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STEM Strategic Report

FOR A STEM STATE OF MIND IN OKLAHOMA

OKLAHOMA STATE DEPARTMENT OF EDUCATION

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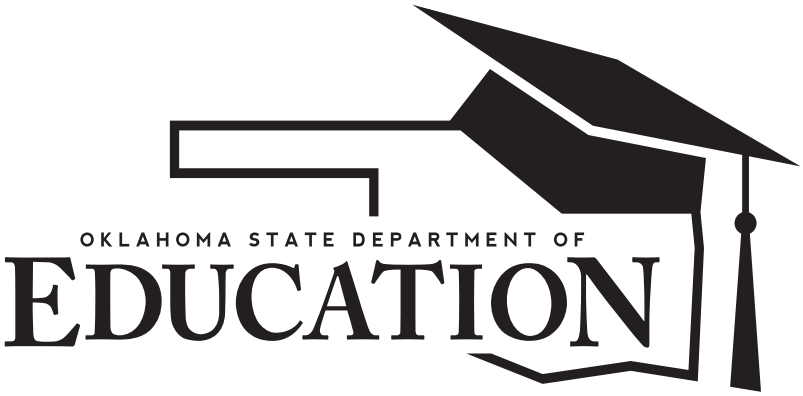

JANET BARRESI

STATE SUPERINTENDENT OF PUBLIC INSTRUCTION

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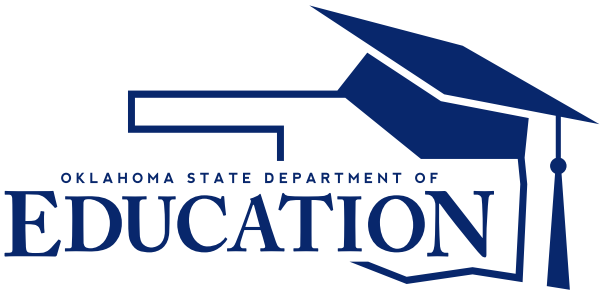

STEM Strategic Report

FOR A STEM STATE OF MIND IN OKLAHOMA

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A Message From State Superintendent **Janet Barresi**

Oklahoma stands poised to play a pivotal role in the nation's future economic turnaround, but only if we can provide a skilled workforce with the knowledge to perform highly technical jobs.

Our state already has a booming energy industry along with aerospace and defense, agriculture and biosciences. Information technology, financial services, transportation and distribution round out the robust list. Yet, I often hear from employers and colleges that our high school graduates must have more science, technology, engineering or math coursework on their transcripts to succeed in these fields. I talk with potential employers often who tell me they have high-paying, entry-level jobs for high school graduates, but they require a strong background of STEM and a college preparatory course of study during high school.

Providing quality STEM education to all Oklahoma students is a critical component to Oklahoma's strong economic future and one of my primary goals as State Superintendent of Public Instruction. It fits with my overall goal of ensuring that every student graduating from an Oklahoma high school by the year 2020 is college, career and citizen ready – C^3 Ready. This plan has the potential to put Oklahoma at the forefront of academic excellence. It is made possible by the vision of lawmakers in our state who have enacted a series of bold reforms. Now comes the hard work of implementation.

I have recruited and hired a quality STEM team with impressive credentials at the State Department of Education to lead the implementation efforts in this area. They have written this strategic plan to ensure all students and parents are made aware of the importance of the STEM subjects and have access to high quality STEM opportunities and instructors.

This strategic plan is evidence of the STEM team working together to create innovative strategies that address the deficiencies in math and science education in our state. It is one of my priorities to ensure that STEM education is a focus of every Oklahoma school, beginning as early as the lower elementary grades. Another high priority is continuing work with Oklahoma's growing CareerTech system and higher education to create a stronger STEM applicant pipeline.

Together, this team has put in place programs such as robotics grant opportunities, K20 Elementary STEM grants, Think Through Math, and other programs that are furthering the offerings of STEM education for all Oklahoma students. I am committed to sustaining all of these efforts and developing more in the future.

In addition, the STEM team is working to revise standards in science and implement new standards in math to ensure our state's students are competitive with students from other states and around the globe. While we must stay true to our Oklahoma values, it is imperative that our students be equipped for jobs in the future. Our goal is to foster the optimal academic environment that will continue to bring high-paying jobs to Oklahoma for an Oklahoma-grown workforce.

Quality K-12 STEM Education is a key component to strengthening the Oklahoma workforce and creating a strong local economy for future generations. Preparing our students for careers of the future is ultimately preparing them for a life of success.

Janet C. Barresi
State Superintendent of Public Instruction
Oklahoma State Department of Education

OKLAHOMA STATE DEPARTMENT OF EDUCATION

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STEM Strategic Report

To ensure Oklahoma students become inspired learners and prepared leaders who can solve the challenges of a world of emerging STEM careers. The Oklahoma State Department of Education STEM Team will provide leadership, support, and resources to allow for the design and implementation of effective STEM learning environments and prepare students to make informed decisions on STEM issues and careers.

To this end, the STEM Team has developed a strategic plan around three goals.

(1) Ensure all students have access to STEM education opportunities;
(2) Ensure all students have access to highly effective STEM educators; and
(3) Leverage the stakeholder resources and partnerships to strengthen the STEM education effort of each school.

These goals are tied to strategies that holistically address the need for a highly educated STEM workforce. Each strategy consists of numerous projects, some of which have been in place previously, some of which are new, and some of which are considered to be bold steps in an effort not only to meet the goals of the OSDE STEM Team, but also to serve as a national model for innovation in STEM education.

Appendix A outlines recommendations made by Governor Mary Fallin's Science and Technology Advisory Council's 2012 Report, which has been reviewed and considered by the STEM Team.

To ensure our vision is realized, indicators of success will be developed to measure:

- STEM Readiness of Graduates;
- STEM Access for all Students; and
- STEM Teacher Recruitment, Retention, and Expertise.

Report Structure

In this report, we have responded to the recommendations made by Governor Mary Fallin's Science and Technology Council (See Appendix A). Three Goals create a framework for the report, seen below in (1) red, (2) orange, and (3) green. Each Goal is supported by multiple strategies which are shown below the goals and listed as A, B, etc.

As the report progresses through each Goal, there is an introduction to the goal that helps clarify its necessity and introduces the related strategies. Subsequently, each strategy is introduced with a title, related projects and expected results.
Related projects are categorized as Bold, New, and Existing. **Only Bold projects are detailed in this report**.

Much research has gone into the development of this strategic plan and, although each report, book, or journal article is not always referenced in the descriptions provided, a Works Consulted section has been provided at the conclusion of the report.

1 Access to STEM Education	2 Highly Effective STEM Education	3 Leverage Stakeholder Support
A Innovative Instruction	**A Teacher Recruitment**	**A Community Partnerships**
B Learning Environment	**B Teacher Expertise**	**B STEM Awareness**
	C Professional Development	
	D Recognition	

*Details not provided in the report.

1 Access to STEM Education

Introduction to Goal 1

It is well known that students who do not have access to rigorous and relevant STEM learning opportunities, whether integrative or in the traditional sense, are less likely to see success in entry-level coursework in a collegiate or work preparation scenario. Equitable opportunities for students across the state, regardless of their geographic location, socio-economic status, structural, digital, or staffing limitations, is a priority and the OSDE seeks to ensure that all students are taught rigorous content, prepared to be active and responsible citizens, are supported when they fall behind or excel, and experience STEM education in relevant and engaging lessons. To this end, the OSDE has developed two strategies, (1.A) Innovative Instruction and (1.B) Learning Environment.

A Innovative Instruction

BOLD PROJECTS

1. Citizenship Standards for Mathematics
2. STEM Blocks
3. Advanced Coursework and Advanced Placement

NEW PROJECTS*

1. Development of New Oklahoma C³ Standards for Science
2. Pre-K Oklahoma C³ Standards for Mathematics and Science
3. Innovative Remediation and Enrichment
4. Exemplar STEM Lessons
5. Next-Generation Assessment Item Bank
6. Defining the T and E in STEM

EXISTING PROJECTS*

1. Oklahoma C³ Standards for Mathematics

RESULTS

- Increased student designations as College and Career Ready according to PARCC and ACT WorkKeys.
- Increased access to College and Career opportunities based on increased ACT/SAT scores.
- Adoption of new Pre-Kindergarten Math Standards and Oklahoma C³ Science Standards.
- Greater variety of remediation services offered by districts coupled with a decrease demand for remediation.
- Increased available funding for STEM-related grants coupled with increased usage of the grants.
- STEM Blocks are adopted statewide as model curricula for STEM courses.
- Increase in proposals for alternative course structures to meet mathematics and science competencies based on Innovation Framework.
- Advanced Coursework rubric used for statewide guidance.
- Increased participation and performance in all STEM related AP courses.

Citizenship Standards for Mathematics

In 2010, the Oklahoma State School Board adopted Common Core State Standards as the new Oklahoma C³ Standards for Mathematics and English Language Arts. Based on the vision of the OSDE to develop students who are College, Career, and Citizen (C³) Ready, the Common Core State Standards fit perfectly as they were specifically designed to increase the focus, coherence, and rigor of the mathematics standards to ensure that students would in fact be College and Career Ready. Noticeably missing is the inclusion of a clear vision for Citizen Readiness in courses other than Social Studies.

The OSDE seeks to remedy this and join a limited selection of states (CEP, 2011) that have adopted the additional 15% standards allowable by the Common Core State Standards Initiative. In fact, Oklahoma may lead the nation as the first state to attempt to create standards that do not just focus on the *what* (content standards) or the *how* (mathematics practices), but also on the *why*. Such standards will create a lens through which mathematics instruction might be contextualized and utilized. This may include conceptual categories such as, but not limited to, Social Justice, Business and Industry; Health and Medicine; and Innovation and Exploration. Domains within each conceptual category will be presented in dialectical terms such as Public vs. Private; Individual vs. Society; Progression vs. Regression; Security vs. Risk, and Form vs. Function.

STEM Blocks

To increase STEM opportunities for students, the OSDE will create statewide partnerships to develop STEM Blocks. The OSDE will work with the Oklahoma legislature to promote a selection of eight semester courses, called STEM Blocks.

These integrated and highly contextualized courses such as Robotics, Environmental Engineering, Energy and Resources, Aeronautics and Astronautics, Biomedical Engineering, Architecture, and others, will align to key STEM concepts that promote the skills that are not only beneficial on the ACT but also in career and college entry. In addition, the OSDE will create an Innovation Framework through which any school might develop their own STEM Blocks that are aligned to the goals and standards of the Oklahoma STEM Education initiative emphasizing rigor, authenticity and student engagement.

At the elementary and middle schools, students will also benefit from STEM Blocks. Structures for STEM courses will provide schools for a vision to replace the traditional mathematics and science structures with STEM Blocks. A STEM Special (elementary elective courses) will be available for

*Details not provided in the report.

schools who are Emerging STEM Schools while Achieving and Innovating STEM Schools will utilize the STEM Block Frameworks to invigorate their mathematics and science courses from Pre-Kindergarten to 8th grade.

Advanced Placement and Advanced Coursework

In an effort to expand opportunities for advance placement coursework, the OSDE will partner with the (1) National Mathematics Science Initiative (NMSI) and explore a (2) Dual Credit Overlay Initiative. The NMSI program works collaboratively with schools and business and industry to encourage students to participate in Advanced Placement courses. Additionally, they assist schools in providing greater support to students enrolled in Advance Placement courses by providing mentors and frameworks for study sessions outside of school hours. Oklahoma initially had two schools in the NMSI program in 2009-2010. In the 2013-14 school year, four more schools will be added to the NMSI cohort.

Students have two options to receive college credit while in high school: dual credit and AP. At present, those two options are mutually exclusive. We propose introducing a Dual Credit Overlay where students would take AP classes at their high school and receive credit at their local community college. Students would be encouraged to also take the AP exam which would, in turn, earn them credit at other colleges. Students then have the option of staying at their local community college or taking their college credit earned by the AP exam to a 4-year college in- or out-of-state.

A focus will be placed on defining rigorous Advanced Coursework at the K-12 levels through the development of a defining rubric. OSDE will lead the efforts of assembling focus groups to create a statewide clear definition of what qualifies a course in any subject area as advanced or honors course. OSDE and district curriculum directors of each subject area will be called upon to work with their consortiums to help create a universal rubric that will provide schools and districts guidance and clarity in advanced coursework.

B Learning Environment

BOLD PROJECTS

1. Authentic Blended Learning
2. STEM Virtual Academy
3. Connected Students

NEW PROJECTS*

1. Fab Labs
2. Online Supplemental Education

EXISTING PROJECTS*

1. Middle School Mathematics Labs
2. Technology Enabled Communication

RESULTS

- Increased number of students who have access to powerful technology 24/7.
- Increasing students choosing to participate in the Oklahoma Virtual STEM Academy.
- Increased students participating in online STEM courses.
- Public presentation of student STEM projects
- Students become STEM scholars through participation in the Oklahoma Virtual STEM Academy.

Authentic Blended Learning

Blended Learning combines online learning with classroom learning and gives students a measure of control over time, place, path and pace for that learning. Authentic learning requires students to focus on tasks and projects that incorporate real-world contexts, have effects outside of school, and are personally meaningful to students. Combining the content delivery and flexibility of time, place, and path aspects of blended learning with the wider real-world contexts of authentic learning results in an innovative approach of Authentic Blended Learning.

An Authentic Blended Learning structure would begin with a foundation built on flexible time. Real-world projects take different amounts of time and how that time is divided in each project can change based on results in the earlier phase of the project. The main focus of this approach is to submerge students into this type of environment that will simulate what students will be experiencing in their post secondary experiences.

Rather than a fixed schedule, the school would have blocks of time set aside for teachers and their students to jointly create time. For example, a portion of the time could be set aside for students to collaborate with each other or with remote partners, as well as to work with online portions of the curriculum. Some of that time might be whole-class meetings with the teachers helping students to understand a difficult concept. Or some of that time might be two or three groups of students sharing their project status and providing feedback to other students.

Staffing needs become flexible, allowing districts to make effective use of their certified staff. Rather than a one teacher to a group of students ratio, one structure could be a team of teachers for a large group of students. Some of those teachers would be master teachers mentoring students as well as newer teachers. As students join projects, a teacher

*Details not provided in the report.

would have primary responsibility for one or two projects and the students in them, but would work with all students on the subject in which the teacher is highly qualified. Creating a school that allows for this flexibility in staffing, scheduling, and teaching requires policy changes.

Authentic Blended Learning is a new approach to learning in Oklahoma that first needs to be developed at the policy level, involving a wide range of stakeholders. The goal is to create an environment where districts can experiment with changes to the structure of schedule and staff. The OSDE will work with stakeholders to create the policies and professional development opportunities that will support schools in such an endeavor.

Oklahoma Virtual STEM Academy

Because of size, many districts in Oklahoma, particularly rural districts, can only offer a few courses other than those required for graduation. Students who wish to explore subjects in depth either are unable to do so, have long commutes to one of Oklahoma's Career Technology Centers, or must attend a residential program at the Oklahoma School of Science and Mathematics. The Oklahoma Virtual STEM Academy (OVSA) will allow all Oklahoma students who wish to receive an exceptional STEM-focused education to do so in their current school. As an academy, the OVSA will designate sequences of STEM Blocks (see previous) as areas of focus, a concept similar to that of a major in college. The STEM Blocks through the OVSA will be primarily virtual courses that students would take online during the regular school day in their own school.

OVSA will be a partnership between OSDE and CareerTech, who will jointly develop the Academy structure and virtual STEM block courses along with input from districts and other stakeholders. As lab work with specialized equipment is an essential part of many STEM subjects, students would occasionally travel to a CareerTech center during an afternoon, evening, or weekend day, to do the essential lab work. OVSA will also provide the oversight and infrastructure to support industry-developed courses, such as the high school courses sponsored by Microsoft as the Microsoft Academy program, or the courses sponsored by Cisco as the Cisco Networking Academy program.

Part of the mission of OVSA will be to provide primarily virtual professional development opportunities for district STEM teachers. The professional development would help STEM teachers investigate and improve their own classroom practice, learn to create and teach blended learning courses, or learn their own subject in more depth.

OVSA will also provide a mechanism for collaborating with Career Tech centers and other states to develop STEM Open Educational Resources (OER) that will be used in OVSA, but are also available to all schools.

OVSA will also be the incubator for teaching and learning using emerging technologies for use in K-12 environments. Such examples now would be incorporating wearable technologies, working with augmented reality, and exploring game-based learning. Rather than treating such emerging technologies as gadgets or novelties, as they too frequently are, the work from the OVSA would show how such concepts can be wisely integrated into teaching and learning.

The success that OVSA has in engaging students will result from effective incorporation of STEM blocks. Student learning will improve as students in all districts will have available a wide variety of STEM subjects that many districts currently cannot afford to offer. District size is no longer a factor.

The National Math and Science Initiative (NMSI) transforms STEM education by focusing on the most critical element in education – teaching

- NMSI's teacher training program for the existing teacher corps provides critical training and resources aligned with Oklahoma C^3 Standards leading to increased rigor for all students.
- NMSI's AP program expands the number of traditionally underrepresented students achieving at high levels.
- NMSI's focus on military families increases AP offerings to high schools in military base districts such as Lawton and Mid-Del resulting in a 112% increase in AP Math and Science Participation and 144% increase in Math and Science Qualifying scores in the first year of implementation.
- The OSDE and NMSI are currently seeking partnerships with more Oklahoma businesses to increase the amount of students taking STEM Advanced Placement courses in high schools across the state.

*Details not provided in the report.

Connected Students

Our schools have a responsibility to assure that students gain skills in content and cognitive domains, as well as preparing them to be citizens in a democratic society and lead in a global society. That society will be filled with ever-changing technology that has opportunities and problems that we cannot yet envision.

This initiative will have four key parts. (1) To encourage the use of student-owned technology, the OSDE will work with the districts to develop policies, procedures, and infrastructure that allow students to use their personal technology devices in school. (2) To ensure equitable access to powerful technology devices, the OSDE will collaborate with stakeholders to develop policies that inform statutory alternatives and funding sources to provide devices for students who truly cannot afford them. (3) To address the effective use of technology, the OSDE will coordinate efforts to provide professional learning opportunities for educators. (4) To address critical issues with broadband access in and outside of school, the OSDE will work with the Offices of Management and Enterprise Services, educators, and the legislature, to develop solutions for access.

Did you know?

OSDE awarded **$100,000 in robotics grants** to 60 schools/teams around the state that competed in four categories of robotics competitions between two separate organizations.

The OSDE and K20 partnership expanded this past year by awarding the first **K20 Elementary STEM grants** to ten elementary schools in Oklahoma.

Oklahoma students that are becoming more algebra ready will have completed over **15 million online math problems** through the OSDE partnership with Think Through Math.

OSDE is developing leaders within math and science education by **launching the first OKMath and OKSci Leadership cohorts** during the summer of 2013.

Because of the support for higher quality and effective STEM education in Oklahoma more and **more STEM opportunities are beginning to emerge** for our students, educators, and parents.

*Details not provided in the report.

2 Highly Effective STEM Educators

Introduction to Goal 2

One of the most significant contributing factors to a student's overall academic success is having access to highly effective teachers. To inspire and prepare students in STEM it is essential that students have access to highly effective STEM teachers. Currently there are not enough certified mathematics and science teachers to fill existing positions and there are concerns that teachers may not have the support they need to be able to provide effective instruction around initiatives like the new Oklahoma C^3 Standards for Mathematics and Science. The OSDE seeks to address factors that may limit student access to highly effective STEM teachers through the following strategies: (2.A) Teacher Recruitment, (2.B) Teacher Expertise, (2.C) Professional Development, and (2.D) Recognition.

A Teacher Recruitment

BOLD PROJECTS

1. STEM Education Recruitment Packet
2. Best Practices Report for Recruiting and Retaining STEM Educators in Oklahoma

NEW PROJECTS*

1. Performance-Based Budgeting to Allow for Compensation Packages

EXISTING PROJECTS*

1. Mathematics Teacher Education Partnership through the Science and Mathematics Teacher Imperative
2. Loan Forgiveness and Teacher Incentive Pay

RESULTS

- Clear statewide initiative to recruit and retain STEM educators.
- Increased use of the Teacher Loan Forgiveness Program and the Teacher Shortage Employment Incentive Program.
- Increased offerings of signing-bonuses and creative compensation packages.

STEM Education Recruitment Packet

To effectively sway high achieving students into the field of STEM Education, the OSDE will collaborate with Colleges of Education across the state to develop a STEM Education Recruitment Packet. It will provide detailed comparative analyses designed to recruit majors, such as finance or engineering to pursue a STEM Certification. Each packet will highlight varying statistics and anecdotes to pique the interests of unique target audience.

Best Practices Report for Recruiting and Retaining STEM Education in Oklahoma

The OSDE will collaborate with research centers and higher education partners to develop a statewide report on the best practices (see The New Teacher Project, 2012) for recruiting and retaining STEM educators, especially in light of new Teacher Leader Effectiveness evaluations and other challenges that face STEM educators.

Such a report will detail data and policy recommendations based on surveys responses from Oklahoma teachers and students in pre-services programs, and various populations of individuals who might consider teaching at some point. School boards, district and state leaders, and colleges of education will be able to utilize the findings as they build recruitment strategies of their own.

B Teacher Expertise

BOLD PROJECTS

1. STEM Master Teacher Corps

NEW PROJECTS*

1. Oklahoma Elementary Math Specialist

RESULTS

- Oklahoma is awarded funding for STEM Corps.
- Increased completion rates at regional universities for Oklahoma Elementary Math Specialists.
- Available incentives for educators with Elementary Mathematics certification.

STEM Master Teacher Corps

The OSDE will apply for the anticipated federal grant program, STEM Master Teacher Corps. The grant provides funding and structures for state's to recruit, reward, and train STEM Master teachers who know and are deeply interested in their subject, care about improving their craft, and inspire both their students and fellow teachers.

Teachers involved in the STEM Master Teacher Corps will be classroom-based educators who are highly effective in improving learning outcomes for their students. They will model outstanding teaching, and share their practices and strategies with professional colleagues to lead and guide improvements in STEM education.

Oklahoma teachers participating in the Master Teacher Corp will be able to collaborate with master teachers from other states and share resources and effective teaching strategies with teachers across Oklahoma. The STEM Master Teacher Corp will serve as another avenue to recognize and reward outstanding STEM teachers in Oklahoma.

*Details not provided in the report.

Oklahoma Elementary Math Specialist

The Oklahoma State Board of Education approved the certification program for the Oklahoma Elementary Math Specialist in February of 2012. Working with the Oklahoma Higher Regents, multiple universities across the state have begun offering courses to elementary teachers as requirements of the certification process with the first scheduled certification exam to take place in the fall of 2013.

Common Core State Standards for mathematics have been adopted by the state of Oklahoma and are in the process of implementation in districts, which will require deeper content and conceptual knowledge and mathematical pedagogy for elementary teachers. Students' success in mathematics is shaped in the elementary grades. However, elementary teachers have typically been trained to be generalists. Professional development does not furnish in depth specialized knowledge required for teaching mathematics today.

The Oklahoma Elementary Math Specialist will provide assistance to staff in grades PK-5 in interpreting data and designing approaches to improve students' achievement and instruction and help ensure that mathematics instruction is aligned with national, state and local curricular frameworks. The elementary math specialist will also provide deep and broad understanding of mathematical content, including the specialized knowledge needed for teaching; solid knowledge of the elementary context; expertise in using and helping others use effective instructional and assessment practices informed by knowledge of mathematical learning trajectories; knowledge and skills for working with educators; and leadership skills necessary to influence and support educational efforts to improve the teaching and learning of mathematics.

C Professional Development

BOLD PROJECTS

1. PD On Your Plan
2. #OK Math/Sci Leadership
3. #OK Math Fellowship

NEW PROJECTS*

1. STEM Summer Academies

EXISTING PROJECTS*

1. Regional Meetings
2. Math and Science Partnerships Grant
3. K20 STEM Grant

RESULTS

- Highly effective STEM educators in every STEM classroom in Oklahoma.
- Increased opportunities for Professional Development
- Increased participation in Professional Development
- Increased capacity in local schools to provide in-house Professional Development.

PD on Your Plan

PD on Your Plan will model authentic blended learning for educators, providing material for cooperative learning among both on-site and virtual professional learning communities. PD on Your Plan will break the mold of traditional professional development overcoming site and district barriers such as geography, communication, department size, and available resources.

As a large scale outreach focused on effective teaching and learning in STEM, PD on your Plan will provide educators with an innovative professional development solution in response to the unique timing, pacing, and location constraints of individual teachers. Technology-enhanced modules will redefine professional development, model effective blended learning practices, and provide educators across the state with opportunities to continually reflect and learn effective teaching practices.

#OKMath/Sci Leadership

Recognizing the extreme need around recruiting and retaining highly effective mathematics and science teachers, the OSDE seeks to create a cadre of highly motivated and innovative educators who will actively contribute to the statewide effort to improve mathematics and science education. Recognizing lack of opportunities for leadership, innovation,

"Now more than ever, teachers need support.
Schools and school districts are beginning to recognize
the important role of the mathematics specialist."

– Fennel, et. al,

*Details not provided in the report.

and autonomy as key factors leading to the low retention rates of our best educators, the OSDE will bring together 30 math and 30 science educators to be empowered leaders within a highly competitive and prestigious professional learning network called #OKMath Leadership and #OKSci Leadership. Each class will last for one year, consist of quarterly meetings, and culminate with a Class Project.

At the 2013 Vision 2020 Conference, 60 educators will join together as Class 0, the pilot classes of the #OKMath and #OKSci Leadership effort. It is imperative that members of this first class are highly motivated, invested in mathematics and science education, desire to refine their educational leadership perspective and capacity, and committed to helping shape the future structure and vision for leadership classes to come.

D Recognition

BOLD PROJECTS

1. STEM Distinguished Scholars
2. STEM School Designation

NEW PROJECTS*

3. STEM Lesson Rubric
4. STEM School Rubric
5. STEM Educator Circle of Excellence Award

RESULTS

- Highly effective STEM educators in every STEM classroom in Oklahoma.
- Increased use of the STEM Lesson Rubric to guide development and evaluation of STEM lessons.
- Increased recognition of schools achieving and innovating in STEM Education.
- Excellent STEM educators and stakeholders are recognized annually.

STEM Distinguished Scholars

The STEM Distinguished Scholars program will provide a comprehensive method for identifying students who excel in STEM areas. OSDE will work with various stakeholders to develop a system for identifying students as STEM-Ready, recognizing those who meet the necessary requirements with a special diploma designation of STEM Scholar.

At an elementary level, students who participate in various STEM activities, in and outside of the formal school day, along with showing potential in STEM according to many various metrics will be determined as STEM-ready. Students, families and schools will be able to make adjustments to learning experiences to increase student progress as STEM-ready. Through middle school, students will be provided with more metrics, such as completing a STEM Shadow day, participation in STEM activities and courses, and achievement, among others. Again, STEM-ready determinations will give students, families and schools information so that instructional opportunities can be modified to support the goals of the student.

In high school, students who actively pursue STEM activities and courses, especially those who successfully complete 10 STEM credits during their four-year high school career will receive the designation as a Distinguished STEM Scholar, providing greater post-secondary opportunities for the student and ensuring colleges, university, and career-preparation programs that the student will be more likely to be successful.

STEM School Designation

The STEM School Designation will be awarded to schools that meet the qualifications based upon a developed rubric by the OSDE STEM team and other focus groups efforts. This rubric will serve as the main source for districts to determine if their schools can have a STEM designation.

Possible metrics that will be considered are staff qualifications, leadership, stakeholder/industry involvement, types of coursework offered, student enrollment in STEM courses, etc. The rubric will also define stages of a school's STEM designation such as determining if a school is in the early, developing or established categories. This strategy has can be used to help enhance other OSDE reforms such as A through F and the newly adopted TLE model.

"Research shows that the primary contributor to making educators effective is continuous, deep learning that builds upon prior learning."

– Postholm

*Details not provided in the report.

3 Leverage Stakeholder Support

Introduction to Goal 3

To increase understanding of the importance of STEM education as well as recognizing it as a powerful economic driver in the state of Oklahoma, it is necessary to create an environment where all stakeholders can engage in deep discussions wrapped around partnership in all STEM educational initiatives. These stakeholders will include respected educators from K-12, Career Tech, and Higher Education; top industry professionals from the five identified economic ecosystems; community members; and state government officials. The primary benefactor of a state wide high quality STEM education movement will be that of industry. It is imperative to have industry's close involvement and participation in the very beginning stages in order to be successful in these efforts. This will be accomplished through the following strategies: (3.A) Community Partnerships and (3.B) Awareness.

A Community Partnerships

BOLD PROJECTS

1. CASMEO
2. National Math and Science Initiative

NEW PROJECTS*

1. Pre-Service STEM Educator Internship

EXISTING PROJECTS*

1. STEM Master's Degree

RESULTS

- Evidence of strong partnerships between OSDE and the STEM Industry.
- Diverse representation on STEM Guiding Coalition.
- Development of Pre-Service STEM Education Internship process.
- Increased participation in STEM Master's Degree programs.

CASMEO

Coalition for the Advancement of Science and Mathematics Education in Oklahoma

This organization is in existence today. It contains stakeholders including representation of K-12, career tech, higher education, business & industry, and local & state government officials. The intention of this stakeholder group is to work to create, promote, and sustain all STEM initiatives in Oklahoma. The goal of CASMEO will be to create a deciding body that fosters an environment of stakeholder collaboration around Oklahoma STEM initiatives. The following five subcommittees have been formed and will be focusing on a holistic approach to all STEM initiatives: (IAC) Industry Advisory Committee (PAL) Policy, Advancement, and Legislation Committee (GEO) Grant, Endowment, and Outreach Committee (SET) Science, Engineering, and Technology Committee (MET) Mathematics, Engineering, and Technology Committee. Each subcommittee has developed a charter to operate within CASMEO. A chair, vice-chair, and committee members will be assigned to each sub-committee.

In pursuit of a much healthier Oklahoma STEM pipeline, CASMEO will work closely with the Oklahoma Department of Commerce generating discussions around the Oklahoma Comprehensive Economic Development Initiative. CASMEO will work to develop strategies for connecting K-12 STEM education to the five identified economic driving ecosystems.

B STEM Awareness

BOLD PROJECTS

1. STEM Marketing Campaign

NEW PROJECTS*

1. STEM Internship Network for Students and Educators

RESULTS

- Students, parents, and communities will have an increased understanding of STEM Education.
- Students, parents, and communities will have higher expectations for STEM Education in their schools.
- Increased number of pathways for STEM internships for students and teachers.
- Increased participation in STEM internships by students and teachers.

STEM Marketing Campaign

A strong emphasis on K-12 STEM education is a vital component to the success of the Oklahoma economy. As STEM-centered industries relocate to the state and offer numerous STEM employment opportunities to Oklahomans, there is an urgent demand to strengthen the applicant pipeline of qualified STEM personnel, leaders, and innovators.

The STEM marketing campaign will deliver the powerful message of STEM awareness building on the cornerstone emphasis of capturing exactly what STEM really is, what experiences lend themselves to STEM, what coursework encompasses rigorous STEM content, and what opportunities can be found in the state to pursue STEM careers. It will serve as a vehicle to communicate to students and parents the incredible STEM opportunities that are available to students in our K-12 system. All messaging that flows through the campaign will begin to lay the foundation for post-secondary STEM experiences either in college or possibly a determined STEM career pathway, strengthening the STEM applicant pipeline in the process.

*Details not provided in the report.

4 Appendix A– One Oklahoma: A Strategic Plan for Science and Technology in Oklahoma

1. Improve STEM teachers' skills and teaching methods

a. Recruit more highly qualified STEM teachers in common education and provide incentives, resources, and assistance to those already teaching STEM subjects by:

i. Establish a career path for teachers.

ii. Creating a system of sign-on bonuses for STEM teachers.

iii. Creating a system of differential pay for qualified STEM graduates.

iv. Creating a system of summer academies for science teachers to learn how to conduct laboratories of practical demonstrations in the classroom.

b. Modernize STEM teaching methods at colleges and universities to reduce the attrition from STEM degree programs.

2. Improve student performance in STEM subjects

a. Establish a "STEM-ready" designation to identify those students who achieve a minimum score on ACT examination.

b. Create a statewide "distance learning" capability.

3. Create a coordinator of STEM programs with the state superintendent's office

a. Develop a STEM strategy at the state level.

b. Create a STEM Education and Industry Advisory Group.

4. Promote STEM education in Oklahoma

a. Establish a system of "STEM communities".

b. The Governor should initiate and lead a statewide marketing campaign to promote "A STEM State of Mind".

Excerpted from: Governor Mary Fallin's Science and Technology Council. (2012). One Oklahoma: A Strategic Plan for Science and Technology in Oklahoma.

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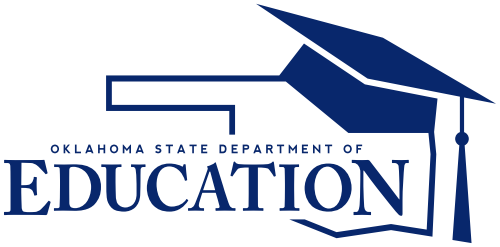
STEM Strategic Report

FOR A STEM STATE OF MIND IN OKLAHOMA



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