross group and cross time comparisons. Further, the gain score computation allows for an examination of how well students are achieving in relation to the progress of the national norm group. If a gain score is computed as 0, then that student has kept pace with the achievement progress of the national norm scores. Scores above 0 would indicate that the pace of achievement progress is faster than the norm group.

In order to provide a benchmark for the FIM results, we compared the mathematics NCE gain scores of our FIM cohort with the average gain scores of the California as a whole. Notably, the California average is computed using the average in each grade at every school, whereas the FIM gain scores reflect an average computed from our cohort of students in each grade. As such, these scores may be not be directly comparable, but can be used to illustrate the type of achievement gains that students using FIM experience after using the program for 1-year period (Exhibit 25).

Exhibit 25. Average CAT/6 Gain Scores reported as Normal Curve Equivalents, by Grade.



Students in 3rd, 5th, and 6th grades made positive achievement gains in their CAT/6 scores above and beyond the progress typically experienced from year to year. The most prominent example was the 6th grade cohort, who increased their CAT/6 NCE scores by nearly 4 points. Fourth grade students using the FIM program progressed at a slightly slower rate than the national normal, as evidenced in their negative gain score.

SUMMARY

This evaluation of the First In Math® (FIM) Online Mathematics Program in the National School District (NSD) in San Diego County focused on three research questions: 1) Does participation in FIM have a positive effect on students' attitudes; 2) Do teachers use students' performance on FIM to make instructional decisions; and 3) Does the amount of time students spend on FIM (dosage) affect their mathematics skills? WestEd drew upon multiple qualitative and quantitative data sources to answer the evaluation questions. We summarize our findings below.

Student Attitudes

- Nearly three-quarters of the students surveyed (72 percent) agreed with the statement "math lessons are fun." Teachers overwhelmingly agreed that students enjoyed the program and sought out time to use the FIM website.
- Teachers reported that the program seemed well-suited for their underachieving or disadvantaged students. Several teachers speculated that because students used FIM alone (as opposed to playing the 24® Game with peers) that students were more likely to explore the games using the computer.
- Teachers reported that FIM encouraged students to try problems on their own, even those problems not yet covered in class. Seventy seven percent of students believed that it was better to "solve a math problem myself" than to ask the teacher for the answer, and 67 percent said they liked trying to solve hard math questions on FIM without their teachers help.

Teacher Use of FIM

- Teachers used FIM as a supplement to their district-mandated curriculum. Teachers often allowed students the opportunity to use FIM during non-instructional hours (before or after school, or during recess or lunch).
- While some teachers tracked student progress on FIM using the online Assessment Reports, they rarely altered their instruction based on the data in those reports.

FIM Student Usage

- Except for English Learner status, all student demographic variables had extremely small but significant effects on FIM use. The school had the largest impact on FIM use.

- Males, on average, spent nearly 30 more minutes than females using FIM for Skill Set® attainment.

- Caucasian students spent the least amount of time using FIM for Skill Set® attainment (1.7 hours), while Asian students spent the largest amount of time using FIM (2.9 hours).

- Native English speakers spent nearly 25 more minutes using FIM for Skill Set® attainment compared with English learners.

FIM Level Attainment

- Students who reached higher Skill Set® levels spent considerably more time using the program. For example, students who reached Level 8 took an average of 12.7 hours to complete the program.

- Higher proportions of male students, Asian students, and English speaking students reached Skill Set® Level 5 or above compared with their counterparts.

FIM and Effects on Student Achievement

- FIM had small but significant effects on California Standards Test (CST) student achievement scores across each grade level. There was a differential effect of the program by grade level, with 3rd grade students benefiting the most from FIM exposure.

- FIM had small but significant effects on California Achievement Test (CAT/6) student scores across all grade levels. FIM exposure had a larger impact on student achievement than student demographic variables, except for students' CAT/6 pre-test score (in all grades) and the effect of attending a particular school (in some grades).

- Controlling for students' previous achievement record, students at each grade level who complete higher FIM Skill Set® levels also had higher CST and CAT/6 achievement scores.

APPENDIX

Supplemental tables for the findings in this report are provided in the following section.

When the effects of demographic characteristics are examined by grade level, school attended is the only variable that is statistically significant across each grade. Differences in the magnitude of the effect across grades indicate that school attended influences usage differently in certain grades. In other words, the effect of school may be stronger in certain grades because differences in usage across schools are more prominent in particular grades.

Exhibit A-1: Effects of Demographic Characteristics on FIM Skill Set® Usage, by Grade Level

Characteristic	***Grade 3***	***Grade 4***	***Grade 5***	***Grade 6***
(Constant)	0.470 *	0.518 *	0.622 *	0.500 *
Sex	0.015 *	0.000	0.004	0.003
Ethnicity	0.031 *	0.005	0.007	0.004
English Learner	0.000	0.002	0.000	0.004
Learning Disabled	0.000	0.002	0.000	0.021 *
Gifted Student	0.007	0.050 *	0.018 *	0.014 *
School	0.090 *	0.137 *	0.110 *	0.093 *

*Significant effect on Program Usage.

School attended has the most significant influence on the amount of time students spend practicing their mathematics skills in workout GYMs. Demographic characteristics such as gender, grade level, learning disability and gifted status have statistically significant effects on program use but these effects are extremely small.

Exhibit A-2: Effects of Demographic Characteristics on FIM GYM Use

Characteristic	***Effect Size***
(Constant)	0.262 *
Sex	0.003 *
Ethnicity	0.003
English Learner	0.001
Learning Disabled	0.008 *
Gifted Student	0.007 *
School	0.076 *
Grade	0.006 *

*Significant effect on Usage

Native English Speaker, students not identified as learning disabled, and gifted students used the FIM program for Skill Set® attainment more frequently than their counterparts. Differences in GYM use were also significant across these academic characteristics.

Exhibit A-3: Average FIM Usage in Hours, by Special Academic Characteristics

	Total Time	*Skill Set® Time*	*GYM Time*
Total	2.5	2.0	0.5
English Proficiency*			
Native Speaker	2.7	2.2	0.6
English Learner	2.3	1.8	0.5
Learning Disability Status*			
Learning Disabled	2.2	1.8	0.4
No Disability	2.6	2.0	0.6
Gifted Status*			
Gifted	2.5	2.0	0.5
Not Gifted	2.3	1.8	0.5

* Statistically significant usage differences.

Exhibit A-4: Average GYM Time in Hours, by School and Grade

	Total	*Grade 3*	*Grade 4*	*Grade 5*	*Grade 6*
Total	0.5	0.5	0.5	0.6	0.5
Central	0.6	0.5	0.4	0.5	0.7
El Toyon	0.4	—	0.4	0.6	0.3
Ira Harbison	0.9	0.7	1.0	1.1	0.7
John Otis	0.8	0.7	0.6	0.9	1.0
Kimball	0.3	0.5	0.3	0.2	0.2
Las Palmas	0.5	0.6	0.4	0.3	0.5
Lincoln Acre	0.4	0.2	0.5	0.5	0.4
New Horizon	0.6	0.6	—	—	—
Olivewood	0.5	0.4	0.5	0.5	0.6
Palmer Way	0.5	0.5	0.5	0.8	0.5

Both student demographics and amount of program usage influence Skill Set® level attainment for each grade level. Program exposure, as measured by usage in minutes, has differential effects on Skill Set® attainment by grade level. Usage has the strongest influence on Skill Set® level attainment for sixth graders. There are also differential effects of demographics by grade level. Some characteristics, such as gender and ethnicity only have significant effects in some grade levels.

Exhibit A-5: Effects of Demographic Characteristics and FIM Usage on Skill Set® Attainment, by Grade Level

Characteristic	***s***	***Grade 4***	***Grade 5***	***Grade 6***
(Constant)	0.13 *	0.04 *	0.13 *	0.17 *
Sex	0.02 *	0.02 *	0.01	0.01 *
Ethnicity	0.06 *	0.02 *	0.00	0.01
English Learner	0.00	0.00 *	0.01	0.00
Learning Disabled	0.01	0.02	0.00	0.00
Gifted Student	0.00	0.11 *	0.05 *	0.02 *
School	0.10 *	0.08 *	0.13 *	0.06 *
Usage (in minutes)	0.69 *	0.72 *	0.74 *	0.79 *

*Significant effect on Skill Set® Level Attainment

Amount of time using FIM and Skill Set® attainment are highly related. Students who reached higher Skill Set® levels spent considerably more time pursuing skill levels and in practice GYM sessions.

Exhibit A-6: Average Amount of Hours Spent Using FIM, by Type of Use and Level Attainment

	Skill Set® Hours	***GYM Hours***
Level 1	0.3	0.2
Level 2	0.7	0.3
Level 3	1.4	0.6
Level 4	2.1	0.7
Level 5	3.7	1.0
Level 6	5.8	1.3
Level 7	8.2	1.3
Level 8	12.7	1.5