

Department of Defense Educational Activity

Project MaSTerS Closeout Report



Project MaSTerS

INCREASING MATHEMATICS ACHIEVEMENT FOR MILITARY CONNECTED STUDENTS, GRADES 3-8 & 11, IN THE OCEANSIDE UNIFIED SCHOOL DISTRICT.

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Closeout Report of Activities

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ACRONYMS

CAASPP	California Assessment of Student Performance and Progress
CCSS	Common Core State Standards
DoDEA	Department of Defense Education Activity
DNR	Duality, Necessity, and Repeated Reasoning
FTE	Full-time Equivalent
MCASP	Military-Connected Academic and Support Program
MTSS	Multi-Tiered System of Support
OUSD	Oceanside Unified School District
PLC	Professional Learning Center
SBAC	Smarter Balanced Assessment
SDCOE	San Diego County Office of Education
TOSA	Teacher on Special Assignment

EXECUTIVE SUMMARY

The Oceanside Unified School District (OUSD) embarked on a transformative journey with Project MaSTerS in Math, supported by the Department of Defense Education Activity (DoDEA) Grant. This initiative aimed to improve the mathematical proficiency and college and career readiness of military-connected students, addressing the unique challenges they face due to frequent relocations and academic gaps, especially in mathematics.

Background

Oceanside, California, home to the largest Marine Corps base west of the Mississippi, hosts a significant military-connected student population. Project MaSTerS targeted these students at four OUSD schools, focusing on enhancing mathematics understanding through rigorous curriculum support and extracurricular activities.

Objectives

The project set ambitious goals to increase the percentages of military-connected students in grades 3–8 and 11 who meet or exceed standards on the CAASPP math assessment by 6% and 10%, respectively, over established baselines. Strategies included DNR-based instruction and the implementation of Summer Academies for intensive learning experiences.

Evaluation

A comprehensive evaluation plan was developed to assess the delivery and quality of program activities and the extent to which program outcomes were achieved. This included both formative (process) and summative (impact) evaluations, focusing on professional development effectiveness, the impact of Summer Academies, and the academic performance of participating students.

Outcomes

Project MaSTerS demonstrated progress towards its goals. Professional development sessions, based on the DNR (Duality, Necessity, and Repeated Reasoning) framework, equipped teachers with advanced instructional strategies. Summer Academies provided targeted remediation and enrichment, directly addressing identified academic gaps. Setbacks due to the impact of COVID-19 on traditional learning environments for both teachers and students impacted the accomplishment of project goals.

INTRODUCTION

In an endeavor to address the unique educational needs of military-connected students, the Oceanside Unified School District (OUSD), leveraging the support from the Department of Defense Education Activity (DoDEA) Grant, initiated Project MaSTerS in Math. This ambitious program was designed with the dual objectives of enhancing military students' mastery in mathematics and ensuring their college and career readiness by the time they complete their high school education.

Oceanside, California, serves as a vibrant community that is home to Marine Corps Base Camp Pendleton, the largest Marine Corps base west of the Mississippi River. OUSD, encompassing 23 schools, some of which are located on base housing, identified four school sites for the implementation of Project MaSTerS. These schools include North Terrace Elementary, Stuart Mesa Elementary, El Camino and Oceanside High School. The selection of these sites was strategic, aiming to cater to the academic and socio-emotional needs of the military-connected student population, which constitutes a significant portion of the student body within these educational institutions.

The project was conceived in response to the observed academic challenges and frequent relocations experienced by military-connected students, which often resulted in gaps in their academic understanding, particularly in mathematics—a subject where content knowledge is progressive and foundational for future learning. Recognizing the importance of mathematics in academic success and postsecondary access, Project MaSTerS aimed to implement targeted interventions to address these gaps and bolster students' performance in mathematics.

Central to Project MaSTerS were two interconnected goals: the first aimed at increasing the percentage of military-connected high school students in grade 11 meeting or exceeding standards on the CAASPP math assessment by 10% over the 2019 baseline by May 2024. The second goal sought to elevate the performance of military-connected students in grades 3–8, aiming for a 6% increase in students meeting or exceeding standards on the CAASPP math assessment over the 2019 baseline by May 2024. These goals were supported by comprehensive strategies including in-class curriculum and instruction support utilizing DNR-based instruction and extracurricular activities such as Summer Academies, fully backed by substantial professional development efforts for educators.

The implementation of Project MaSTerS was a collaborative effort, involving a wide array of stakeholders from project directors to educators, all united in their commitment to enhance the educational outcomes for military-connected students. As we embarked on this evaluation, our aim was to assess the extent to which Project MaSTerS met its stated

objectives, the effectiveness of the strategies employed, and the impact of the project on the targeted student population. This evaluation will provide valuable insights into the successes achieved, the challenges encountered, and the lessons learned, offering a roadmap for future initiatives designed to support military-connected students in OUSD and beyond.

Objectives and Activities

The project set forth two primary objectives:

1. By May 2024, increase by 10% the percentage of military-connected high school students in grade 11 meeting or exceeding standards on the CAASPP math assessment over the 2019 baseline.
2. By May 2024, increase by 6% the percentage of military-connected students in grades 3–8 meeting or exceeding standards on the CAASPP math assessment over the 2019 baseline.

To achieve these objectives, Project MaSTerS implemented strategies focused on in-class curriculum and instruction support through DNR-based instruction and extracurricular activities, particularly Summer Academies.

EVALUATION QUESTIONS AND METHODS

The MaSTerS evaluation was designed to ensure that: a) implementation was monitored systematically and on an on-going basis; b) specific progress measures were established to assess the quality and completeness of project activities; and c) specific progress measures were aligned with the goals, targets and expected outcomes so that progress towards achieving these outcomes could be accurately assessed.

The evaluation included formative (process) and summative (impact) performance measures. The evaluator supported the project partners to collect the required data regarding program measures. Formative evaluation methods considered the effectiveness of the project's procedures, practices, and activities in implementing the project and in meeting project milestones based on proposed timelines. A key purpose of the formative evaluation process was to collect, analyze, and disseminate data over the course of the project to help the project partners and staff to stay "on track" in implementing project activities and to promote ongoing project improvement. Summative evaluation activities examined the impact of the project on academic achievement, in addition to an analysis of participation factors that indicated motivation and engagement.

This Closeout Report focuses on the two major evaluation questions and the evidence gathered to answer these questions. For the first question, "To what extent have the

program activities been delivered to participants with quality?” we considered a number of milestone accomplishments including: 1) teacher participation and learning from DNR-based professional development sessions, and 2) participation and learning from the Summer Institute and Academies.

To what extent have the program activities been delivered to participants with quality?

Regarding Goal 1 and Goal 2 of the project – improving the percentage of military-connected high school level students in grades 3-8 and 11 meeting or exceeding standards on CAASPP math assessment, we report on the following program activities.

Design and implementation of DNR-based professional development:

The DNR approach to teaching mathematics, supported by Professor Guershon Harel at the University of California, San Diego (UCSD), is a comprehensive framework that stands for Duality, Necessity, and Repeated Reasoning. This approach is designed to deepen students' understanding of mathematical concepts through three foundational principles:

- Duality: This principle emphasizes the importance of understanding both the procedural and conceptual aspects of mathematics. Duality in learning ensures that students not only know how to perform mathematical operations (procedural fluency) but also understand the underlying concepts and why these operations work (conceptual understanding). This dual approach helps students to apply mathematical concepts more flexibly and creatively.
- Necessity: The principle of necessity focuses on motivating the learning of mathematical concepts by making their need apparent to students. Instead of presenting mathematics as a set of arbitrary rules to be memorized, the DNR approach seeks to engage students in problems and scenarios where the relevance and application of mathematical concepts are clear. This need-based learning encourages deeper engagement and retention of knowledge.
- Repeated Reasoning: This component highlights the importance of practice, reflection, and iterative learning in mathematics education. By engaging in repeated reasoning, students develop a stronger grasp of mathematical concepts over time. This process involves revisiting concepts, reflecting on problem-solving strategies, and continuously applying knowledge in new contexts. Repeated reasoning supports the development of mathematical intuition and the ability to tackle complex problems.

Professor Guershon Harel's DNR framework is grounded in the belief that effective mathematics education requires not just the acquisition of skills and formulas but the development of a deep, conceptual understanding of mathematical ideas. Through duality, necessity, and repeated reasoning, students are encouraged to become not just proficient calculators, but thoughtful and reflective mathematical thinkers.

Over the past 4 years, both Drs. Harel and Soto delivered 22 professional development (PD) sessions. These sessions explored the curriculum used by mathematics teachers in the district, emphasizing creating mathematical models for problems involving proportional reasoning, linear and exponential growth, and other important concepts. Key insights from these PD events include:

1. **Engaging Students with Word Problems:** The importance of making word problems accessible and engaging for students was a common PD topic. Teachers observed that students often struggle with setting up and understanding the context of word problems. Strategies like breaking down the problem, focusing on input-output relationships, and encouraging students to notice and wonder about key details were emphasized in many sessions.
2. **DNR Principles in Practice:** Dr. Harel highlighted how the DNR approach advocates for starting from students' conceptual understanding and gradually leading them to see the necessity of more abstract mathematical tools like tables, graphs, and equations (both explicit and recursive). This approach aims to make mathematical concepts more intuitive and necessitated for students.
3. **Challenges and Strategies:** Various pedagogical challenges were identified as part of the PD process, such as students' difficulties with scaling tables, understanding input-output relationships, and the order of operations. Dr. Harel led discussions that covered ways to necessitate mathematical operations and the importance of verbalizing mathematical reasoning as a way to solidify understanding.
4. **Developing Mathematical Identity:** Drs. Harel and Soto underscored the role of mathematical problems in reinforcing students' mathematical identity in their PD sessions, showing how tasks that allow for multiple entry points and strategies can make mathematics more accessible to all students, regardless of their starting level.
5. **Task Analysis:** Every PD session included several tasks teachers analyzed for their potential to engage students in using both arithmetic and algebraic tools, exploring the transition between these tools, and understanding the role of algebraic thinking in solving real-world problems.
6. **Importance of Conceptual Frameworks:** Drs. Harel and Soto emphasized the importance of teachers using a conceptual framework to guide the creation of problems and lessons. This approach helps in setting objectives that focus not just

on mathematical skills, but also on developing habits of mind and ways of thinking about mathematics.

Overall, the PD event centered on using the DNR approach to deepen teachers' understanding and teaching strategies of important mathematical concepts, highlighting the importance of making these concepts necessary and intuitive for students through carefully designed tasks and discussions.

Design and implementation of Summer Institutes:

A Summer Institute is an enriching professional development opportunity designed for educators, focusing on enhancing their mathematics teaching skills in alignment with the Common Core State Standards for Mathematics (CCSS-M). Unlike other professional development programs that broadly address teaching methodologies, Math for America's San Diego Summer Institutes (MfA SD) specifically aim to advance teachers' abilities in teaching mathematics. This distinction was highlighted by a teacher who appreciated the focused approach on math education.

MfA SD, affiliated with CREATE and supported by a consortium of three public universities in San Diego, has been a beacon for math teachers aiming to refine their instructional skills, especially concerning the integration of CCSS-M's eight mathematical practices into their classrooms. These summer institutes serve as a crucial bridge for educators to not only familiarize themselves with the mathematics standards but also to explore effective ways to infuse their teaching with these principles.

Over 20 Oceanside Unified math teachers participated in Summer Institutes throughout the MaSTerS grant. The institutes grounded teachers in mathematical content, ways of addressing students' intellectual needs and CCSS-M practices. Teachers engaged with mathematical problems during these sessions both individually and in groups, learning that effective teaching strategies and pedagogical decisions stem from a profound understanding of mathematics and students' perspectives. These sessions combined both theoretical knowledge and practical insights into various aspects of math teaching, from algebra to integrated mathematics, and from the mathematics of functions and inequalities to innovative teaching strategies.

Design and implementation of Summer Academies:

The Summer Academies, as part of the broader initiative by Math for America San Diego (MfA SD) and implemented in partnership with Oceanside Unified School District (OUSD) and the University of California San Diego, represent a multifaceted approach towards

enhancing mathematics education through Duality, Necessity, and Repeated Reasoning (DNR)-based instruction. These academies serve both as a professional development opportunity for teachers and a remedial and enrichment experience for students, particularly focusing on military-connected students in the OUSD.

Overview and Objectives

The Summer Academies aim to address learning losses and gaps in mathematics, exacerbated by the COVID-19 pandemic, as evidenced by fluctuating CAASPP (California Assessment of Student Performance and Progress) scores over the years. For high school students, particularly in grade 11, the goal was to increase the percentage of students meeting or exceeding standards in mathematics, with strategies including the implementation of DNR-based instruction and the operation of Summer Academies for hands-on application of learned concepts.

Implementation and Impact

The professional development sessions, led by Dr. Guershon Harel, Osvaldo Soto, and supported by other educators, focused on immersing teachers in DNR principles, aiming to rethink their approach to teaching mathematics. These sessions involve observation, analysis, and collaborative planning of DNR-based lessons. Despite challenges such as the pandemic and logistical constraints, these efforts have led to significant improvements in teaching practices, as observed through classroom instruction that prioritizes quantitative reasoning, mathematical discourse, and engagement with rich mathematical problems.

The Summer Academies, conducted for both middle and high school students, represent a direct application of DNR-based instruction. These academies allowed over 200 students to engage deeply with mathematical problems, fostering a critical understanding of mathematical concepts and enhancing their reasoning skills. Activities such as exploring the Pythagorean Theorem and ratio and proportional reasoning are tailored to prepare students for future academic challenges in mathematics. The academies also serve as a venue for teachers to refine their instructional strategies, engage in reflective practice, and collaboratively develop lessons that resonate with students' learning needs.

Outcomes and Reflections

Feedback from participants highlights the academies' success in making mathematics more relatable and engaging for students, many of whom had previously struggled with seeing the value in mathematical learning. By focusing on student-produced solutions and critical thinking, the academies have encouraged students to explore multiple pathways to understanding, leading to a richer educational experience. Moreover, the collaborative

teaching and debriefing sessions have been pivotal in enhancing educators' pedagogical strategies, contributing to a more cohesive and effective approach to teaching mathematics.

Future Directions

The ongoing implementation of DNR-based instruction and the continued operation of Summer Academies underscore a commitment to improving mathematics education in the region. The initiatives not only address immediate academic needs but also aim to foster a lasting appreciation and understanding of mathematics among students, preparing them for success in future endeavors. As MfA SD plans to expand these programs during the next iteration of this grant (Secondary Math Project), the focus remains on leveraging analytical and critical thinking skills to advance mathematical understanding, ensuring that students are well-equipped to navigate the complexities of mathematics in their academic and everyday lives.

To what extent have the program outcomes been accomplished?

During the planning year of the grant, Project MaSTerS established the following goals:

Goal 1 Summative Outcome:

- By May 2024 the percentage of military-connected high school level students in grade 11 meeting or exceeding standards on CAASPP math assessment will increase by 10% over 2019 baseline)

The Goal 1 outcome data for each grant year is arrayed in Table 1 in APPENDIX I. Despite the strategic implementation of Project MaSTerS aimed at addressing the academic challenges inherent to military-connected students, the program's objectives related to math achievement have presented mixed outcomes. While the goal for military-connected high school students in grade 11 was to increase the percentage meeting or exceeding standards on the CAASPP math assessment by 10% over the 2019 baseline by May 2024, data indicate a decrease of 9 percentage points from 30% in 2019 to 21% in 2024.

Goal 2 Summative Outcome:

- By May 2023, the percentage of military-connected students in grades 3-8 score meets or exceed standards on CAASPP math assessment will increase by 6% over 2019 baseline.

Conversely, for grades 3-8, the target was a 6% increase in achievement levels by May

2024. Here, the outcomes were somewhat more encouraging, with a 9-percentage point increase from the previous year, though it represented a 19-percentage point decline from the baseline. This suggests that while the interventions may have positively impacted students within this age group in the short term, there remains a substantial gap compared to baseline performances, possibly exacerbated by the disruptions of the COVID-19 pandemic.

Key findings from question 2 include:

- Substantial gaps in achievement compared to baseline performance
- High engagement and positive feedback from teachers on professional development activities.
- Successful implementation of Summer Academies, with survey data suggesting positive perceptions from students.

These findings suggest that while the program has made strides in certain areas, particularly in fostering engagement and providing substantial professional development, the actual impact on standardized test performance has been mixed. It highlights the need for continued refinement of instructional strategies and support mechanisms, particularly for high school students, to align more closely with the intended outcomes of Project MaSTerS. Moving forward, the focus will be on leveraging insights from these outcomes to enhance the design and delivery of targeted interventions, ensuring that they are not only robust but also adaptable to the evolving educational needs of military-connected students. This approach will be crucial for not just meeting but exceeding the standards set forth, thus truly fulfilling the project's overarching aim of academic excellence and readiness for college and career paths.

Sustainability and Future Directions

Sustainability efforts are well-aligned with OUSD's broader educational objectives, with plans to integrate project strategies into ongoing programs supported by Title I and Federal Impact Aid funds. The project's focus on professional development ensures that its benefits will extend beyond the grant period, with trained teachers continuing to apply effective instructional strategies.

Lessons Learned

Project MaSTerS in Math demonstrated the critical role of targeted professional development and direct student services in addressing the unique challenges faced by

military-connected students. The project's collaborative approach, involving stakeholders from the University of California, San Diego, set a foundation for sustained impact.

Recommendations

The following recommendations are for Project Staff, DoDEA personnel and future grantees.

Project specific recommendations

1. Strengthen and expand professional development (PD) opportunities: Continuous and targeted professional development, especially in DNR-based instruction, was pivotal to the program's implementation. Future iterations should not only continue these efforts but also expand them to include more specific training on addressing the diverse needs of military-connected students. This could include strategies for bridging academic gaps due to frequent relocations and integrating socio-emotional learning components that cater to the unique circumstances of military families.
2. Enhance parental involvement and support systems: While the program focused significantly on teacher professional development and student academic support, increasing parental involvement could further bolster student outcomes. Developing workshops and informational sessions for parents about the curriculum and how to support their children's learning at home could empower families and enhance the educational support network for students outside school.
3. Refine and expand summer academies: The summer academies proved to be a valuable aspect of the program, offering both remediation and enrichment opportunities. Recommendations include refining the curriculum to ensure it is closely aligned with school-year instruction and expanding these academies to reach more students. Additionally, incorporating more real-world applications and problem-solving scenarios that reflect the unique experiences of military-connected students could make the learning more relevant and engaging.
4. Implement a robust evaluation and feedback loop: The program's evaluation highlighted the importance of monitoring and adjusting strategies based on outcomes. Going forward, a more robust system for collecting, analyzing, and responding to data should be established. This system should include mechanisms for regular feedback from all stakeholders—students, teachers, parents, and administrators—to inform continuous improvement of the program.
5. Focus on sustainability and scaling: With the success of the program in its initial implementation, future plans should include strategies for sustainability and potential scaling. This could involve securing additional funding sources, developing partnerships with other organizations, and creating a model that can be adapted

and replicated in other districts with high populations of military-connected students.

Other Recommendations

6. Grant directors must have an active role in the project, communicating and coordinating professional development, data collection and management, and supporting teachers, administrators, and students. Furthermore, grant directors must have the autonomy to make decisions that are in the best interest of the program so that it continues to grow and mature and reap long term benefits for students.

These recommendations are designed to build on the strengths of the program while addressing areas for improvement, ensuring that the program continues to evolve and better serve the needs of military-connected students and their families.

Acknowledgments

The project team extends its gratitude to the Department of Defense Education Activity for funding, to OUSD staff and teachers for their commitment, and most importantly, to the students and families whose educational journeys inspire our work. This report synthesizes the project's narrative, achievements, and lessons learned to guide future initiatives and sustain the positive impacts on military-connected students' education in mathematics.

APPENDICES

Appendix I: Achievement Tables

Table 1: Percentage of 11th grade military-connected students meeting or exceeding standard on the Smarter Balanced Mathematics Assessment

	Spring 2019	Spring 2020	Spring 2021	Spring 2022	Spring 2023	Spring 2024
% Total meeting or exceeding standard	30%	No Test	37%	19%	25%	21%

Table 2: Percentage of 3-8th grade military-connected students meeting or exceeding standard on the Smarter Balanced Mathematics Assessment

	Spring 2019	Spring 2020	Spring 2021	Spring 2022	Spring 2023	Spring 2024
% Total meeting or exceeding standard	59%	No Test	56%	33%	31%	40%

Mathematical Content

Instructional Approach

Mathematical Practice

Algebraic Thinking Institute (ATI)

Dates: **June 14-18, 2021**
Times: **8:00 A.M. – 1:00 P.M.**
Location: **Virtual**
Facilitators: **Prof. Guershon Harel** (UC San Diego Math Dept.) and **Dr. Osvaldo Soto** (UC San Diego Mathematics Project)
Registration: **<https://bit.ly/30t2e0g>**

The institute will focus on the mathematics of entry-level algebra (e.g., AQA) and Integrated Math 1.

The format includes three main activities:

- Teachers solve mathematical problems in small-working groups.
- Teachers discuss their own solutions and approaches in whole-class settings.
- Teachers identify the relevance, the challenges, and the affordances, of what they have learned to what they teach.

As the name of the institute suggests, the central focus will be on the development of *algebraic reasoning* via DNR-based instruction.

DNR is a conceptual framework developed by Professor Harel, which places the mathematical integrity of the content taught and the intellectual need of the students at the center of the instructional effort.

Algebraic reasoning is defined as the ability to use rule-governed notational system to express, manipulate, generalize, and formalize quantitative relationships. This definition highlights three critical components of algebraic reasoning:

- Quantitative reasoning:** the ability to make sense of the quantities and their relationships in problem situations.
- Symbolic reasoning:**
 - Decontextualization:** the ability to abstract quantitative relationships and represent them by strings of symbols obeying well-articulated rules.
 - Contextualization:** the ability to give quantitative meaning to such strings of symbols.
- Symbolic manipulation skills:** the ability to manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents, and pause as needed during the manipulation process in order to probe into the referents for the symbols involved.

