

**Maine's State Systemic Improvement Plan (SSIP)
Phase III, Year 4**

April 1, 2020

Summary of Maine's SSIP -- Phase III, Year 4

The Maine Department of Education (Maine DOE) has chosen, as its SSIP, implementation of evidence-based professional development in the teaching of mathematics to improve the math proficiency of students with disabilities. This initiative has been named Math4ME ("Math for Maine"), and a logic model containing the implementation activities and expected outcomes is contained in Attachment A of the Phase III Year 3 report. This report will describe the Math4ME implementation activities for participants in all cohorts in 2019–20 and the evaluation activities spanning the 2018–19 and 2019–20 school years.

The State-Identified Measurable Result (SIMR) of the Math4ME initiative is as follows: Students in grades 3–8 with Individualized Education Programs (IEPs) will demonstrate improved math proficiency as measured by math scores on the statewide Maine Educational Assessment (MEA) in the schools in which teachers receive evidence-based professional development in the teaching of math. To express proficiency as a percent, Maine reports proficiency as follows: *Percent = number of grade 3–8 students with IEPs in the identified schools who demonstrate proficiency in math divided by the number of grades 3–8 students with IEPs in the identified schools who are evaluated on the math assessment.*

To evaluate progress for FFY2018 (2018–19), year-to-year proficiency was assessed for all grade 3–8 students with IEPs in schools with Math4ME teachers. The proficiency percentages and proficiency targets are listed in Table 1 below.

SIMR: FFY2016–FFY2018 Student Proficiency Data

FFY	2015 (Cohort 1 Baseline)	2016 (Cohort 1 and 2)	2017 (Cohort 1 and 2)	2018 (Cohort 1, 2 and 3)
Proficiency Percentages	15.07%	9.47%	8.67%	9.91%

FFY2016–FFY2019 Targets

FFY	2015	2016	2017	2018	2019
Target	(Cohort 1 Baseline)	16.00%	17.00%	17.00%	17.00%

Table 1: SIMR Proficiency Data and Targets

The total number of grade 3–8 students with IEPs in Math4ME schools who took the 2018–19 statewide math assessment was 868. Of these students, 86 (9.91%) achieved proficiency. This was a 1.24% increase from 2017–18 proficiency rate of 8.67%.

The improvement in the percentage of proficient students receiving special education in Math4ME-participating schools between 2017 and 2018 is encouraging, but the percentages are based on the performance of all grade 3–8 students with IEPs in Math4ME-participating schools; they are not based on the performance of the specific students who were taught by Math4ME-trained teachers. More detailed analyses included statistical regression procedures that contrasted students taught by Math4ME teachers and those not taught by Math4ME teachers. The results of these analyses did not reveal a statistically significant difference in math scores when comparing students taught by Math4ME teachers and those not taught by Math4ME teachers. The external evaluators (Maine Educational Policy Research Institute (MEPRI) researchers), Maine Department of Education Math4ME program staff, and stakeholders have discussed the possibility that the Maine Educational Assessment may not be the best, most appropriate measure of skills that are improved through Math4ME participation. It is possible that Math4ME participation improves specific math skills that are not appropriately measured by the broad-based Maine Educational

Assessment. Additionally, it may be possible that specific content or skills showing the greatest improvement may be assessed only in one or two grade-levels. If so, other assessments may be more effective at measuring the effects of Math4ME participation. One option suggested by MEPRI would be to include local (district-level) testing data that may assess different or more specific math skills, and this possibility will be discussed at the upcoming stakeholder meeting scheduled for April, 2020.

In addition to analysis of student performance on the statewide math assessment, this report presents the results of the Post-Training Survey for Cohorts 3 and 4, Pre-Training–Post-Training Assessment Results for Cohort 4, Fidelity-of-Practice results for Cohort 3, and the Post-School-Year Survey for all of the coaches and teachers (from any cohort) who participated in any of the Math4ME activities during the 2018–19 school year.

Math4ME implementation during the 2019–20 school year consisted of several training activities that were open to teachers in each of the 4 cohorts that have participated so far. One Cohort 1 teacher who received initial Math4ME training during 2016–17 received additional training during 2019–2020. Additionally, 5 Cohort 2 teachers, trained during 2017–2018, continued to participate and received support during 2019–2020. Cohort 1 and 2 professional development during 2019–2020 consisted of an interactive webinar hosted by the new Maine Department of Education math specialist and the Math4ME lead coach, access to an updated Padlet of math resources, and feedback on the implementation of two math routines in the classroom.

Of the 28 teachers from Math4ME Cohort 3 (which received initial training in 2018–19), 15 continued during 2019–2020. The 2019–20 training for Cohort 3 consisted of a 2-day summer session and two 1-day sessions in the fall of 2019. The training included a focus on the use of a diagnostic screening tool to pinpoint

student difficulties across several areas and the use of formative assessments and formative feedback. Additionally, Cohort 3 participants received classroom coaching visits during the 2019–2020 school year with a focus on selected National Council of Teachers of Mathematics (NCTM) practices.

Math4ME Cohort 4 consisted of 30 teachers from 13 schools spanning 7 LEAs. Cohort 4 training consisted of a 3-day summer 2019 session and two 1-day sessions in the fall of 2019. The training was designed to build participants' understanding of mathematics concepts, hone diagnostic skills for identifying students' difficulties and misconceptions, and expand teachers' repertoire of practices for teaching and supporting struggling students. This was the same initial training received by Cohort 2 and 3, and it is described in detail in the Phase III Year 2 report. Additionally, Cohort 4 participants received classroom coaching visits during the school year with a focus on selected National Council of Teachers of Mathematics (NCTM) practices.

In addition to the 2019–20 implementation activities, this report presents the results of several evaluations of the Math4ME trainings, coaching, and participant experiences; specifically, the results of the 2019–20 Post-Training Survey for Cohorts 3 and 4, the 2019–20 Pre-Training–Post-Training Assessment Results for Cohort 4, the 2018–19 Fidelity-of-Practice results for Cohort 3, and the Post-School-Year Survey for all of the coaches and teachers from Cohort 1, 2, and 3 who participated in any of the 2018–19 Math4ME activities. Details of these evaluations are contained in Section E of this report, but a summary of the results is given below.

On the final afternoon of the summer 2019 training sessions, Cohort 3 and 4 participants were emailed a link to a Post-Training web-based survey. The goal was to collect participants' perceptions about the training and their feedback and suggestions for improvements. All participants responded and feedback from both

cohorts was very positive. Respondents indicated that this training was valuable to them (96%) and would recommend it to others (96%). Almost all participants felt they were better prepared to use multiple strategies to help students who struggle in math (98%). Teachers felt confident they would be able to change their instructional practices to incorporate some of the teaching strategies discussed. Most participants felt better prepared to institute the NCTM instructional practices and reported a better understanding of addition, subtraction, fraction, and problem-solving concepts. Cohort 3 also was introduced to the EMDI screening tool. These teachers felt better prepared to use it, and they understood how it could inform their instruction.

To assess potential growth of the teachers' knowledge of mathematical content for teaching as a result of Math4ME training, Cohort 4 teachers participated in the Learning Mathematics for Teaching (LMT) assessment on the first day of training, prior to any training activities, and upon completion of all training activities. The results of this assessment indicated an overall increase from the pre-training to post-training scores of 0.05 standard deviation units, where the standard deviation is the average amount by which participants differed from the average score. Due to the relatively small overall increase in scores compared to the variability among participants, however, this increase was not considered statistically significant. This result differs from the previous LMT result for Cohort 2 in which a larger overall increase of 0.54 was found. A contributing factor for this difference appears to be a significantly higher performance (both on the pre- and post-training assessment) for Cohort 4 compared to Cohort 2. It is unclear why Cohort 4's overall performance was significantly higher than Cohort 2's across both assessments.

After the summer training, each Cohort 3 and 4 teacher was assigned a coach who conducted all coaching and Fidelity-of-Practice observations of the

teacher. The coaches received Math4ME training from the Lead Math4ME Trainer and Lead Coach prior to the start of the year and throughout the year. The coaching model and Fidelity-of-Practice assessment process are described in detail in the Phase III Year 2 Report. Formal classroom observations of the classroom practices of Cohort 3 teachers were conducted 3 times during the 2018–19 school year. Classroom observations/Fidelity-Of-Practice Assessments for Cohort 4 have been ongoing during the 2019–20 school year but currently are not occurring (as of March 2020) due to school closures as a result of the COVID-19 pandemic. These results will be reported in the next SSIP report.

The Fidelity-of-Practice evaluation tool includes 4 broad practice areas: *Establish Mathematics Goals to Focus Learning*, *Use and Connect Mathematics Representations*, *Build Procedural Fluency from Conceptual Understanding*, and *Implement Tasks that Promote Reasoning and Problem Solving*. During the observations, the math coaches wrote detailed notes to describe teaching practices related to these four instructional practices. These notes were then used to complete the observation tool and to score the degree to which the coach saw evidence of the four instructional strategies in action. There was observed improvement in implementing the principles in each observation in all instructional areas. When the change in score between evaluations was examined, there was statistically significant improvement within each major practice area between the initial and final observations except for *Establish Mathematics Goals to Focus Learning*. There was improvement in this practice area, but it did not meet the threshold for statistical significance. This improvement in all practice areas was consistent with observed improvement for each new cohort in the previous 2 years. The increase in scores over the years indicates that, with continued professional development and coaching during the school year, there was an increased adoption of these evidence-based practices. It is unclear why improvement in the area *Establish*

Mathematics Goals to Focus Learning was not great enough (compared to the variability among participants) to reach statistical significance, but it is notable that the overall fidelity score for the initial observation was highest for this practice area.

All 2018–19 participating Math4ME teachers and coaches (participants from Cohorts 1, 2, and 3) were asked to complete an electronic, anonymous Post-School Survey near the end of the 2018–19 school year. Forty-five of the 46 teachers and all 9 coaches responded. Questions were designed to collect feedback on participants’ experiences and impacts of the professional development and coaching. Likert-scale, fixed-choice, and open-response questions were included. Details of the survey responses are reported in Section E of this report but are summarized below.

Overall, teachers indicated that the workshops given during the school year were very useful. They appreciated the time to collaborate with other teachers and indicated that the workshops gave them new strategies and methods to teach to students of differing abilities. Teachers felt one of the strengths of the workshops was having the chance to explore and practice different teaching methods and activities. Many commented that on the hands-on activities for students were practical, easy to recreate, and quick. They felt these activities helped students visualize concepts and helped develop numerical fluency. Teachers said they learned strategies for getting students to engage in mathematical discourse. They felt they gained a better understanding of how to ask questions and allow students to arrive at answers on their own. Teachers found coaching to be helpful. Most felt the feedback they received from coaching was *extremely helpful* (62%), 36% felt that coaching was *moderately helpful*, and 1 respondent (2%) described it as *somewhat helpful*. No teacher selected the options *slightly helpful* or *not at all helpful*. Responses to the open-ended question about the most useful thing about the coaching centered on mentoring.

All teachers reported that they felt students were more confident and engage, better able to explain their thinking and use a variety of representations. In response to open-response questions, some special education teachers felt that they had noted measurable progress even when it was not reflected in test scores and noted that students were discussing math spontaneously. One teacher said her students had improved in STAR assessments and had moved from the NumberWorlds textbook to the same text as their peers. Additionally, most special education teachers (59%) felt their teaching in other subjects was *somewhat affected* to *greatly affected*. Teachers also were asked if they had shared their experiences with other non-participating teachers and 91% reported doing so. Sixty-four percent of the teachers also felt that other teachers' practices were *somewhat* or *very much affected* by their sharing of Math4ME experiences.

Challenges that were noted included student behavioral issues and students' memory and retention abilities and knowledge gaps. Teachers also reported struggling with a wide span of learning levels among their students. Several teachers felt the Math4ME topics were too advanced and others felt the topics were not at a high enough level. District timelines that assign a length of time to teach each unit was also cited as a challenge.

In response to the survey of Coaches, all 9 coaches felt Math4ME had a positive impact on students receiving special education. All coaches exceeded the program guidelines by either modeling demonstration lessons or doing additional observations of their assigned teachers. Coaches felt they had the greatest impact by providing support, resources, strategies, and feedback on what was working well. All coaches felt the Math4ME program had a *somewhat positive* ($n=6$) or *extremely positive* ($n=3$) effect on special education students. Coaches felt teachers showed growth in understanding the mathematics learning process and teaching principles through the year. Coaches felt teachers showed the greatest improvement in

implementing tasks to promote students' reasoning and problem solving skills and establish mathematics goals to focus learning. Eight coaches reported sharing Math4ME resources, activities or ideas with teachers outside the program either through professional development or individually. Seven of those coaches felt the other teachers' instructional practices were *somewhat* or *very much* affected.

Additional support for the participating teachers in all cohorts included emailed resources and access to a Math4ME Padlet website. The resources were created and/or curated and maintained by the Lead Coach. These publications are described in the Phase III Year 2 report, and they contain numerous resources relevant to math content and pedagogy, including learning trajectory resources, formative assessment tools, materials from trainings, and full research articles on evidence-based practices for math instruction.

Maine continues to build infrastructure in support of Math4ME implementation and evaluation. The former Maine DOE Math Specialist, Cheryl Tobey, continued to lead the Math4ME trainings. Cheryl left her position at the DOE but was hired as a contractor to complete the fall 2019 trainings. Jennifer Robitaille has replaced Cheryl at the department and led the January 2020 webinar for Cohorts 1 and 2. Jennifer is currently conducting EMDI (Early Mathematics Diagnostic Interview) trainings across the state and will lead the summer and fall trainings for 2020–2021. The Lead Math Coach, Nancy Lander, Nancy Lander, co- led the training for all cohorts in 2019–20. Nancy continues to support LEA coaches and directly coaches Math4ME teachers.

Maine DOE renewed its contract with the Maine Educational Policy Research Institute (MEPRI) to serve as the external evaluator of the SSIP. MEPRI is a University of Maine based research center with two decades of experience providing research, program evaluation, and policy analysis to Maine schools, government and community agencies, and the Maine State Legislature. MEPRI

personnel are accomplished researchers with detailed knowledge of Maine's educational data and initiatives.

Additionally, Maine continues to benefit greatly from the support and assistance of OSEP-funded technical assistance agencies. The IDEA Data Center and other agencies have provided indispensable guidance, consultation, and coordination through all steps of Maine's SSIP development and implementation.

All training and implementation activities that have occurred prior to March 2020 have been accomplished within the planned timeline. However, coaching and Fidelity-of-Practice assessments are not currently occurring for the participating cohorts due to the school closures as a result of the COVID-19 pandemic. The impact of the school closures on the Math4ME implementation and evaluation activities may be substantial, and this impact will be presented in the next Phase III report.

Currently, the planned Math4ME activities for the 2020–21 school year include continued training of Cohort 4, focused on the progression of numeracy ideas with diagnostic interview tools. The first 2 days of training are planned for August 6 and 7, 2020, and the final 2 days are scheduled for October 8, 2020 and December 10, 2020. The Cohort 4 teachers will receive coaching and Fidelity-of-Practice support from a Lead Coach or LEA-Level Coach, with 2 classroom visits with each teacher during the 2020–2021 school year. Coaches will complete a Fidelity-of-Practice measure for each visit. Post-training surveys, Learning Mathematics for Teaching pre- and post-training assessments, and Fidelity-of-Practice assessments are also planned for the new cohort. Maine plans to continue to assess growth in math proficiency for students in all cohort schools, but the current COVID-19 pandemic and school closures will certainly impact the state-wide assessments.

Maine DOE Special Services will continue its efforts to build infrastructure

and capacity to support Math4ME. The Lead Trainer will lead the Math4ME training and will continue to build the state's capacity by providing advanced training and coaching consultation to the Lead Coach and LEA-Level Coaches during the coming year. Maine will continue to work with federally-funded technical assistance centers in the coming year for support in best practices and strategies for Math4ME scale-up and sustainability.

B. Progress on Implementing the SSIP

1) Implementation Progress

Math4ME Participants:

Cohort 1 and 2 teachers: One Cohort 1 teacher who received Math4ME training during 2016–17 received additional training during 2019–2020. Additionally, 5 Cohort 2 teachers, trained during 2017–2018, continued to participate and received support during 2019–2020.

Cohort 3 Teachers: Of the 28 teachers from Math4ME Cohort 3, 15 continued during 2019–2020. The Cohort 3 teachers were from 9 schools spanning 7 school districts. These teachers received their initial Math4ME training in the summer of 2018.

Cohort 4 Teachers: Math4ME Cohort 4 consisted of 30 teachers from 13 schools spanning 7 LEAs. These teachers received their initial Math4ME training in the summer of 2019. The participating Local Education Agencies (LEAs) were selected based on an application process that assessed readiness and capacity to institute evidence-based improvement practices in teaching mathematics. This process is described in the SSIP Phase II Report.

Math4ME Training and Support (2019–20):

Cohort 1 and 2 training and support: Cohort 1 and 2 professional

development consisted of an interactive webinar hosted by the Maine Department of Education math specialist (Jennifer Robitaille) and the Math4ME Lead Coach, access to an updated Padlet of math resources, and feedback on implementation of two math routines in the classroom.

Cohort 3 training and support: Training for Cohort 3 consisted of a 2-day summer session and two 1-day sessions in the fall of 2019. The training included a focus on the use of a diagnostic screening tool to pinpoint student difficulties across several areas: fundamental concepts related to number and place value, computational fluency, and operations and algebraic reasoning. Additional topics included problem-solving skills and processes, concrete-representation-abstract connections, and the use of formative assessments and formative feedback. Additionally, participants received classroom coaching visits during the 2019–2020 school year with a focus on selected National Council of Teachers of Mathematics (NCTM) practices (described in detail in the Phase III Year 2 report).

Cohort 4 training and support: Cohort 4 training consisted of a 3-day summer 2019 session and two 1-day sessions in the fall of 2019. The training was designed to build participants’ understanding of mathematics concepts, hone diagnostic skills for identifying students’ difficulties and misconceptions, and expand teachers’ repertoire of practices for teaching and supporting struggling students. This was the same initial training received by Cohort 2 and 3, and it is described in detail in the Phase III Year 2 report. Additionally, Cohort 4 participants received classroom coaching visits during the school year with a focus on selected National Council of Teachers of Mathematics (NCTM) practices.

Math4ME Lead Trainer and Coaches: The 2019–2020 Math4ME implementation team consists of Maine DOE’s Mathematics Specialist as Lead

Trainer (Cheryl Tobey & Jennifer Robitaille), Math4ME Lead Coach (Nancy Lander), 3 returning (2018–2019) LEA-Level Coaches, and 6 LEA-level coaches coming on in the fall of 2019. The enlistment of Cheryl Tobey as the Math4ME Lead Trainer and Nancy Lander as the Lead Coach was described in detail in the Phase III Year 2 report. During Phase III Year 4, Cheryl and Nancy designed and led the Cohort 3 and 4 training sessions during the summer and fall of 2019. During Year 4, Cheryl Tobey left the Maine DOE and was contracted through the Maine Math and Science Alliance (MMSA) to complete the training cycles. Jennifer Robitaille joined the Maine DOE as the math specialist in the fall of 2019 and planned and implemented the Cohort 1 and 2 webinar in January 2020. Jennifer will plan and implement 2020–21 training with the Lead Coach and LEA coaches. Additionally, Maine DOE sponsored the Lead Coach’s attendance at a National Council of Supervisors of Mathematics (NCSM) conference in the spring of 2019 and will sponsor her attendance at NCSM/NCTM conferences in 2020 with the new Maine DOE math specialist. Table 2 below provides a summary of the roles of the trainer and the coaches.

Role	Responsibilities
Lead Trainer	Design and lead Cohort 1, 2, 3 & 4 trainings; conduct train the trainer sessions; meet with Lead Coach and LEA-Level Coaches to plan trainings
Math4ME Lead Coach	Co-facilitate trainings; conduct formal and informal support cycles for Cohort 3 & 4 participants; provide ongoing support to LEA-Level Coaches; participate in 2 support cycles with district LEA coaches to maintain fidelity accuracy and validity; maintain/update the Math4ME Padlet Website; Coaches 18 of the Cohort 3 & 4 teachers.
Math4ME LEA-Level Coaches	Attend trainings, participate in train the trainer sessions, conduct formal and informal

	support cycles for participants in LEAs; together coach 27 of the Cohort 3 & 4 teachers.
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Table 2: Summary of Trainer and Coach Roles and Responsibilities

Support cycles: Math4ME Cohort 3 and 4 teachers have received coaching support from the Lead Coach or an LEA-Level Coach during the 2019–2020 school year. Cohort 3 participants receive 2 cycles of coaching support and Cohort 4 receives 3 cycles.

Currently, teachers in both cohorts are moving into the last cycle of support. Each cycle includes 1) a coaching component that focuses on the teachers’ self-selected areas of math focus and 2) a Fidelity-of-Practice observation. Prior to each visit, teachers are contacted either in person or by email, and the coach and the teacher have a *pre-conference* in which the coach asks the teacher to choose 2 or 3 elements from 4 indicators contained in the National Council of Teachers of Mathematics *Principles to Actions* as the areas of focus for the coaching visit. The 4 indicators are: 1) *Establishing Mathematics Goals to Focus Learning* 2) *Using and Connecting Mathematical Representations*, 3) *Building Procedural Fluency from Conceptual Understanding*, 4) *Implementing Tasks that Promote Reasoning and Problem Solving*. The teacher and coach discuss the planned lesson within the context of the selected indicators and consider questions such as the learning goals, the mathematical concepts that will be presented, and the planned teaching strategies. During the visit, the coach observes the teacher in the classroom and notes the teacher's use of instructional practices related to the selected indicators. After the observation, the coach and teacher discuss aspects of the lesson that went well, areas that were challenging to teach, areas in which students had difficulties, and evidence-based strategies that can be used to deliver effective instruction in the identified areas. The coach follows up with a written response to the teacher

regarding the post-observation discussion and provides additional feedback to the teacher.

The coaches also use data collected during the classroom observations to complete a Fidelity-of-Practice assessment of the observed teacher. The Fidelity-of-Practice Tool is discussed in detail in the Phase III Year 2 Report. As of January 2020, all 45 (15 returning teachers from Cohort 3 and 30 Cohort 4 teachers) have been observed at least once formally and informally with follow-up oral and written feedback. Due to the COVID-19 outbreak, the coaches may not complete all visits by the end of the 2019–2020 school year. Most schools in Maine closed March 16, 2020. Until the closures, the coaches were on track to complete all observations.

Additional Supports: In addition to coaching, participants from all cohorts are supported with ad-hoc assistance from the Lead Coach and LEA-Level Coaches and are provided with numerous technical assistance resources via the Math4ME Padlet Website (described in detail in the Phase III Year 2 report).

The Padlet contains numerous resources relevant to math content and pedagogy, including learning trajectory resources, formative assessment tools, and full research articles on evidence-based teaching practices. The website also contains preconference coaching tools, coaching visit overview, and other materials used by the Coaches and Math4ME teachers for the coaching visits. The Math4ME Padlet Website can be accessed at

https://padlet.com/Math4ME/Continuing_PD_for_C1andC2

https://padlet.com/Math4ME/Cohort_3 and

<https://padlet.com/MathProbes/Math4MEcohort4>.

Additional supports provided to Cohort 3 and 4 teachers include: informal observations with feedback, model teaching of math routines, model lessons, co-plan lessons, analysis of formative assessment results with teachers, methods of

evaluating students for math levels to report strengths and needs, and other supports as requested by the teacher. Table 3 below summarizes the 2019–2020 implementation activities and relates them to the planned improvement strategies.

<p align="center">Planned Activities/Improvement Strategies</p>	<p align="center">Implemented Activities and Outputs 2019-2020</p>
<p>Train teachers of grades 3-8 special education students of grades in fundamental concepts in math content and pedagogy.</p>	<p>Cohort 3: 2-Day Training in Summer 2019 and 2 1-Day Trainings in Fall 2019.</p> <p>Cohort 4: 3-Day Training in Summer 2019 and 2 1-Day Trainings in Fall 2019.</p>
<p>Train Coaches in fundamental concepts in math content and pedagogy and provide ongoing support.</p>	<p>Lead Coach co-led trainings; met monthly with the Maine DOE Math Specialist for coaching consultation and advanced training throughout the school year; plans to attend a National Council of Teachers of Mathematics (NCTM) conference in 2020.</p> <p>LEA-Level Coaches attended summer and school year trainings and met every other month with the Lead Coach for coaching consultation and advanced training throughout the school year.</p>
<p>Support trained teachers on fidelity of teaching practices in math throughout the school year.</p>	<p>Cohort 3: Teachers received 2 coaching visits during the 2019-2020 school year with a focus on National Council of Teachers of Mathematics practices. Via the Padlet, teachers were supported with access to numerous resources on evidence-based practices and teaching strategies.</p> <p>Cohort 4: Teachers have received at least 1 coaching visit from the Lead or LEA-Level Coach. Each teacher was on track to receive 3 visits before the end of the 2019-2020 school year, but the impact of school closures due to the COVID-19 pandemic on any continuing visits remains unclear. Cohort 4 teachers also have been supported with access to numerous resources on evidence-based practices and teaching strategies.</p>

<p>Publicize successful outcomes to encourage teachers from other LEAs to volunteer for training.</p>	<p>The initial 5-Day Math4ME training was featured in the Maine DOE Commissioner's update (distributed electronically to all subscribing K-12 teachers and administrators in Maine) and the local news. A new special initiatives webpage for the Office of Special Services highlights Math4ME. This was shared with the public in a Maine DOE news update in 2019.</p> <p>Project staff have presented at MADSEC, Maine Administrators of Services for Children with Disabilities and NCTM's Innov8 Conference.</p>
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Table 3: Overview of Implementation Activities and Outputs; April 2019–March 2020

2) Stakeholder Involvement in Implementation

The Math4ME stakeholder group consists of LEA special education directors, teachers and consultants, Maine DOE Special Services personnel, the Maine Parent Federation, a member of the State Performance Plan/Annual Performance Report State Advisory Panel, and several higher education consultants and evaluators. An online stakeholder meeting is planned for April 2020 to share implementation progress and the outcomes of the Cohort 3 and 4 trainings. At the meeting, the Maine DOE Math Specialist will lead participants through a variety of activities and discussions designed to showcase various components of the training and fidelity measures while providing a conceptual framework for stakeholders. Additionally, the external evaluator will present and discuss the evaluation results from the Cohort 3 and 4 data collected from surveys, interviews, fidelity checks, and the Cohort 3 student assessment results. Because 2020–2021 will be year five of the project, the stakeholders will be presented with decision points regarding future scale-up. Stakeholders will continue to be a critical component in providing guidance to the Maine DOE for future implementation and scale-up efforts.

Additionally, in September 2019, the Math4ME Coordinator, Trainer, and Lead Coach provided a 2.5 hour Math4ME Administrators' Information Session

for administrators from participating Cohort 3 and 4 LEAs. Session attendees included superintendents, building level administrators, curriculum coordinators, and special education directors. An overview of various components of the program, including aspects of the professional learning model, coaching support cycles, results from the evaluations conducted so far, and additional research supporting the model was provided to participants. The session targeted key LEA personnel to increase administrative knowledge and support for the initiative and provided a vehicle for maintaining participation within LEAs.

C. Data on Implementation and Outcomes

1) Measures Used to Assess Effectiveness of Implementation

Maine is committed to ensuring that progress on Math4ME implementation activities and intended outcomes are informed by high-quality data and analyses. Therefore, Maine has continued to contract with the Maine Educational Policy Research Institute (MEPRI) to evaluate SSIP progress. MEPRI is a University-of-Maine-based research center with two decades of experience providing research, program evaluation, and policy analysis to a wide variety of community organizations and government agencies in Maine. The lead SSIP evaluators are Janet Fairman, Ph.D., an Associate Research Professor at the University of Maine, and Craig Mason, Ph.D. a Professor of Education and Applied Quantitative Methods at the University of Maine. Drs. Fairman and Mason have detailed knowledge of Maine's educational data and initiatives and have expertise in quantitative analyses, including value-added and growth models, qualitative methods, and survey design. The Maine DOE Data Manager, Math4ME Coordinator, Math Content Specialist, and Math4ME coaches have collaborated with MEPRI on the design of measures to ensure progress toward SSIP objectives

can clearly be charted and the data gathered are actionable and can inform (i.e., modify, if necessary) future implementation activities and strategies.

A general description of the key measures used during the reporting period follows below. The results of each evaluated activity using these measures are described in Section E of this report.

Post-Training Survey:

MEPRI created an online survey and emailed the link to the survey to all participants at the end of the final day of training for each cohort. Participant responses were anonymous. The survey included 5-point Likert-scale questions related to participants' perceptions of the training and its expected impact and several open-ended questions to collect participants' views on 1) most beneficial aspects of the training, 2) least beneficial aspects of the training, 3) readiness to implement new knowledge from the training, and 4) a general open-ended question for any other comments the participants wanted to share. Results of this measure (discussed in Section E1 of this report) are considered in the evaluation of progress toward Outcome 2 of the SSIP logic model: Increased knowledge of fundamental concepts in math content and pedagogy for special education teachers of grades 3–8.

Pre-Training/Post-Training LMT Assessment:

The Learning Mathematics for Teaching (LMT) is designed to assess teachers' content knowledge for teaching, with questions situated in the context of common issues that arise in the teaching of mathematics. The scope of questions includes requirements "to provide an explanation to a mathematical rule or procedure, examine an unusual method for solving a problem, or decide which of several definitions is accurate and usable with students at the grade level she teaches"

(<http://www.umich.edu/~lmtweb/>). The LMT has been extensively studied and is considered a reliable and valid measure of teachers' content knowledge for the teaching of mathematics. The LMT has several forms covering the same content areas, allowing for pre-training/post-training comparisons and assessments of participants' growth. Detailed information about the LMT can be found at <http://www.umich.edu/~lmtweb/>. Results of this measure are considered in the evaluation of progress toward Outcome 2 of the SSIP logic model – Increased knowledge of fundamental concepts in math content and pedagogy for teachers of grades 3–8.

Teacher Fidelity-of-Practice Assessments:

Math4ME Coaches conduct classroom observations of trained teachers to document Fidelity-of-Practice of the Math4ME training strategies and practices. Fidelity is measured using a rubric developed by the Math4ME Trainer, the Lead Coach, and the Math4ME External Evaluator. Four indicators taken from the National Council of Teachers of Mathematics *Principles to Actions* (2014) were adopted for the Fidelity-of-Practice rubric: 1) *Establish Mathematics Goals to Focus Learning*, 2) *Use and Connect Mathematical Representations*, 3) *Build Procedural Fluency from Conceptual Understanding*, and 4) *Implement Tasks to Promote Reasoning and Problem Solving*. Details on the development and use of the rubric and the classroom observation procedures are provided in the Phase III Year 2 Report.

The fidelity observations are analyzed by the external evaluator to document teachers' progress in the implementation of Math4ME evidence-based practices, document teachers' successes and challenges, and inform future professional development on challenging areas/practices. Results of this measure (discussed in Section E1 of this report) are considered in the evaluation of progress toward

Outcome 3 of the SSIP logic model – improved skill of special education teachers of grades 3–8 in teaching fundamental concepts in math.

Post-School Year Survey:

With input from the Math4ME Trainer, Lead Coach, and Maine DOE personnel, MEPRI created an online confidential survey and emailed the invitation to Math4ME teachers and coaches near the end of the 2018–19 school year. Questions were designed to collect information that would be useful, formative feedback on participants’ experiences and impacts of the professional development and coaching at the individual teacher and coach level. Most of the survey items allowed for quick response via selection of a fixed-choice response and some items utilized a five-point Likert scale. The survey also included open-response items to allow participants to explain their views and provide more specific information. The survey included the following topics:

- Feedback on the usefulness of professional development (fixed-choice and open-ended questions)
- Feedback on the math coaching provided during the year, perceptions of the usefulness of the coaching, and impact of coaching on instructional practice (both fixed-choice and open-ended questions)
- Specific examples where the teacher perceived making the most positive change in his/ her instructional practice during the year (open-ended)
- Challenges in efforts to implement new instructional practices (open-ended)
- Suggestions for ways to improve the Math4ME program (open-ended)

Maine Educational Assessment (MEA):

The statewide math assessment, the Maine Educational Assessment (MEA), was selected as the measure of student proficiency and progress toward the SIMR. In the spring of each year, students in grades 3–8 take the assessment online in 2 sessions in a single day. Each session lasts 65 minutes, and a break of at least 10 minutes is given between sessions. The assessment is fixed-form (all students in a given grade see the same questions) and is scored based on Item Response Theory (IRT) (scoring takes into account the difficulty of each item answered correctly). Detailed information about the MEA is contained in the Phase III Year 2 Report. Results of this measure (discussed in Section E of this report) are considered in the evaluation of progress toward Outcome 5 of the SSIP logic model: Increased proficiency in math for students with disabilities in grades 3–8.

2) Stakeholder Involvement in the SSIP

Stakeholders have been integral in the selection of the evaluation measures listed in Section C and evaluation activities described in Section E of this report, and Maine DOE will continue to engage stakeholders in the evaluation of progress toward all goals of the initiative. Stakeholders have provided input on the types of evaluations and specific questions they thought would be important to ask to evaluate progress toward the planned outcomes.

During the upcoming stakeholder meeting in April 2020, stakeholders and DOE staff will continue the discussion concerning the current measure of student proficiency and changes in proficiency over time. The statewide Maine Educational Assessment (MEA), is relatively broad-based and, compared to other assessments that might be used, does not focus on the more specific aspects of student learning that are expected to increase as a result instruction by a Math4ME

teacher. Other assessments that are commonly used in classrooms have been identified and may be more sensitive to increases in student performance. These additional assessment data may be reviewed for the 2020–2021 school year.

D. Data Quality Issues

Maine DOE is committed to ensuring that evaluations of progress toward Math4ME intended outcomes are informed by high-quality data and analyses. Therefore, Maine continues to contract with the Maine Educational Policy Research Institute (MEPRI) to evaluate implementation outputs and progress toward the intended outcomes. The Maine DOE Math Content Specialist, Special Services Data Manager, Lead Coach, and Math4ME Coordinator will continue to collaborate with MEPRI to ensure that measures and evaluation methods yield valid and reliable data that directly target the constructs and outcomes of interest.

In considering data quality, Maine DOE refers to resources provided by the IDEA Data Center (IDC) at the following website <https://www.ideadata.org/resources/resource/1582/working-principles-of-high-quality-idea-data> and information presented at the IDC's Institute on High-Quality Data & the SSIP in April 2015. Based on these resources, Maine DOE considers the timeliness, completeness, and accuracy of all data collected.

As mentioned above, stakeholders, Math4ME external evaluators, and DOE staff have discussed the concern that the current measure of student proficiency, the statewide Maine Educational Assessment (MEA), is relatively broad-based and, compared to other assessments that might be used, not as focused on the more specific aspects of student learning that are expected to increase as a result instruction by Math4ME teachers. Other assessments that are commonly used in classrooms may be more sensitive to increases in student performance.

Stakeholders and Maine DOE staff intend to discuss with the IDEA Data Center the possibility of adding an additional, more focused assessment as an additional tool for monitoring student progress, and the issue will be discussed in greater detail at the April 2020 Math4ME stakeholder's meeting.

An additional issue that will be discussed with stakeholders involves the standardization of coaching and observation practices. Although the coaches were encouraged to use the same procedures before the classroom observations/Fidelity-of-Practice assessments, there was not a consistent pattern of communicating with teachers for pre-observation conferencing across the coaches. Only 1 coach indicated he/she *never* met with teachers in-person or by phone for a pre-observation conference. Four coaches met with teachers in-person or by phone a *few times* for pre-observation conferences. For pre-conferencing, there was no consistent pattern to the use of e-mail. For post-conferencing, most coaches *always* (n=5) or *usually* (n=2) met in person with the teachers. The 2 coaches that indicated they met with teachers a *few times* for a post-observation conference also indicated that they provided written feedback by email or on paper after an observation a *few times*. The effect of this lack of standardization on the teacher observations and preparedness is unknown, but it may be beneficial to ensure standardization of all procedures regarding pre-observation, Fidelity-of-Practice observation, and post-observation feedback to the teachers.

E. Progress Toward Achieving Intended Improvements

1) Evaluation of Implementation Activities and Progress toward Outcomes

The section below contains general descriptions and key results of evaluations of improvement activities implemented during the reporting period. Descriptions of the measures/instruments are described in Section C and are not

reproduced below. Analyses were conducted to assess the impact of the training and coaching on teaching practices in mathematics, examine how teachers responded to the coaching support, and examine the impact having a Math4ME trained teacher had on student performance on the statewide math assessment (MEA).

Post-Training Survey:

Two training workshops were held during the summer of 2019. Cohort 4 received 3 days of summer training in mathematical instructional practices while participants returning from Cohort 3 received 2 days of summer training in the evaluation of students and delivering instruction based on the evaluation results. Two additional days of training were held in the fall; Cohort 4 training focused on multiplication and division and Cohort 3 focused on the use of student formative assessment to inform instruction.

The summer training was conducted by Maine Department of Education (DOE) staff and Math4ME coaches. The goals of the training sessions were:

- Build a deep and flexible understanding of mathematics concepts from Common Core State Standards.
- Hone diagnostic skills for identifying students' difficulties/misconceptions.
- Expand repertoire of practices for teaching and supporting struggling students.

The Post-Training Survey was developed by the Maine DOE team and the external evaluator in collaboration with the program team and is described in detail in the Phase III Year 2 report. Respondent identities were not linked with responses to survey questions. The goal was to collect participants' perceptions about the training and their feedback and suggestions for improvements. Most of the items used a five-point Likert scale. There were also several open-ended questions that allowed respondents to provide individual impressions.

Cohort 4: 30 Teachers 6 Coaches:

Overall perceptions of training: All teachers and coaches responded to the anonymous survey. Overall, 97% *agreed* or *strongly agreed* that the training was valuable and 94% would recommend the training to others. All participants felt the material was clearly presented in a way that they could understand and there was a good balance between material presented and active learning.

Impact on Teaching Content: When asked about their understanding of mathematical concepts and procedural strategies, over 90% felt that their understanding had improved. Two respondents disagreed with several statements. One respondent indicated that she/he would like more middle school level information.

Instructional practices: Participants were queried about their preparation to institute the NCTM instructional practices that serve as a focus of the Math4ME program. Most respondents (69%–92%) agreed that they were better prepared to institute the NCTM instructional practices. Respondents felt the workshop better prepared them to provide mathematical representations (92%), and model mathematical reasoning to their students. (89%).

Student-specific impacts: Almost all participants felt that they were better able to use multiple strategies to help students who struggle in math (97%). The participants felt they better understood common mathematical misconceptions that students have (97%). Fewer teachers felt better prepared to identify students' common errors (86%) and give students feedback on their solution strategies. (80%). Three-fourths (75%) of respondents felt that they were better prepared to assess students' mathematical knowledge.

Most and least beneficial aspects of training: All of the new teachers and coaches in Cohort 4 were very positive about the training, and every participant listed at least one item that they found to be the most beneficial part of the training.

Two-thirds (67%) of respondents mentioned the hands-on activities, stations and routines that were designed to engage and teach students. Several respondents noted that engaging in each activity from the perspective of a student was very helpful. Teachers reported that they took away ideas on how the activities could be adapted to their students. Working with other teachers and discussions were highlighted by 6 participants as the most beneficial aspect. Learning about the Concrete-Representational-Abstract progression of learning was specifically noted as very useful for 4 respondents.

When asked about the least beneficial aspect of training, all but 1 of the participants responded. Twelve participants felt all parts of the training were valuable. The research rounds were considered the least beneficial part of the course for 12 respondents. Two teachers had questions about how to adapt the materials to be used learners of different levels. One teacher felt the mathematics was beyond their students' understanding level while another questioned how to tie the new practices to middle school grade level standards. A third teacher wondered how to use the material within the required curriculum. Suggestions on how to improve the course included comments on allowing more time to write out their reflections and showing videos of teachers doing direct instruction.

Cohort 3: 15 Teachers, 2 Coaches:

Overall perceptions of training: Coaches, who had not previously responded to a perceptions survey, and all Cohort 3 teachers responded to the anonymous survey. The returning participants had a very positive response to the summer training. All participants felt the training was valuable, information was clearly presented, and they would recommend the training to other colleagues. The vast majority of respondents (94%) believed that they would use the strategies they learned in their work with students. The readings were viewed favorably by most

participants (82%). All respondents felt there was a good balance between presented material and active learning.

Student-specific impacts: The training for the returning cohort introduced the Early Mathematics Development Inventory (EMDI) screening tool and covered several math concepts. Teachers felt what they learned gave them a better understanding of math concepts and prepared them to use instructional strategies that will benefit students. Teachers felt that the training improved their understanding of multiplication and division strategies (94%), addition and subtraction strategies (100%), and fraction strategies (100%). All respondents indicated that they were better prepared to help students build understanding of multiplication and division concepts, addition and subtraction concepts, and fraction concepts. All participants felt they were better prepared to implement the EMDI screening tool. All teachers felt that they were better prepared to evaluate students' mathematical knowledge and 94% felt they had a better understanding of how the EMDI tool can inform their instruction plans. As a result of this training session, all teachers felt they were better prepared to use multiple instructional strategies to help students who struggle in math.

Most and least beneficial part of training: The teachers found the training beneficial with 94% singling out specific topics in an open-ended question. One teacher did not answer any open-ended question. A majority (63%) of the teachers mentioned that the EMDI screening tool was the most useful aspect of the training. Teachers appreciated the opportunity to work with others using the EMDI tool. They liked the feedback and discussion with their peers. The videos of teachers administering the EMDI to students were beneficial. Respondents felt the hands-on activities that allowed them to practice what they had learned was useful.

Only 4 participants commented on the least beneficial aspect of the training. One felt the Research Rounds was least beneficial. One lower-grade-level special

education teacher felt they did not teach fractions often. Another special education teacher thought the grade level was sometimes too low for middle school students.

Summary of summer 2019 training for both cohorts: The survey feedback from both the new cohort and the returning cohort was very positive. Respondents indicated that this training was valuable to them (96%) and would recommend it to others (96%). Almost all participants felt that they were better prepared to use multiple strategies to help students who struggle in math (98%). Teachers felt confident they would be able to change their instructional practices to incorporate some of the teaching strategies discussed. Most of Cohort 4 felt better prepared to institute the NCTM instructional practices. They reported a better understanding of addition, subtraction, fraction, and problem-solving concepts. The returning Cohort 3 felt an improved understanding of the math concepts that were covered (multiplication and division, addition and subtraction, and fractions). Cohort 3 also was introduced to the EMDI screening tool. These teachers felt better prepared to use it and understood how it could inform their instruction.

Teacher Pre-Training–Post-Training Assessment:

To assess potential growth of the teachers' knowledge of mathematical content for teaching as a result of Math4ME training, Cohort 4 teachers participated in the Learning Mathematics for Teaching (LMT) assessment on the first day of training, prior to any training activities, and on the last day of training upon completion of all training activities. Twenty-five of the 30 Cohort 4 participants completed both assessments (pre- and post-training). Because the assessment is adaptive, Item Response Theory (IRT) scores, which account for the difficulty of each question in addition to a correct answer to the question, are automatically generated by the LMT software as a measure of the teachers' performance. IRT

scores are necessary because more familiar measures such as the percentage of items answered correctly are misleading when applied to adaptive assessments (e.g., it is possible for a teacher to have answered fewer questions correctly on a post-test while nevertheless, based on correct responses to more difficult questions, achieving an overall higher level of performance on the post-test).

The calculation of the overall effect of a training is often represented as a single value called *effect size*; this is an expression of the overall pre-test–post-test difference in performance when pooling all participants together. The effect size for the change in Cohort 4 teachers’ scores was +0.05. Due to teacher variability, however, this increase was not statistically significant. This means that, pooling all participants together, there was a non-significant overall increase in scores of 0.05 standard deviation units between the pre- and post-training assessment (where the standard deviation is the average amount by which participants differed from the average score). This result differs from the previous LMT result for Cohort 2 in which a larger overall increase of 0.54 was found. A contributing factor for this difference appears to be an overall higher performance (both pre- and post-training) for Cohort 4 compared to Cohort 2, as seen in Table 4 below. A decrease in the overall variability of the Cohort 4 teachers scores may have yielded a statistically significant result for the increase. It is unclear why Cohort 4’s overall performance was significantly higher than Cohort 2’s across both assessments.

	Pre-Training	Post-Training
Cohort 2	-0.25	+0.01
Cohort 4	+0.42	+0.48

Table 4: Average IRT Pre-Training and Post-Training Scores for Cohorts 2 and 4

Teacher Fidelity-of-Practice Assessment:

Formal classroom observations of the classroom practices of Cohort 3 teachers were conducted 3 times during the 2018–19 school year. Some of the classroom observations/Fidelity-of-Practice Assessments for Cohort 4 have been conducted during 2019–20 but currently are not occurring due to school closures as a result of the COVID-19 pandemic. Those results will be reported in the next SSIP report. Each Cohort 3 teacher was assigned a coach who conducted all observations and evaluations of the teacher. The coaches received Math4ME training from the Lead Math4ME Trainer and Lead Coach prior to the start of the year and throughout the year. The observation and Fidelity-of-Practice Assessment process is described in detail in the Phase III Year 2 Report. To increase inter-rater reliability, initial joint observations were done with the Lead Coach and new coaches to standardize their ratings. LEA-Level Coaches also met every other week with the Lead Coach and reviewed coaching progress and discussed questions about ratings. For cases in which a coach felt an observation was difficult to accurately rate using the field notes and verbal input from the observing coach, the group came to consensus on how to rate the observation.

The Math4ME evaluation tool includes 4 broad practice areas: *Establish Mathematics Goals to Focus Learning*, *Use and Connect Mathematics Representations*, *Build Procedural Fluency from Conceptual Understanding*, and *Implement Tasks that Promote Reasoning and Problem Solving*. During the observations, the math coaches wrote detailed notes to describe teaching practices related to these 4 instructional practices. These notes were then used to complete the observation tool and to score the degree to which the coach saw evidence of the 4 instructional strategies in action. A scoring rubric developed jointly by the project team and the evaluator included scores ranging from 0 (not observed) to 4 (strong evidence).

The average scores for the four key instructional practices for Cohort 3 are shown in Table 5 below.

Average Scores for the Four Key Practice Areas			
	Initial	Middle	Final
Establish mathematics goals to focus learning	2.2	2.6	2.7
Use and connect mathematics representations	1.9	2.5	3.0
Build procedural fluency from conceptual understanding	1.8	2.3	2.4
Implement tasks that promote reasoning and problem solving	2.0	2.5	2.9
All Scores Average	2.0	2.5	2.8

Table 5: Average Fidelity of Practice Scores for Cohort 3.

In the analysis, observations were matched by teacher so change over the year could be noted. When the change in score between evaluations was examined, there was a significant improvement ($p \leq 0.05$) within each major practice area between the initial and final observations except *Establish Mathematics Goals to Focus Learning*. As seen from the table, there was an increase in this practice area, but the initial score that was higher than the other practice areas.

Data from the observations provide insight into how the NTCM Principles to Action were implemented. There was observed improvement in implementing the principles in each observation in all instructional areas. This improvement in all practice areas was consistent with observed improvement for each new cohort in the previous 2 years. The increase in scores over the year indicates that, with continued professional development and coaching during the school year, there was an increased adoption of these evidence-based practices.

Post-School Year Teacher Survey:

This section presents findings from the spring 2019 survey of all teachers (from any cohort) who participated in Math4ME activities during the 2018–19 school year. An e-mail invitation to an online survey was sent in mid-May to the 46 teachers (6 in Cohort 1, 12 in Cohort 2, 28 in Cohort 3) who participated in any of the Math4ME activities during 2018–19.

Three participating teachers who were assigned to lower grades and did not have their classroom observations reported were included in the survey. The survey was administered through a web-based survey tool. The response rate was 95% with 45 teachers responding.

The survey was developed by the evaluators in collaboration with the Maine Department of Education program team. The goal was to collect information that would be useful, formative feedback on participants’ experiences and look at perceived impacts of the professional development and coaching. The survey was confidential, with only the evaluator having knowledge of the respondents’ identities. Most of the survey items allowed for quick response via selection of a fixed-choice response, and some items utilized a five-point Likert scale. The survey also included open-response items to allow participants to explain their views and provide more specific information.

Feedback on Workshops: For each workshop attended, the teachers were asked to rate the usefulness of the training using a five-point Likert scale ranging from *not at all useful* to *extremely useful*. Three-quarters (74%) of the new cohort felt the October workshop on multiplication and division was *very useful* or *extremely useful*. The December workshop of word problems, teacher influences, and formative assessment was seen as *very useful* or *extremely useful* by 89% of the respondents. Both workshops

for the returning cohorts were also well-received. The October workshop on multiplication and division was rated *very useful* or *extremely useful* by 76% of participants. A slightly higher percentage (82%) of the returning cohorts felt the math fluency and formative assessment was *very useful* or *extremely useful*.

Workshops for Cohort 3	Slightly Useful	Moderately Useful	Very Useful	Extremely Useful	Total
Multiplication & Division, October	1 (3.7%)	6 (22.2%)	17 (63.0%)	3 (11.1%)	27
Word Problems, Teacher Influences and Formative Assessments, December	2 (7.4%)	1 (3.7%)	18 (66.7%)	6 (22.2%)	27

Workshops for Returning Cohorts	Slightly Useful	Moderately Useful	Very Useful	Extremely Useful	Total
Multiplication & Division, October	1 (5.9%)	3 (17.6%)	7 (41.2%)	6 (35.3%)	17
Math Fluency and Formative Assessment, December		3 (17.6%)	9 (52.9%)	5 (29.4%)	17

Table 6: Teacher Assessment of Workshop Effectiveness.

Teachers were asked to reflect on the most useful thing they obtained from the professional events they attended in the summer and fall. Respondents felt that one of the strengths of the workshops was having the chance to explore and practice different teaching methods and activities. Many commented that the hands-on activities were practical, easy to recreate, and quick. They felt these activities helped students visualize concepts and helped develop numerical fluency. The participants understood the importance of understanding students' thinking and taking the necessary time for students to move from concrete representations to abstract concepts. Teachers said they learned strategies for getting students to

engage in mathematical discourse. They felt they gained a better understanding of how to ask questions then allowing students to arrive at answers on their own.

Experience with Coaching: Teachers were asked about their experience with coaching through several questions. The first few questions asked how they received feedback and then comment on their overall perceptions of the coaching. Teachers found coaching to be helpful. Most respondents felt the feedback they received from coaching year was *extremely helpful* (62%). A third said coaching was *moderately helpful* (36%). One described the feedback as *somewhat helpful*. No teacher selected the options *slightly helpful* or *not at all helpful*.

The teachers' responses to the open-ended question about the most useful thing about the coaching centered on mentoring. They felt supported, received encouragement and affirmation that they were helping students, received confirmation that their lessons and routines are highly effective for their students and reassurance that it is acceptable to deviate from the curriculum to provide hands-on learning. The coaches guided some teachers to go beyond their comfort zones. Teachers felt they could have their questions answered by the coaches and the advice they received related to the training that they had undertaken. Teachers were directed to resources in the Padlet. Teachers indicated that consulting with a subject expert and positive feedback increased their confidence in teaching math. Coaches helped guide lesson structure for student experience and gave ideas for progression of future lessons. Most teachers felt coaches gave realistic ideas and suggestions, but one middle school special education teacher noted that some of the suggestions were not feasible to use in their classroom.

Some teachers felt the most useful aspect of the coaching was on classroom management and teaching techniques. Coaches provided ideas on classroom management, pacing techniques, and developing routines to support learning at all levels. Teachers found it useful when the coach modeled lessons and provided

ideas on how to implement best practices.

Progress in implementing Key Instructional Practices: The teachers were asked to rate how well the coaching supports affected their preparation to implement instructional practices within each of the 4 key practice areas as well as their ability to “Use a variety of instructional strategies to assist students who struggle in math”. For each statement, 84%–88% of respondents *agreed* or *strongly agreed*. Response percentages are shown in Table 7 below. One teacher’s responses stood out. One teacher selected *disagree* for most practice areas but found coaching feedback extremely helpful. This teacher did not write about any specific changes they were making in the open-ended question that corresponded to the principle.

As a result of the coaching supports I am better prepared to ...

Practice Area	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Establish mathematics goals to focus Student learning	0 (0%)	1 (2.2%)	3 (6.7%)	24 (53.3%)	17 (37.8%)
Help students use and connect mathematical representations	0 (0%)	1 (2.2%)	0 (0%)	23 (51.1%)	21 (46.7%)
Help students build procedural fluency from conceptual understanding.	0 (0%)	0 (0%)	2 (4.4%)	23 (51.1%)	20 (44.4%)
Implement instructional tasks to promote students' reasoning and problem solving skills	0 (0%)	1 (2.2%)	0 (0%)	29 (64.4%)	15 (33.3%)
Use a variety of instructional strategies to assist students who struggle in math	0 (0%)	1 (2.2%)	2 (4.4%)	24 (53.3%)	18 (40.0%)

Table 7: Teacher Assessment of Effect of Coaching Supports on Their Preparation to Implement Key Practices.

The areas where most teachers felt they made positive changes in their instructional practice were helping students *use and connect mathematical representations* and *implementing instructional tasks to promote students' reasoning and problem-solving skills*.

Under the practice area of *establish mathematics goals to focus student learning*, teachers made setting goals, referring back to them and assessing learning part of their class routine. Once teachers began incorporating goals into their teaching, they felt it was advantageous. Setting individual lesson goals helped teachers plan how lesson concepts build on previous learning and prepare for future learning.

Teachers felt that Math4ME changed their instructional practice of *helping students use and connect mathematical representations*. Teachers used questioning as well as asking students to use different representations of concepts. They became more explicit in linking models to expressions and equations. They found that students needed more time with models to connect them to procedures. Teachers found that having routines gave students confidence. The possibilities of showing different representations increased as students used white boards, manipulatives, tens frames, counting collections and tiles. One teacher had students use everyday items such as toothpicks, marshmallows, or Play-doh to create models. On-line resources were incorporated by some teachers. Others had students use words, models and numbers to represent a problem. Teachers were using a variety of representations to reach all learners in a class. Teachers made a point of using real life examples and had students connect the lessons to previously learned skills and real life.

The Math4ME program changed how several teachers felt they taught. The practice area of *helping students build procedural fluency from conceptual*

understanding was identified by 36% of teachers as an area where they made the most change. Teachers slowed down the lessons and increased wait times for students to answer their questions. The emphasis was on moving from concrete to conceptual before using algorithms. Teachers sought to have students develop a deeper understanding of what math looks like. Teachers asked students to make sense of problems and share their thinking as they did so. Some teachers even changed their teaching from showing a procedure to giving a problem and then observing how students solved it. They then reviewed procedures that might be more effective.

More than half of the teachers (56%) felt that *implementing instructional tasks to promote students' reasoning and problem-solving skills* was an area where they made the most change. Several teachers increased the time spent on reasoning and problem solving. They did this by decreasing instruction time spent on procedures and by incorporating math into other subjects or functional skill time. Some made a set rotation of activities such as numberless word problems, 'notice and wonder', and fraction tiles. They were having students apply what they already knew. Teachers used activities that allowed all students to participate. There were more group discussions. Teachers avoided telling students if they were right or wrong but had them come to their own conclusions, explain their reasoning and determine if the answers were reasonable.

Challenges in implementing Key Instructional Practices: Teachers faced several challenges in implementing the instructional practices. Teachers, particularly special education teachers, struggled with the wide span of learning levels among their students. For example, within a small group, special education students could be working at kindergarten to fifth grade levels. Several teachers felt the Math4ME topics were either too advanced for some of their students, while a few teachers felt topics were not at a high enough level. Students' memory and

retention abilities, as well as knowledge gaps also presented a challenge. Student behavioral issues affected some teachers' ability to incorporate the instructional practices. A high percentage of students moving into and out of special education classes presented a challenge to some. Some felt they had a high caseload and group size was a challenge. Needing more time with students was seen as a challenge by some teachers. Other teachers wanted more planning time and time for monitoring and reflecting on student understanding. The district timeline that assigns a length of time to teach each unit was cited as a challenge for 1 teacher who felt the time for units was not long enough for students to master the skills.

Impacts: The Math4ME program was seen by teachers as positively impacting their students' math learning. There were spillover effects as teachers also felt it changed how they taught other subjects. Most teachers shared some of their Math4ME experiences with other teachers and felt it affected other teachers' instructional practices. All teachers of special education and regular classrooms felt the Math4ME program had either a *somewhat positive* (38.6%) or *extremely positive* (61.4%) effect on their students' mathematics learning.

In responses to the open-ended question about how their students were affected by Math4ME, all teachers felt students were more confident and engaged. Students were better able to explain their thinking and use a variety of representations. Special education teachers recognized that their students' progress might not be reflected in test scores, but they noted they had seen measurable progress. Students were discussing math spontaneously. One teacher said her students had improved in STAR assessments and had moved from the NumberWorlds textbook to the same text as their peers.

Although Math4ME is directed only at mathematics teaching, most teachers in the Math4ME program teach subjects other than math (96%). Most special education teachers (59%) felt their teaching in other subjects was *somewhat*

affected to greatly affected. General education teachers who taught subjects other than math were split on the affect Math4ME had on teaching other subjects; 45% felt their teaching in other subjects was *somewhat affected to greatly affected.*

The effect on teaching of subjects other than math came from teachers applying the same principals to their instruction of other subjects. Some were applying the lesson goal strategies they learned in Math4ME. They were incorporating more interactive learning and taking more time to have fun with activities. Teachers were encouraging problem solving and discussion. They were asking more questions and looking for a deeper conceptual understanding.

Impact for other teachers: Teachers were asked if they had shared their experiences with other non-participating teachers. Ninety-one percent reported doing so and 64% felt other teachers' instructional practices were *somewhat or very much affected* by their sharing of their Math4ME experiences. In addition to sharing with other teachers, respondents also mentioned sharing with Ed Techs and resource room staff. Those who felt other teachers' practice was affected were asked to describe how they thought the other teachers changed their instruction. Some shared the program philosophy. While some did not know what ideas other teachers used, others had clear opinions. Giving more thought to learning goals, pacing, asking probing questions, using daily routines and allowing students to use multiple methods were broad ideas other teachers incorporated into their practice as a result of the Math4ME program. Resources from the Padlet, lesson plans, games and activities were also used by non-participating teachers. Three acts problem structure and Graham Fletcher talks were specifically mentioned resources that were shared. The EMDI screener was also shared with colleagues. Teachers also encouraged others to take the training in the coming year.

Suggestions and Feedback: Overall, most teachers found the Math4ME program to be very helpful and appreciated it. Teachers felt more training, coach co-

teaching, and coach modeling of lessons or strategies would be helpful to support implementation of new practices. Specific suggestions were warm-up activities, more resources that allow students to be correct as long as they can justify their answers (“would you rather”), fraction probes, guided math lessons, and electronic binder of activities. Some felt support for teachers of younger students with lesson plans and activities directed at lower learner levels would be of value.

Post-School Year Coach Survey:

The Math4ME program had 9 coaches during the 2018–19 school year. The program expanded from 1 to 4 instructional coaches in the 2017–18 school year then added 5 new coaches in 2018–19. In mid-May, the coaches received an e-mail invitation to participate in a confidential on-line survey about their experiences in the program. All 9 coaches responded to the survey about their experience in this year’s program.

The on-line survey was developed by the evaluators based on the prior 2017–18 teacher and coach surveys with Math4ME program team input. The goal was to collect information that would provide useful, formative feedback on the coaches’ experiences. The survey was confidential, with only the evaluator having knowledge of the respondents’ identities. Most of the survey items allowed for quick response via selection of a fixed-choice response, and some items utilized a five-point Likert scale. The survey also included open-response items to allow participants to explain their views and provide more specific information.

Observations and coaching: All coaches exceeded the program guidelines by either modeling demonstration lessons or doing additional observations of their assigned teachers, in addition to the required formal observations and feedback on mathematics teaching practices. Although the Lead Coach reported that coaches were encouraged to use the same pre-observation form that was used in the prior

year and not to do pre-observation conferencing, there was not a consistent pattern of communicating with teachers for pre-observation conferencing across the coaches. Only 1 coach indicated he/she *never* met with teachers in-person or by phone for a pre-observation conference. Four coaches met with teachers in-person or by phone a *few times* for pre-observation conferences. For pre-conferencing, there was no consistent pattern to the use of e-mail. For post-conferencing, most coaches *always* (n=5) or *usually* (n=2) met in person with the teachers. The 2 coaches that indicated they met with teachers a *few times* for a post-observation conference also indicated that they provided written feedback by email or on paper after an observation a *few times*.

Principles to Action areas: Coaches were asked to choose up to 3 practice areas that received the most emphasis from teachers and up to 3 that areas received the least attention. Coaches indicated 1 to 3 practice areas for the areas that received the most attention and 1 to 2 practice areas as those that received the least attention by teachers.

Coaches indicated that teachers paid the most attention to the practice area of *implementing instructional tasks to promote students' reasoning and problem-solving skills* (n=6) and *helping students use and connect mathematical representations* (n=5) in the lessons they observed. The practice areas that received the least attention were *establishing mathematics goals to focus student learning* (n=4) and *building procedural fluency from conceptual understanding* (n=4).

Instructional practice: Coaches were given open-ended questions asking about the areas of practice they felt teachers showed the most improvement and the areas teachers struggled the most to effectively implement. Coaches felt the teachers showed the greatest improvement in *implementing tasks to promote student students' reasoning and problem-solving skills* (n=4), and *establishing mathematics goals to focus learning* (n=3). Two coaches felt helping students *use and connect*

mathematical representations was the area of greatest improvement.

Three coaches noted that teachers struggled with helping students *build procedural fluency from conceptual understanding* with 2 of these coaches specifically mentioning generalization. Three coaches felt the teachers struggled with *helping use and connect mathematical representations*.

Impacts of coaching: Coaches felt the Math4ME program impacted the teachers in the program, the regular and special education students in Math4ME teachers' classroom, as well as some teachers who were not in the program. Coaches felt they had the greatest impact by providing support, resources, feedback on what was working well, and strategies. Coaches felt the 4 *Principles to Action* goals were important tools for them and their teachers to use. Having teachers practice and reflect on instruction routines during a monthly meeting was useful to teachers. Two coaches felt their greatest impact was improving how the teachers react to their students. Another coach listed trouble shooting learning issues as the area where they most helped teachers. Coaches felt teachers became more confident and structured in their teaching over the year. One coach was not sure of their impact, noting that it was difficult since they were in a different building than their assigned teachers. All coaches felt the Math4ME program had a *somewhat positive* (n=6) or *extremely positive* (n=3) effect on special education students.

All but 1 coach responded to the question asking if they had shared their Math4ME experience with other teachers who were not in the program and to rate how it affected their teaching. Five of the 8 coaches felt their sharing with teachers not in the Math4ME program had *somewhat affected* the other teachers' instruction. Two felt other teachers were *very much affected* and one felt other teachers were *slightly affected*. In an open-ended response question, the effect on other teachers was seen through their district coaching roles, which included

professional development. In other situations, other teachers became interested in the program, asked the coaches questions, then decided to try some of the strategies. Resources such as Early Math Diagnostic Inventory (EMDI) structures and activities have been used with other teachers.

Statewide Math Assessment:

The statewide Maine Educational Assessment (MEA) was selected as the measure of student math proficiency and progress toward the SIMR, which is as follows: Students in grades 3–8 with Individualized Education Programs (IEPs) will demonstrate improved math proficiency as measured by math scores on the MEA in the schools in which teachers receive evidence-based professional development in the teaching of math. To express proficiency as a percentage, Maine reports proficiency as follows: *Percent = number of grade 3–8 students with IEPs in the identified schools who demonstrate proficiency in math divided by the number of grade 3–8 students with IEPs in the identified schools who are evaluated on the math assessment.*

To evaluate progress, year-to-year proficiency was assessed for all grade 3–8 students with IEPs in schools with Math4ME teachers. The proficiency percentages and proficiency targets are listed in Table 8 below.

SIMR: FFY2016–FFY2018 Student Proficiency Data

FFY	2015 (Cohort 1 Baseline)	2016 (Cohort 1 and 2)	2017 (Cohort 1 and 2)	2018 (Cohort 1, 2 and 3)
Proficiency Percentages	15.07%	9.47%	8.67%	9.91%

FFY2016–FFY2019 Targets

FFY	2015	2016	2017	2018	2019
Target	(Cohort 1 Baseline)	16.00%	17.00%	17.00%	17.00%

Table 8: SIMR Proficiency Data and Targets

The total number of grade 3–8 students with IEPs in Math4ME schools who took the 2018–19 statewide math assessment was 868. Of these students, 86 (9.91%) achieved proficiency. This was a 1.24% increase from 2017–18 proficiency rate of 8.67%.

The improvement in the percent of proficient students receiving special education in Math4ME-participating schools between 2017 and 2018 is encouraging, but the percentages are based on the performance of all grade 3–8 students with IEPs in Math4ME-participating schools; they are not based on the performance of the specific students who were taught by Math4ME-trained teachers. More detailed analyses included statistical regression procedures that contrasted students taught by Math4ME teachers and those not taught by Math4ME teachers. The results of these analyses did not reveal a statistically significant difference in math scores when comparing students taught by Math4ME teachers and those not taught by Math4ME teachers. The external evaluators (Maine Educational Policy Research Institute (MEPRI) researchers), Maine Department of Education Math4ME program staff, and stakeholders have discussed the possibility that the Maine Educational Assessment may not be the most appropriate measure of skills that are improved through Math4ME

participation. It is possible that Math4ME participation improves specific math skills that are not appropriately measured by the broad-based Maine Educational Assessment. Additionally, it may be possible that specific content or skills showing the greatest improvement may be assessed in only one or two grade levels. If so, other assessments may be more effective at measuring the effects of Math4ME participation. One option would be to include local (district-level) testing data that may assess different or more specific math skills, and this possibility will be discussed at the upcoming stakeholders meeting scheduled for April 2020.

2) Infrastructure Changes and Capacity-Building in Support of the SSIP

Maine Education Policy Research Institute (MEPRI): Maine DOE has maintained its contract with MEPRI to serve as the external evaluator of the SSIP. MEPRI is University-of-Maine-based research center with two decades of experience providing research, program evaluation, and policy analysis to Maine schools, government and community agencies, and the Maine State Legislature. Based on this long relationship, MEPRI personnel have detailed knowledge of Maine's educational data and initiatives. The SSIP evaluation will be coordinated by Janet Fairman, Ph.D., an Associate Research Professor of Education at the University of Maine, and Craig Mason, Ph.D. a Professor of Education and Applied Quantitative Methods at the University of Maine. Based on the combined expertise of MEPRI researchers in quantitative analyses, including value-added and growth models, qualitative methods, and survey design, their continued involvement significantly benefits the Math4ME initiative.

Maine DOE Math Specialist/Math4ME Trainer: The Maine DOE Math Specialist, Cheryl Tobey, has brought a wealth of experience and math content and pedagogical expertise to the Maine DOE, and she continued to lead the Math4ME

trainings. Cheryl left her position at the DOE after leading the summer trainings and was hired as a contractor to complete the fall trainings. Jennifer Robitaille has replaced Cheryl at the department and Jennifer led the January 2020 webinar for Cohorts 1 and 2. Jennifer is currently conducting EMDI (Early Mathematics Diagnostic Interview) training across the state and will lead the summer and fall trainings for 2020–2021. Jennifer meets regularly with the Lead Math Coach, Nancy Lander. Nancy Lander co-led the training for all cohorts and continues to support LEA coaches and coaches Math4ME teachers.

Math4ME Coaches: For the 2019–20 school year, Math4ME coaches consist of the Lead Coach (Nancy Lander), 3 returning (2018–2019) LEA-Level Coaches, and 6 LEA-level coaches coming on in the fall. The Lead Coach has been also responsible for coaching, Fidelity-of-Practice observations, and ad-hoc instructional guidance (including maintenance/update of the Math4ME Padlet Website) and currently coaches 18 participants across the 2 Cohorts. Nancy’s continued contribution and commitment have been crucial to the success of the Math4ME initiative. The additional LEA-Level Coaches conducted support cycles for 27 participants across the 2 Cohorts.

OSEP-Funded Technical Assistance: Maine continues to benefit greatly from the support and assistance of OSEP-funded technical assistance agencies. The IDEA Data Center and other agencies have provided indispensable guidance, consultation, and coordination through all steps of Maine's SSIP development and implementation. Maine will continue to engage with these agencies for support in aligning Maine's monitoring and support systems with the SSIP and other initiatives.

F. Plans for Next Year

The Maine DOE Math Specialist and the current Lead and LEA-Level Coaches will lead a 4-day training for the returning Cohort 4 teachers. The training will focus on the progression of numeracy ideas with diagnostic interview tools. The first 2 days of training will take place on August 6 and 7, 2020, and the final 2 days will take place on October 8, 2020 and December 10, 2020.

Cohort 4 teachers will receive coaching and Fidelity-of-Practice support from a Lead Coach or LEA-Level Coach, with 2 classroom visits with each teacher during the 2020–21 school year. Coaches will complete a Fidelity-of-Practice measure for each visit. These measures will be assessed by the external evaluator at the end of each school year to evaluate teachers' progress implementing Math4ME strategies and practices. Maine DOE expects to see an overall increase in Fidelity-of-Practice scores across the span of the coaching visits, and results of this measure will be considered in the evaluation of progress toward Outcome 3 of the SSIP logic model – Improved skill of special education teachers of grades 3–8 in teaching fundamental concepts in math.

In May of each school year, the trained teachers in each cohort will receive an invitation to participate in a post-school-year survey. The survey questions are designed to gather teachers' perceptions of the coaching visits, successes and challenges implementing Math4ME strategies and practices throughout the year, and the use of technical resources available via the Math4ME Padlet Website. Additionally, the Lead Coach and LEA-Level Coaches will complete a survey designed to gather the coaches' views on their coaching activities with their respective cohorts, teachers' responses to feedback after classroom observations, and examples of teacher improvements and challenges. Maine DOE anticipates that these interviews will provide complementary and contextual data on teacher

growth, trends observed in the field, and examples of teachers' successes and challenges. Data from the interviews, surveys, and the Fidelity-of-Practice evaluations will also be used to inform future trainings (e.g., focus more on specific strategies and practices and/or offer additional training opportunities).

Maine DOE Special Services will continue in its efforts to build infrastructure and capacity to promote evidence-based teaching by enlisting and supporting additional LEA-Level Coaches and providing administrator sessions and outreach activities for future scale-up efforts. Maine DOE will continue to work with MEPRI researchers at the University of Maine to provide external evaluation for Math4ME.

In the year ahead, Maine DOE will engage stakeholders and participating LEAs to develop a model that will sustain participating schools' energy and focus on evidence-based strategies and practices in the teaching of math beyond the years in which Math4ME provides the coaching. The model may include supporting the development of LEA- or regional-level communities of practice, and the infrastructure and capacity-building necessary to develop such structures of support will be assessed. A full online meeting with all SSIP stakeholders is planned for April 2020, and scale-up, sustainability, and potential barriers will be discussed.

Maine DOE has benefitted greatly from the support and assistance of OSEP-funded technical assistance agencies through all steps of SSIP development and implementation. Maine plans to reach out to the IDEA Data Center and other technical assistance centers in the coming year for support in best practices and strategies for Math4ME scale-up and sustainability.