The California State University
BUSINESS AND FINANCE

401 Golden Shore, 5th Floor
Long Beach, CA 90802-4210

CSU Legislative Reports Website
https://www.calstate.edu/legislativereports/

Steve Relyea
Executive Vice Chancellor
and Chief Financial Officer

562-951-4600
srelyea@calstate.edu

November 8, 2021

Nancy Skinner
Joint Legislative Budget Committee
State Capitol, Room 5094
Sacramento, CA 95814

Gabriel Petek
Legislative Analyst Office
925 L Street, #1000
Sacramento, CA 95814

Keely Bosler, Director
Department of Finance
State Capitol, Room 1145
Sacramento, CA 95814

Erika Contreras
Secretary of the Senate
State Capitol, Room 3044
Sacramento, CA 95814

Cara L. Jenkins
Legislative Counsel
State Capitol, Room 3021
Sacramento, CA 95814

Sue Parker
Chief Clerk of the Assembly
State Capitol, Room 3196
Sacramento, CA 95814

RE: California State University Mathematics and Science Teacher Initiative Report

This report is about the California State University (CSU) Mathematics and Science Teacher Initiative (MSTI). The report provides (1), annual information on the number of mathematics and science teachers credentialed, (2), an expenditure plan, (3), a report of the initiative's different components and activities, including best practices, and (4) the job placement of students who earn a mathematics or science teaching credential.

The report is important because the state of California continues to experience a teacher shortage in mathematics and science. The CSU strategies for addressing the shortage are the primary feature of MSTI and its activities are critical to ensuring that California's students are taught by qualified mathematics and science teachers.

The annual report is provided each year in accordance with Provision 5 of the Budget Act of 2009.
Should you have any questions about this report, please contact Nichole Muñoz-Murillo, Assistant Vice Chancellor, Advocacy and State Relations at (916) 445-5983.

Sincerely,

Steve Relyea
Executive Vice Chancellor and
Chief Financial Officer

SR:dr

Full report posted to https://www.calstate.edu/legislativereports/

c: Lisa Qing, Senior Fiscal & Policy Analyst, Legislative Analyst Office
Joseph I. Castro, Chancellor, California State University
Sylvia A. Alva, Executive Vice Chancellor, Academic and Student Affairs
Lawrence Salinas, Interim Vice Chancellor, University Relations and Advancement
Nichole Muñoz-Murillo, Assistant Vice Chancellor, Advocacy and State Relations
Ryan Storm, Assistant Vice Chancellor for Budget
Jeni Kitchell, Executive Budget Director
Marquita Grenot-Scheyer, Assistant Vice Chancellor for Educator Preparation and Public School Programs
Frederick Uy, Director, Educator Preparation and Public School Programs

The California State University
WORKING FOR CALIFORNIA

CALIFORNIA STATE UNIVERSITY
MATHEMATICS AND SCIENCE TEACHER INITIATIVE

ANNUAL REPORT

CALIFORNIA STATE UNIVERSITY
OFFICE OF THE CHANCELLOR

MAY 2021

Table of Contents

Contents

Overview……......1

Background.....1

Expenditure of Mathematics and Science Teacher Initiative Funds.....2

Effectiveness of Mathematics and Science Teacher Initiative Components 3

Identification of Best Practices 5

Additional Exemplary MSTI Initiatives ……7

Job Placement of CSU Students Who Earn a Mathematics or Science Teaching Credential.....8

Conclusions 9

Tables

1. CSU Mathematics and Science Teacher Candidate Production by Subject: 2014-15 to 2019-20 per CTC..……....10
2. Number of In-Service Teachers Served by CSU Campuses Who Earned or May Potentially Earn Their Supplementary and/or Subject Matter Authorizations in Mathematics, Science, and Computer Science: 2019-20 ……..……10
3. CSU Mathematics and Science Teacher Candidate Production by Campus: 2014-15 to 2019-20 per CTC……...11

California State University
Mathematics and Science Teacher Initiative (MSTI)

Overview

Through the implementation of its systemwide Mathematics and Science Teacher Initiative (MSTI), the California State University (CSU) has supported the production of mathematics and science teachers. Since the program began, CSU campuses have increased the annual number of mathematics and science teachers from 2002-03 to the present fiscal year 2019-20. CSU campuses currently produce the highest number of mathematics and science teachers in the state. In these chronic shortage fields for grades PK-12, data collected by the California Commission on Teacher Credentialing (CTC) for the 2019-20 program year showed that CSU campuses prepared a total of 755 preliminary and intern credential teachers, of which 373 were in mathematics and 382 were in science. This outcome represents an unexpected systemwide decline in production of 102 teachers (8.8%) compared to the prior year. The decline was more pronounced in science than mathematics and production trends varied considerably by campus. Chancellor's Office (CO) staff continue to explore the factors contributing to the decline. Possible factors include: A decline in applications due to the Covid-19 pandemic; Science, Technology, Engineering, and Math (STEM) candidates seeking non-teaching careers due to higher pay; and fewer job prospects due to declining PK-12 student enrollment. We will also further investigate the relationships between specific recruitment strategies used in different programs with their production outcomes in order to continue to identify more robust innovative ways of recruiting STEM teachers.

To further leverage the investment of supporting the MSTI initiative in addressing the state's STEM teacher shortage, the CSUCO invested $10,000,000 for four years (2019 – 2023). This investment doubled each campus's funding allocation for 2019-20 and created a competitive proposal for $100,000 for the academic year 2020-21. Together these investments are aimed to help support campuses in the recruitment of diverse candidates and high-quality preparation of these candidates to become teachers of science and mathematics. Funds would also help campuses address the teacher shortage in these critical fields by not only attracting more students in the programs, but also by retaining current teachers in the workforce. Some funds were used for review courses and test fees to assist these teachers in earning an added authorization in mathematics or science.

Additionally, campuses that demonstrated an increase in STEM teacher production attested that having a dedicated recruitment coordinator was especially effective as this individual attended to the many responsibilities associated with this role, including planning and executing recruitment activities, tracking recruitment processes and outcomes, establishing partnerships within the institution and broader community, and fostering ongoing connections with potential teacher candidates. Also, it is important to identify and establish relationships with students much earlier by providing more opportunities for them during their undergraduate, community college, and even high school education. This will create opportunities to explore career choices inclusive of not only teaching but also early field experiences. Simply waiting during their senior year to recruit potential teacher candidates is unproductive. Finally, earning a teacher credential is a sophisticated process. Therefore, an effective advising process must be in place. Reinforcing the value and benefits of a teaching career, while disputing the unfavorable perspectives towards a teaching career, is an important aspect of advising. It takes a special individual to do this work.

Utilizing MSTI resources in strategically planned efforts, CSU campuses not only have been effective in the production of mathematics and science teachers, but also have been successful in acquiring federal grants to supplement the initiative. This includes prestigious Robert Noyce scholarship awards from the National Science Foundation (NSF). Furthermore, the CSU has developed strong partnerships with the U.S. Department of Energy, the National Aeronautics and Space Administration (NASA), and the National Oceanographic and Atmospheric Administration (NOAA). These agencies have provided more than 750 research internships in leading federal labs for CSU future mathematics and science teachers.

CSU's success in mathematics and science teacher preparation includes the continuation of its being a leading partner in the 100Kin10 national initiative, a group of national foundations, education institutions, and businesses that have joined to prepare 100,000 excellent science, technology, engineering, and mathematics (STEM)

teachers by 2021. As part of the initiative, CSU has committed to sustain and annually grow its preparation of new mathematics and science teachers. Its priorities include: producing increased numbers of teachers in severe shortage fields; placing new mathematics and science teachers in high-need schools; and preparing candidates credentialed in more than one STEM discipline to assist hard-to-staff schools.

Background

The Learning Policy Institute in 2018 reported that a projected need for new mathematics and science teachers will continue in California over the next ten years[1]. The overwhelming demand for mathematics, science, and computer science teachers is far greater than the pool of teachers credentialed in these fields, and many students in the state continue to be taught by teachers who are under-prepared or unprepared in these subjects. Worst of all, some teachers were even unauthorized to teach these subject areas.

There is a direct relationship between a teacher's qualifications, in terms of certification, subject-matter knowledge, highest degree, and years of experience, and student achievement. Students with less-qualified mathematics and science teachers demonstrate lower achievement gains than those whose teachers are more qualified. And more often than not, these less-qualified teachers are placed in schools with highest needs.

The persistent crisis of an inadequate number of adequately- and well-prepared STEM teachers has not diminished at all. As mentioned earlier, less-qualified teachers are placed more often and disproportionately in schools with the highest needs, mostly located in urban areas that primarily serve students of color. Unfortunately, a noticeable high percentage of these unqualified teachers are found in many mathematics, science, and computer science classrooms.

Compared to other institutions, the CSU as a system produces the largest numbers of mathematics, science, and computer science teachers in California, averaging annually at least 30 percent of new teachers in these fields[2]. Through MSTI, each CSU campus implements strategies based on its strengths and the needs and opportunities in the area it serves. All campuses have an annual action plan with goals for increased credential production and strategies for reaching those goals.

The campus approaches are integrated within the CSU systemwide initiative that includes seven comprehensive strategies. The evidence from efforts in mathematics and science teacher preparation indicate there is not one simple solution to increasing the production of STEM teachers. Various obstacles to increasing recruitment and production exist, and these obstacles must be addressed through a multi-faceted approach for sustained effectiveness. The CSU approach includes the following:

a. recruitment of diverse new students,
b. increasing production through new credential pathways,
c. financial support to attract outstanding candidates and facilitate credential completion,
d. community college program alignment,
e. online and in-person test preparation,
f. early exposure to fieldwork,
g. partnerships with federal labs and industry, and
h. identification of the most successful approaches to share with other campuses.

Campuses work diligently together so that these approaches and structures are in place for the campuses to share ideas and to assist each other in applying such approaches.

Finally, significant attention is given to the preparation of new mathematics and science teachers in accordance with the state standards. CSU's leadership in these areas has been recognized in its receiving major federal and

[1] Darling-Hammond, L., Sutcher, L., & Carver-Thomas, D. (2018). *Teacher Shortages in California: Status, Sources, and Potential Solutions* (research brief). Palo Alto, CA: Learning Policy Institute.
[2] California Commission on Teacher Credentialing. (2020). Teacher Supply Credentials. Retrieved from: https://www.ctc.ca.gov/commission/reports/data/edu-supl-creds

philanthropic grants for teacher preparation approaches addressing the standards.

Expenditure of Mathematics and Science Teacher Initiative Funds

The 2020-21 State Budget appropriated $2.713 million for the CSU Mathematics and Science Teacher Initiative. The expenditure plan adopted for these funds consists of two primary components, as described below.

- Support provided for each of the 22 campuses preparing mathematics and science teachers to implement approaches such as: (a) comprehensive recruitment efforts, (b) a range of credential pathways to increase mathematics and science credential production, (c) financial support for candidates, (d) programs aligned with community colleges, and (e) test preparation.

- Statewide management and administration, including activities aimed at: (a) acquiring external resources through aligned federal and philanthropic funds, (b) monitoring program implementation and effectiveness by the Educator Quality (EdQ) Center, (c) recruitment efforts of the EduCorps initiative, (d) disseminating effective practices, and (e) program management and administration.

Campus funding was, as in previous years, based on and reflected the production of mathematics and science teachers by each campus. This approach has been used during the previous years in order to target resources effectively. Allocations to campuses ranged from $55,000 to $150,000 in 2020-21, and individual campus amounts were based on (a) production, (b) increases achieved during the entire period of the systemwide initiative, and (c) total campus annual production. In order to receive an allocation, each campus was required to submit a plan that included:

- Credential production targets
- Action steps for increasing production and recruitment of diverse candidates to become mathematics, science, and computer science teachers
- A detailed budget and budget justification for the allocation
- A progress report, including the identification of effective strategies and best practices

Purposes for which the campus allocations are being used follow systemwide guidelines. These guidelines are for administrative fees, faculty salaries, consultants, and travel in order to ensure that resources are targeted primarily to assisting students entering and completing credential preparation. Only activities that are directly related to mathematics, science, and computer science teacher recruitment and preparation can be supported, and the funds cannot be used to offset costs of instruction or student support that are part of ordinary campus academic programs. All budgets are reviewed thoroughly by the MSTI Director to ensure conformity with the above-mentioned requirements.

Budget items for which campuses used MSTI funds included the following items:

- Scholarships to assist students in completing their mathematics or science credential
- Stipends to students who served as mathematics or science aides and/or tutors in PK-12 schools or as STEM assistants in some learning programs
- Collaboration with computer science colleagues in developing a program for in-service teachers to earn their Supplementary Authorization in Computer Science
- Establishment and offering of review and/or preparation courses for the California Subject Examination for Teachers (CSET) in mathematics and science
- Reimbursement of testing, registration, and application fees
- Recruitment and diversification efforts and outreach
- Support to programs like STEM Teacher and Researcher (STAR) at Cal Poly San Luis Obispo to gain a better understanding and experience in STEM
- Dedicated project coordinators and support staff personnel responsible for advising, planning, managing, meeting, and reporting
- Coordination with community colleges and advising for community college students

- Upkeep and improvement of project websites of campuses

Systemwide guidance regarding the use of MSTI funds is provided to ensure that activities are undertaken that have significant promise for recruiting diverse candidates to become new mathematics and science teachers. In addition, a primary feature of systemwide management is strategic use of program funds to leverage federal and philanthropic funding.

Effectiveness of Mathematics and Science Teacher Initiative Components

The components of MSTI are integrated into a comprehensive systemwide strategy that is recognized as being one of the most significant efforts for increasing mathematics and science teacher preparation that has been nationally undertaken. The five distinctive features of the initiative are as follow:

- **Institutional commitment that is articulated and reinforced at multiple levels**

  A first feature that has supported program effectiveness is institutional commitment at all levels. Support of campus academic leaders and staff, engagement of science, mathematics and education faculty, and cooperative efforts to attract, recruit, and prepare diverse outstanding candidates are characteristic of MSTI. The programs on campuses have mutually supportive leadership among the top academic leaders in STEM and teacher preparation.

- **Comprehensive recruitment and financial support**

  A second feature that has been instrumental in supporting program effectiveness is the integration of comprehensive recruitment strategies and financial support. Strategies for recruiting candidates from diverse populations are directly aligned with scholarships and paid field experiences working with PK-12 students to enable candidates from diverse backgrounds to complete a credential program without incurring significant student debt.

- **Approaches that connect future teachers with communities of practice that include scientists and mathematicians as well as other dedicated teachers in STEM disciplines**

  A third feature supporting effectiveness in preparation connects future teachers with science and mathematics communities of practice. In programs like the STAR program, CSU STEM teacher candidates are directly involved in scientific practice and discourse, and the programs engage them as members of professional communities with leading scientists.

- **Broad-ranging collaboration and partnerships with other educational entities and with federal science agencies**

  A fourth feature advancing effectiveness involves collaborative strategies and partnerships that often extend beyond traditional boundaries. These include innovative partnerships between colleges of education, science, and engineering that have resulted in recruitment of outstanding undergraduates in a range of STEM majors.

  A variety of partnerships also exist with PK-12 educational institutions and higher education. A significant partnership is with the CDE (Californians Dedicated to Education) Foundation. CSU has also been an active partner and sponsor in its annual STEAM Symposium.

  MSTI has an important higher education partnership with the Association of Public Land Grant Universities (APLU) through the Mathematics Teacher Education Partnership (MTEP). Its goal is to enhance the preparation of mathematics candidates at the secondary level. All CSU campuses has representation in the CSU systemwide MTEP. Through it, campuses are collaborating in research- based efforts aimed at recruiting more mathematics teacher candidates and enhancing their content and clinical preparation. CSU is the largest participant in the national MTEP and plays a prominent role in the APLU

initiative. To date, the CSU is embarking on its second phase, known as MTEP 2.0. Similarly, MSTI is also seeking an equivalent in the preparation of science and computer science teachers.

The Chevron Corporation also has provided support to CSU for its work in mathematics and science. Through its support, campus courses, labs, practicums, and field experiences have been revised to address (a) scientific and engineering practices, (b) crosscutting concepts in science, and (c) the engineering design process. Moreover, Chevron supported the following programs: STAR and Makerspace initiatives. The STAR program at CSU San Luis Obispo has placements in federal and other distinguished research laboratories for students each summer, and participants become members of a community of teacher- researchers and have ongoing professional development opportunities. Makerspace initiatives include makerspaces and Fabrication labs; these have been established in a range of formal and informal learning environments at Sonoma State University.

- **Rigorous data systems and evaluation procedures for monitoring outcomes**

  A fifth feature that has been instrumental in supporting program effectiveness is the thorough data systems to monitor candidate progress and program outcomes. Staff of the Educator Quality Center (EdQ), another unit of the Educator Preparation and Public School Programs department, compiles data to enhance educator preparation throughout the CSU and supports all 22 campuses in applying these data to improve their programs and results. EdQ data includes surveys of teachers and their employers about the quality and effectiveness of CSU teacher preparation, data on employment outcomes for CSU-prepared teacher candidates, and teacher pipeline data to track candidates through recruitment, application, admission, enrollment, and program completion.

Identification of MSTI Best Practices

Best practices have been identified for each factor associated with effectiveness by examining relationships between the factors and changes in credential production. There has been a consistent association between certain approaches and large increases in the preparation of well-qualified teachers. In order to identify them, the CO MSTI Team interviewed the campuses that showed the strongest gains were interviewed and analyzed the campus reports. Some examples of these best practices are listed below.

A. Recruitment

Active recruitment has been found to be the most effective way of growing the number of teacher candidates. In recruitment, campuses use a variety of approaches. These include nominations by professors of candidates likely to be successful in a teaching career, social media, advertising, and pre-teaching clubs. They provide advising and mentoring, host numerous events, and develop networks of students interested in pursuing a mathematics or science credential. They provide support for early field experiences of varying durations, some paid and some unpaid, depending in large part on the candidates' ability to make a sustained time commitment. They also annually award MSTI funds for small scholarships for students in mathematics and science teacher pathways.

A dedicated Recruitment Coordinator. Campuses that demonstrated an increase in STEM teacher production gave credit to having a dedicated recruitment coordinator attending to the many responsibilities associated with this role, including planning and executing recruitment activities, tracking recruitment processes and outcomes, establishing partnerships within the institution and broader community, and foster ongoing connections with potential teacher candidates. The need for committed financial support for programs to hire a stable recruitment coordinator was also mentioned by several directors. Even at campuses with highly effective recruitment coordinators, there were concerns that these positions are typically filled via part-time, temporary contracts and paid for with grants, a difficulty indeed in retaining these positions over time.

Further, it is ineffective to wait and start recruiting potential teacher candidates during their senior year. It's much more effective to begin establishing relationships with students much earlier by providing more opportunities for students during their undergraduate, community college, and even high school education to explore career options including teaching and early field experiences. Working with students and with academic advisors while

they are undergraduates, and even while they are in community college and high school goes a long way toward ensuring students are prepared when they reach the point of applying for a credential program. Moreover, another approach to increase the pool of well-trained STEM teachers is by creating alternative routes to teacher certification for career-changers. Targeting recruitment workshops and professional conference presentations to this audience helps demonstrate how the "doing of science" can be translated into the "teaching of science.

Finally, EduCorps helped campus recruitment and practical strategies to increase and diversify the number of students entering CSU's teacher preparation programs. A special focus is in high-need areas including mathematics and science. Many campuses coordinated and collaborated with EduCorps in both formulating and implementing the MSTI recruitment and diversification initiatives.

B. Financial Support

For financial support, campus efforts to secure external scholarship funding for candidates have been effective. The use of MSTI funds as aligned with resources to secure federal funds and the commitment of these funds for the entire period of federal grants has helped CSU campuses obtain scholarships that attract outstanding mathematics and science majors into teaching. CSU campuses have been awarded National Science Foundation Robert Noyce scholarships and fellowships. As stipulated in the award, scholarships are for one to three years leading to a teaching credential while fellowships continue support for up to four years thereafter. Finally, the CSU received a gift from the Microsoft Corporation to help support mathematics and science teacher candidates. These pre-service teachers were awarded scholarships to assist them while completing their credentials.

Another form of financial support is reimbursement of fees. In order to prove subject matter competency, some candidates need to take the CSET in Mathematics and Science. To lessen the burden for students, MSTI reimburses these students who passed these examinations. Some campuses go further by reimbursing CTC application fees.

C. Advising

The teaching credential process in California is complicated. Providing active and accessible advising is extremely important, especially for first generation college students who may not have a support network with experience navigating higher education. Programs that have been able to institutionalize effective advisement processes and routines for mathematics and science teacher candidates and potential candidates by working with community college, undergraduate, and credential program students to provide guidance for successfully fulfilling teacher credential program requirements and responsibilities have been most successful in improving STEM teacher production outcomes. Recruiting resources are helpful in communicating positive messaging about the value and benefits of a teaching career. However, negative attitudes about the education profession continue to be widespread among the current generation of young adults and must be countered with stories regarding the power of teaching.

D. Branding

The concurrent branding of mathematics, science, and computer science teaching as a prestigious career choice is a best practice that many campuses use. Some achieve this through engaging messages on bookmarks, posters, and ads. Others have created exciting videos that demonstrate how mathematics and science teaching careers are attractive and highly rewarding. The STAR program is an example of a best practice communicating the prestige of STEM teaching and enabling future science and mathematics teachers to participate actively in scientific communities of practice. Through it, outstanding science teacher candidate's work with some of the nation's leading researchers.

E. Test Preparation

An important practice undertaken by most CSU campuses is test preparations and review for CSET: Mathematics and CSET: Science that candidates are required to pass to enter the program. Campuses provide face-to-face and online preparation, campus-based test preparation workshops, and non-credit test preparation and/or review

courses for mathematics and science candidates as part of MSTI. In the spirit of collaboration, campuses not offering said programs avail of these services of other campuses that do offer the said programs.

F. Admission requirement

Some campuses attributed STEM teacher production gains to changes they made to their admission requirements. Rather than require several prerequisite courses and demonstration of subject matter competency, some programs found it beneficial to waive the upfront subject matter competency requirement or integrate prerequisite course work into the program.

G. Early Fieldwork Experiences

Summer internships for early STEM majors were noted as one productive way to generate interest in teaching as a career among STEM-talented students. The STAR (STEM Teacher and Researcher) Program at Cal Poly was similarly recognized for offering a prestigious "teacher-researcher" career path to aspiring and early career STEM teachers via paid summer research experiences at national, university, and independent laboratories. one campus launched a learning assistant program in physics that has proven effective in attracting physics majors into teaching careers by providing opportunities for them to experience the rewards of facilitating active learning and collaborative instruction. Another example is having elementary students come to the campus and provides opportunities for undergraduate students to teach these students in an after-school setting. Another campus set up opportunities for students to go into neighboring schools and serve as academic tutors. Participating in the tutoring pipeline not only exposes students to the joys of teaching, it helps those who ultimately enter the profession be better teachers.

H. Monitoring and Reporting Systems

As noted earlier, another best practice enhancing MSTI effectiveness pertains to thorough and refined data systems for monitoring candidate progress and program outcomes. Robust data systems managed by the CSU Educator Quality Center are used to (a) identify the program models that are most effective in increasing production of well qualified mathematics and science teachers and (b) examining these programs to determine their distinguishing characteristics and strategic approaches. Furthermore, the Center’s data collection and reporting systems enable educator preparation program leadership to track teacher candidates into the workforce, identify the characteristics of schools where they are employed, and analyze their degree of preparation based on feedback from candidates, first-year teachers, and their instructional supervisors.

Additional Exemplary MSTI Initiatives

A. Collaboration with Computer Science Department

Significant MSTI activities focus on working closely with computer science departments to encourage and support candidates in obtaining a Supplementary Authorization in Computer Science. Campuses are providing courses and professional development for candidates and are offering computer science programs to local schools in order to provide field experiences for candidates and support computer science education in these schools. In fact, several campuses already have offered their Supplementary Authorization in Computer Science to in-service teachers and additional campuses are developing their own programs in support of the proposed requirement of an additional year of quantitative reasoning for first time freshman.

B. Grow Your Own Program

Some campuses work with various school districts to increase their mathematics and science teachers. They offer Grow Your Own teacher pathways to recruit local students into teaching. The campuses reach out to the candidates in their own communities and provide advising, financial aid, and support services, including their parents in outreach activities.

Another excellent practice is supporting Learning Assistant programs. In these programs, candidates in

mathematics and science teacher pathways and undergraduates in mathematics and science majors serve in teaching assistant roles, working with individual undergraduates or helping a faculty member as a course assistant. The Learning Assistant programs serve to encourage undergraduate tutors—majors in mathematics and science--to pursue teaching as a career. Importantly, the programs may be coordinated with undergraduate academic tutoring as part of Graduation Initiative 2025.

C. Support for Professional Learning

Many campuses support candidate participation at professional conferences, enabling them to participate in the community of mathematics and science teachers. For example, some campuses provide support for candidates to go as a group to the annual conferences sponsored by California Science Teachers Association (CSTA), California Mathematics Council (CMC), California Department of Education (CDE), Californians Dedicated to Education Foundation, Computer Using Educators (CUE), etc.

D. Working with PK-12 Learners

Some campuses have exemplary programs run by the campus that involve candidates in working with children as a way of supporting their interest in teaching. One campus has a Hands-on Lab and another a Learning by Doing Lab. Local K-12 students visit the labs and candidates work with them and their teachers in structured learning activities. Another campus invites schools and community groups to visit the campus or participate in a Mobile Fab Lab. As part of MSTI, candidates in a mathematics or science pathway work with the visiting school and community groups in active hands-on programs addressing STEM and the engineering design process.

On some campuses, MSTI outreach involves high school student engagement and working with students interested in teaching careers. Typically, a partnership includes middle and high school teachers and the collaboration includes students who are in a secondary Teaching Academy serving students interested in teaching. Programs may be undertaken with Educators Rising, which provides guidance for programs with local high school teacher clubs that offer a range of activities for students who wish to pursue or learn more about teaching and teaching careers.

E. Teacher Ambassadors

On several campuses, prospective mathematics and science teachers serve as Teacher Ambassadors. These university students work with high schools, community colleges, learning centers, outdoor activities, and at university events to promote careers in teaching, with an emphasis on mathematics and science. They, along with undergraduates, attend teacher career fairs aimed at helping them make connections with potential employing school districts and schools.

An example is one in which undergraduate students participate in a local school, after-school, Saturday, or summer program, working with PK-12 students in mathematics, science, and computer science enrichment activities. These often include robotics, coding, and hands-on learning involving the engineering design process. The MSTI students may receive a scholarship or stipend in association with this work. The participants on some campuses are referred to as MSTI Fellows, creating distinction for the program. Often more than one undergraduate works at a field experience site with a resultant sense of community among the CSU students.

F. Working with Community Colleges

On other campuses, MSTI collaborates closely with one or more community colleges. In some cases, the community college and CSU students together serve as STEM assistants in local schools or community organization STEM programs. In most cases, there is a comprehensive recruitment and advising program, with thorough coordination between the community college lower division mathematics and science experience—both academic and student services—and the CSU upper division mathematics and science preparation pathway and credential program.

Finally, some campuses are meeting with their area community colleges in conjunction with the Integrated

Teacher Education Program (ITEP). Faculty in both segments work collaboratively to support the transfer process. These faculty focus on Associate Degree Transfer (ADT) and Transfer Model Curriculum (TMC).

Job Placement of CSU Students Who Earned a Mathematics or Science Teaching Credential

An analysis was conducted by EdQ on 2020 on the job placement of CSU mathematics and science completers. The findings were striking, demonstrating that large numbers teach in high-need schools. Of CSU mathematics and science teacher graduates:

- 74% taught in schools with more than half of the students in poverty, and over 92% taught in schools with 25% or more of the students in poverty;
- 44% taught in city schools, approximately 6% in rural schools, 7% in town schools, and the remainder in suburban schools;
- In the schools where graduates taught, approximately 34% of students met or exceeded math standards, somewhat lower than the California state average (statewide, 40% of students met or exceeded math standards);
- 75% taught in schools with less than 100% fully credentialed teachers.

California teacher workforce shortages underscore the importance of these job placements among CSU mathematics and science teachers—showing a sustained pattern in which the majority are in high-need schools.

Challenges of finding qualified mathematics and science teachers are acute among the state's high-need schools. The new mathematics and science teachers prepared by CSU are meeting the needs of California's school districts, teaching in the neediest schools and contributing substantially to overcoming inequities in the distribution of well qualified mathematics and science teachers.

Conclusions

CSU campuses continued the production of new secondary mathematics and science teachers in 2019-20. The new mathematics and science teachers produced by CSU campuses are taking job positions in high-need schools across the state. These graduates are contributing markedly to addressing school district needs, including those in urban, rural, high-need, and low-income districts. CSU campuses are committed to reducing the disparities in access to fully qualified and diverse mathematics and science teachers that have existed in the state of California for decades.

Mathematics and Science Teacher Production

Tables 1 and 2 present data from 2014-15 through 2019-20 for new teachers prepared in mathematics and science. The figures are based on the count by CTC of mathematics and science credentials that were received by preliminary credential candidates and intern credential candidates, including those who received Foundational Level Mathematics (FLM) and Foundational Level General Science (FLGS) preparation. Clear credentials, Subject Matter Authorizations, and Supplementary Authorizations were not part of the CTC count; however, a separate entry for supplementary and/or subject matter authorizations is shown to indicate the CSU effort in getting more qualified mathematics, science and computer science teachers in TK-12 schools[3].

Table 3 lists new teachers prepared in mathematics and science from 2014-15 through 2019-20 by each CSU campus.

Table 1: CSU Mathematics and Science Teacher Candidate Production by Subject: 2014-15 to 2019-20 per CTC

Subject	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Mathematics	459	430	408	417	385	373
Science	451	484	511	506	472	382
Total Mathematics and Science	910	914	919	923	857	755

Table 2: Number of In-Service Teachers Served by CSU Campuses Who Earned or May Potentially Earn Their Supplementary and/or Subject Matter Authorizations in Mathematics, Science, and Computer Science: 2019-20

Subject	2019-20
Mathematics	762
Science	529
Computer Science	91
Total	1382#

This total represents the number of in-service teachers who have taken at least one course in a CSU campus that may lead to a Supplementary Authorization or Subject Matter Authorization. Redesigned data collection started in 2019-20 only.

[3] California Commission on Teacher Credentialing. (2020). Teacher Supply Credentials. Retrieved from: https://www.ctc.ca.gov/commission/reports/data/edu-supl-creds

Table 3: CSU Mathematics and Science Teacher Candidate Production by Campus: 2014-15 to 2019-20 per CTC

	2014-15			2015-16			2016-17			2017-18			2018-19			2019-20		
Campus	**Math**	**Sci**	**Total**	**Math**	**Sci**	**Total**	**Math**	**Sci**	**Total**	**Math**	**Sci**	**Total**	**Math**	**Sci**	**Total**	**Math**	**Sci**	**Total**
Bakersfield	28	14	42	26	21	47	29	22	51	17	25	42	24	29	53	16	25	41
Channel Islands	9	6	15	3	8	11	10	9	19	5	13	18	3	12	15	7	12	19
Chico	11	10	21	13	14	27	12	17	29	16	26	42	12	21	33	11	23	34
Dominguez Hills	63	65	128	40	64	104	36	44	80	42	32	74	38	31	69	26	19	45
East Bay	22	27	49	25	25	50	22	29	51	35	36	71	17	34	51	22	20	42
Fresno	22	12	34	25	23	48	13	42	55	25	50	75	28	26	54	21	39	60
Fullerton	23	34	57	23	38	61	26	39	65	25	24	49	30	23	53	25	18	43
Humboldt	7	9	16	5	8	13	8	7	15	3	5	8	4	14	18	9	9	18
Long Beach	32	42	74	42	41	83	35	53	88	34	26	60	36	45	81	48	29	77
Los Angeles	28	14	42	18	25	43	23	14	37	11	13	24	8	13	21	23	11	34
Monterey Bay	21	11	32	10	5	15	10	12	22	13	19	32	10	22	32	12	17	29
Northridge	23	24	47	21	16	37	20	24	44	20	28	48	22	32	54	13	18	31
Pomona	19	24	43	25	18	43	13	16	29	17	17	34	15	9	24	12	14	26
Sacramento	20	17	37	12	25	37	20	24	44	19	12	31	7	20	27	16	18	34
San Bernardino	25	13	38	32	16	48	37	27	64	33	39	72	33	22	55	26	16	42
San Diego	27	31	58	34	25	59	26	29	55	30	36	66	32	22	54	37	27	64
San Francisco	12	13	25	9	15	24	7	14	21	18	20	38	16	12	28	12	8	20
San Jose	13	24	37	15	24	39	22	21	43	17	20	37	13	24	37	8	19	27
San Luis Obispo	4	13	17	10	18	28	9	34	43	11	25	36	4	17	21	6	13	19
San Marcos	19	25	44	9	20	29	7	12	19	9	8	17	9	16	25	10	11	21
Sonoma	16	14	30	18	17	35	7	8	15	6	11	17	7	11	18	2	4	6
Stanislaus	15	9	24	15	18	33	16	14	30	11	21	32	17	17	34	11	12	23
Total	459	451	910	430	484	914	408	511	919	417	506	923	385	472	857	373	382	755