Race to the Top
Application for Phase 3 Funding
CFDA Number: 84.395A

APPENDICES - Part II Application

The State of Arizona

December 13, 2011

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ARIZONA'S EDUCATION REFORM PLAN

Arizona's Vision Statement: A future where all Arizona students are prepared to succeed in college and careers and lead this state in the next 100 years and beyond.

OFFICE OF
GOVERNOR JANICE K. BREWER

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Introduction

Background

In 2009-2010, the State of Arizona responded to an opportunity to apply for federal Race to the Top funds designed to support states' efforts to address the nation's four education reform priorities: college and career-ready standards and assessments, effective data use, great teachers and leaders, and support for struggling schools. When Governor Brewer made the decision to apply for Race to the Top funds, she did so with the intention of developing a state education reform plan that would serve as a roadmap to improve Arizona's education system and ensure its students are prepared for the 21st century. With broad stakeholder support, the Governor emphasized that regardless of the outcome of the Race to the Top competitive grant process, Arizona would move this plan forward. Although Arizona was not one of the twelve states who were awarded funds, the quality and soundness of the plan is evidenced by the fact that Arizona was one of 18 finalists in Round II, and only five points away (out of a possible 500) from the winning proposals.

In keeping with the Governor's commitment, shortly after notification of the Race to the Top awards Governor Brewer charged the P-20 Coordinating Council (Council) with examining the Race to the Top Round II proposal to determine what, when and how the major reform initiatives described in the proposal could be implemented. For several months, the Council's Task Force chairs and selected members (P-20 work group) met to transition the Race to the Top proposal into a viable Arizona education reform plan and develop recommendations regarding the implementation of the plan, the governance structure to oversee it, funding implications and the benchmarks to be accomplished. It was not the work of the P-20 work group to digress from the Race to the Top proposal, but rather to reconfirm the vision, goals and initiatives developed for the application Round II and begin to develop a strategic plan to implement them.

Process

The P-20 work group began its work in fall of 2010. Each member reread and revisited the Arizona Race to the Top proposal and the recorded Arizona finalist presentation and panel review available on the USED website. The P-20 work group then used an analysis tool [See Appendix A for Analysis Tool] to take into account several conditions in considering the implications of implementation without Race to the Top funding. Examining the major strategies and activities under each reform area, the Task Force work group considered:

- The feasibility of implementation based on funding opportunities
- Funding potential including the type and name of potential funding sources if none currently exists
- What actions were needed to implement this initiative/strategy e.g., legislation, policy, new governance structures
- When the initiative/strategy needed to be implemented, noting the sequence of efforts that are or may be dependent upon one another
- Who would be primarily responsible for implementation of this initiative/strategy
- The priority/urgency of this initiative/strategy

Rankings were given for feasibility, priority and capacity (high, moderate, low) and rationale was provided to support, clarify and/or explain the group's ranking scores [See Appendix B for Analysis Tool Directions].

The work group then used this data analysis to form recommendations for the larger P-20 Coordinating Council and ultimately, the Governor [See Appendix C for Analysis results]. Once this initial analysis was completed to determine the high priority/high urgency initiatives, the work group then developed a timeline, mapping the high priority items over a four year period; noted those initiatives that were critical for others to occur; and identified critical benchmarks in the four year plan in order to ensure adequate progress.

Underlying Concepts and Assumptions

As a result of discussions throughout the process, the four priority areas were recognized as the four pillars of Arizona's reform plan, with vital support areas (e.g. Regional Centers, STEM, etc.,) being threaded within and across the four pillars. The work group identified the following concepts and assumptions that underlie the recommendations:

1. All four pillars need to be involved in varying degrees for each initiative/task to be successful, recognizing that the four pillars not only support the reform platform, but support each other as well and are interdependent. For example, key elements of the data system need to be in place, as they set the foundation for the entire plan; improving struggling schools will only happen if staffed with highly effective teachers and leaders.

2. The plan requires all P-20 education institutions to support and make needed changes to improve public education.

3. Budget will be an issue. Examine resources across the state budget, as this is not just a K-12 or P-20 issue. Use available funds, along with additional grant opportunities, knowing they will have to be reallocated and repurposed as needed.

4. Each group – K-12, higher education, early childhood –needs to take ownership of their piece of the plan, determining implementation strategies and sharing public accountability reporting with the P-20 Coordinating Council. The P-20 Coordinating Council needs to strongly support the education reform plan that it recommends to the Governor.

5. The plan needs to be reassessed and updated on a regular basis. While the four pillars form the core of the plan, they may not be all-inclusive. This plan will continue to evolve with the implementation phase.

Achieving Arizona's Vision for Education

As it approaches its centennial celebration, Arizona has an opportunity to reflect on its past and look ahead to its future. Arizona deeply respects the entrepreneurial spirit that built the first 100 years of the state's history, and it is determined to preserve that spirit into its second century. Arizona's future will rest on the success of its young people, which in turn rests on current action to transform its education system. The transformation of Arizona's education system will realize the state's vision:

A future where all Arizona students are prepared to succeed in college and careers and lead this state in the next 100 years and beyond.

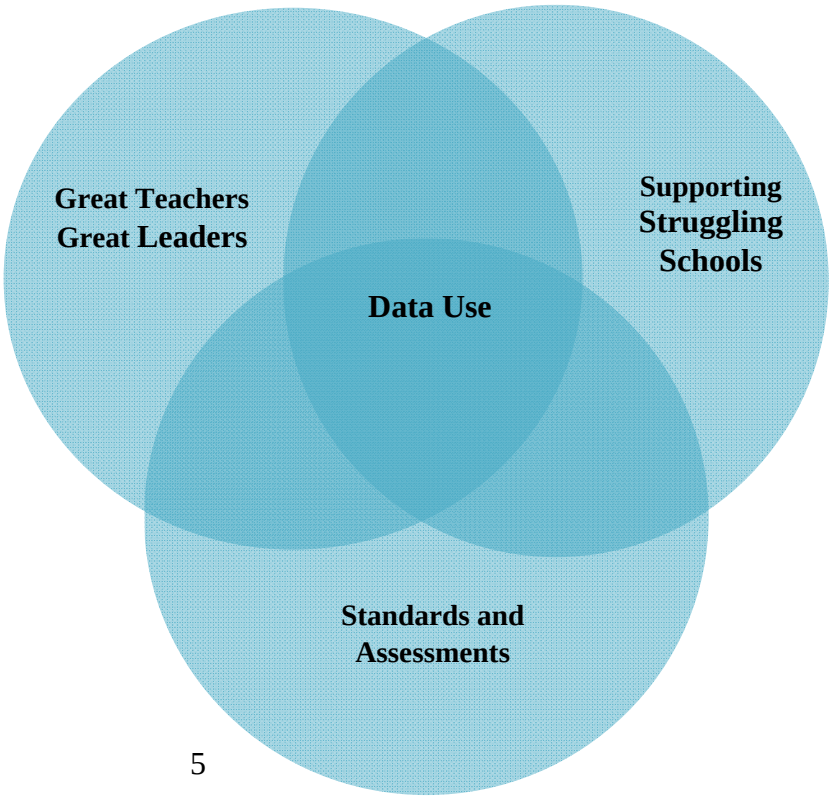
Arizona is building on this innovative, entrepreneurial history of education reform, focusing on the most important priority in improving student learning: ensuring that all students benefit from effective instruction, year after year, in every grade, in every course, in every school, and in every area across the state.

Arizona is drawing on its courageous spirit to realize this strategy, aided by strong leadership and true partnerships among State government, district and school leaders, teachers, postsecondary leaders and faculty, the business community, communities, parents and students.

The guiding force behind Arizona's education transformation agenda is the urgent need to prepare our students to be leaders in a new economy that highly values advanced knowledge and skills, particularly in science, technology, engineering and mathematics. Over the last decades, Arizona has been racing to re-tool itself by building on its economic history – one defined by the "Five Cs" of cotton, cattle, citrus, copper and climate – to develop a new economic base focused on fast-growing aerospace, biotech, computer chip and solar energy industries.

This can be achieved through an integrated educational system designed to drive continuous improvement and built on four foundational pillars: effective data use, strong standards, assessments and accountability, renewed investment to produce great teachers and great leaders and a dedication to the supports needed to improve achievement at historically low performing schools.

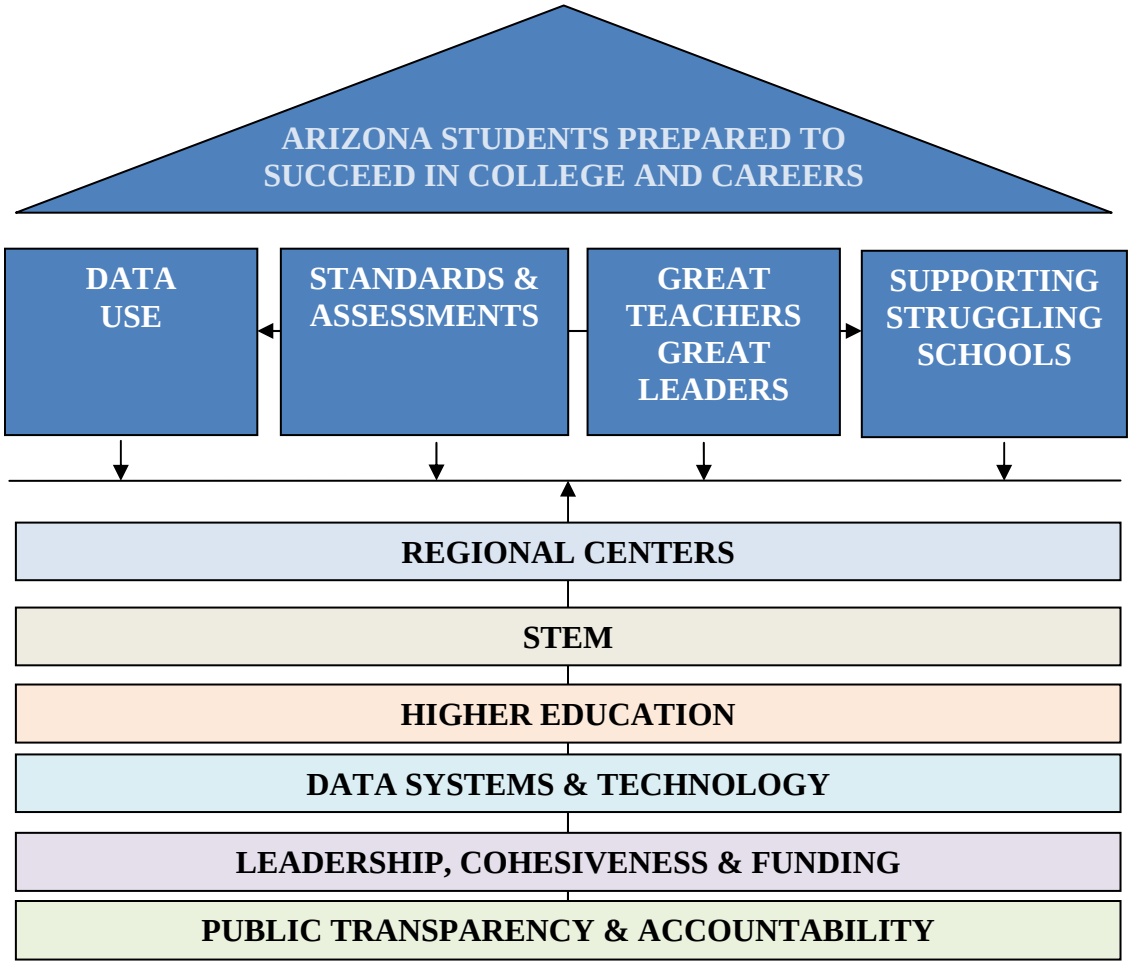
An integrated system is key. The interrelatedness of each of the four pillars is displayed in this graphic.



To address the four pillars, ***a statewide data system is essential***– it provides both the storage and delivery mechanism for key information needed for **data use** by stakeholders. Meanwhile, all schools need ***great leaders and teachers*** *and* ***a solid accountability system*** based on ***rigorous standards and assessments*** to monitor student progress and efficiently identify ***struggling schools in need of assistance.***

Vital supports are threaded within and across the four pillars: **Regional Centers** for training and technical assistance; a focus on science, technology, engineering and mathematics (**STEM**); the involvement of **higher education** to produce strong teachers and leaders who are prepared to work in a standards-based system as well as using new state assessments to determine preparedness of high school graduates for credit bearing coursework; the use of **robust data systems** accessible at all levels as well as use of **technology** in the classroom; a strong commitment from the state in terms of **leadership, cohesiveness, and funding** with **public transparency and accountability**.

Components of Arizona's Reform Plan



The Four Pillars

At its core, the education reform plan is rooted in the idea that before systematic reform can occur it is essential that there be **high quality data systems** to inform instruction, drive innovation and improve accountability. The **data systems** must provide timely and relevant information to teachers, school leaders and policy makers. The use of data to drive instruction must become a cultural given within our schools and inform all of our reform efforts. The system is also required by SFSF and provides a critical and foundational component to the other three areas of the educational reform plan including:

1. Having access to high quality, timely and secure data is a requirement to support the implementation of the other key areas of the AZ Education reform plan, and
2. SFSF commitment requires full implementation of all 12 elements of the SLDS by November 2011.

While high quality **data systems** are foundational to the plan, the plan itself is built on a deceptively simple charge: focus on the effectiveness of **great teachers and great leaders** to improve instruction. It is a given that **great classroom teachers** who are supported by **strong academic leaders** are essential for student success. The reform plan works to tie rewards and accountability to classroom performance while providing more robust professional development to improve **teachers' and leaders' capacity** to grow student learning. Professional development will be particularly focused on maximizing the use of assessment **data to improve instructional practice.**

Working diligently in recent years to align its mathematics and English language arts **standards** with rigorous national guidelines and NAEP frameworks, Arizona moved aggressively to enact even higher standards through the adoption of the **Common Core State Standards** and by joining the **PARCC assessment** group to develop meaningful evaluations of student progress. By 2014 Arizona students, teachers, schools and districts will be assessed on the new common core standards that measure the skills needed to be college or career ready at graduation. **Assessment** efforts will be shaped by discussion and decisions among multiple states including Arizona. This multi-state approach, coupled with Arizona's history of and reputation for high quality state **standards** suggests that the state will meet the timelines we have developed and that Arizona Department of Education resources will be appropriately deployed. Arizona can also anticipate new government funding for development purposes.

While we move to **higher standards and college and career ready assessments**, Arizona's historically **struggling schools** create the biggest challenges and opportunities. Creating a unified and consistent system to evaluate school performance is essential to ensure accountability. In addition, it is critical for Arizona to build a pipeline of turnaround professionals who can jump start education reform in even the most challenging academic environments. Finally teachers, schools and districts will need high quality and convenient assistance delivered through Regional Centers.

Recommendations

As charged by Governor Brewer, the P-20 Coordinating Council, through its P-20 work group, has developed the following recommendations based on analysis of the urgency, feasibility, and capacity to implement the initiatives and strategies outlined in the education reform plan developed through Arizona's Race to the Top application. The recommendations are organized in two groups: those that are specific to the four pillars and those that are overarching. **It is important to note that although a few recommendations must be considered before others can be implemented, they are not listed sequentially or by order of importance; but rather, the recommendations are interrelated, one building upon another**. **The recommendations, therefore, should be viewed as a whole to fully address the systemic nature of these reform efforts.** Notations at the end of each recommendation reference the pillar and the section of the Race to the Top proposal in which the initiatives are described: (B=Standards and Assessment, C= Data Use D= Great Teachers and Leaders, E= Struggling Schools); task numbers reference the priority initiatives/tasks outlined in the reform implementation timeline table that follows.

I. Reform Plan Recommendations: the Four Pillars

Recommendation 1: Create a Statewide Longitudinal Data System (SLDS) governance structure that spans P-20 and beyond. The data system needs to be ready in time for, if not ahead of, the needs of the other priority areas. Additionally, while it may appear that the Arizona Department of Education is solely responsible for the SLDS and that many of the recommendations are focused on the K-12 component of the system, the SLDS must be a data management system that seamlessly links P-12 and higher education with other agencies such as labor, commerce, health etc. That strongly suggests that the ultimate responsibility for developing and implementing the system be the responsibility of a governance structure and leadership that does not reside in only one agency. We also recommend that this work needs to be led by more than the P-20 Coordinating Council and needs a dedicated staff member, at least part-time, to manage the development and implementation of the Data System across the various stakeholders and agencies and across the other three pillars in order to meet timelines and assurances of SFSF [Tasks 1, 5, 6, 18, 19 – C (1) (2) (3)].

Recommendation 2: Expand SLDS reach into the workforce, and support more than P-20. The SLDS that we envision is not just a P-12 system, or even a P-20 system, but rather an integrated data system that also reaches into the workforce, providing access to quality data and meaningful information that not only ensures excellent teaching and maximizes learning and student achievement but also drives and supports success in the workplace, economic development and personal prosperity. [C (3)]

Recommendation 3: Move data systems from compliance to use with a focus on teachers and teacher leaders. Indicative of the inflection point that we are at in moving from data for compliance purposes to the use of good data and information to inform our thinking, planning and decision making, we have given a very high priority to the use of data and data systems by teachers and teacher leaders. [Tasks 2, 3, 4, 8, 9, 10, 15, 26, 27, 33 – C (2) (3), D (1) (2) (5)].

Recommendation 4: ***Ensure that the SLDS links student performance data to specific classrooms and teachers, districts and schools, and teacher preparation programs.*** While the general topic of data gathering, analysis and access is discussed above, it must be emphasized that virtually all of the needs related to Great Teachers, Great Leaders are predicated on the timely, comprehensive delivery of meaningful, actionable data that links student performance to not just district and schools and specific classrooms and teachers but also to specific teacher preparation programs to inform decisions and drive improvement. [Tasks 2, 8, 19, 23, 24, 25 – B (3), C (2)(3), D (2)]

Recommendation 5: ***Make the Common Core State Standards and the accompanying assessment a high priority.*** They are foundational to reform efforts**,** clearly linked to other reform efforts, and critical in meeting student achievement goals [Tasks 11, 12, 13, 14, 21, 25, 28, 31 – B (3)].

Recommendation 6: ***Communicate to LEAs the transition plan from current AIMS items based on state standards to assessments based on the CCSS.*** LEAs need to be clear that the transition is not a redesign of AIMS and there will be several years where the common core state standards need to be taught while the current AIMS tests are given [Tasks 11, 25, 27, 31 – A (2), B (3), C (3)].

Recommendation 7: ***Expand formative assessment tools and development of interim assessments.*** This may be accomplished through IDEAL, the PARCC consortium, current district systems and /or other efforts that will develop as this effort moves forward [Tasks 13, 21, 28, 31 - B (3)].

Recommendation 8: ***Establish the use of educator evaluations to facilitate continuous improvement at all levels of a school.*** More meaningful evaluation tools that are based largely on student achievement will only be meaningful if they are used to drive behaviors and decisions around compensation, promotion and retention of teachers and administrators. They must also drive the allocation of professional development resources dedicated to helping underperforming teachers and administrators improve as well as help excelling teachers and administrators reach their full potential [Tasks 8, 9,15, 27, 29, 30, 33 – A (2), C (3), D (2)(3)].

Recommendation 9: ***Enhance incentives for alternative pathways.*** Central to the goal of increasing the number of effective teachers and administrators in Arizona's public schools is our ability to increase the pipeline of highly capable and highly qualified candidates for those positions. The current environment relies heavily on the schools of education at our three state universities and a handful of private post-secondary institutions. An immediate goal would be to identify any barriers to expanding this range of sources. A longer range goal is to create a "feedback loop" that uses the data generated by a fully implemented evaluation system to provide information to those institutions pointing to the strengths, weaknesses and gaps in their teacher and administrator preparation programs. The potential also exists for leveraging existing alternative sources (Teach for America, Arizona Teaching Fellows, et al for example) through more aggressive public-private partnerships to bring more high potential candidates into the pool, particularly targeting more hard-to-staff subjects and geographic areas [Tasks 14, 15 – D (3)]. 0

Recommendation 10: ***Provide pre-service and new teachers and administrators with meaningful mentorship and induction experiences.*** Student teachers and aspiring principals should have the opportunity to be mentored by successful educators, especially in high needs areas, to ensure that they are prepared for these challenging positions. By the same token, new teachers and administrators should have access to strong induction programs. Several exist and should serve as models for expansion [D (3)(5)].

Recommendation 11: ***Provide incentives for highly effective educators to work in struggling schools.*** One of the highest priorities for improving student outcomes is to ensure an adequate supply of teaching and leadership excellence and expertise to our most challenged schools and students most in need. Targeted strategies around incenting highly effective educators to work in these schools on both a short term (as part of a turnaround team) and long term (as permanent staff) basis have been suggested ranging from financial incentives including stipends and/or student loan forgiveness, specialized programs such as "grow your own" teacher recruitment and development, and targeted public-private partnerships. Several exist and have the potential to be expanded with relatively modest increases in invested resources [Tasks 4, 15 – D (1) (3)].

Recommendation 12: ***Grow a cadre of turnaround experts at the teacher, principal, and district levels through a turnaround leadership training program that coordinates various leadership training opportunities.*** This is one of the most challenging projects for the state but also the most important, and is essential to changing the culture and performance in historically underachieving schools. This can be done through a turnaround leadership training program specifically designed to prepare educational leaders to work in failing schools. While the early efforts of building this cadre of turnaround specialists will be focused on the most severely struggling schools, the long-term goal is to have a wealth of expertise at the state and local levels so performance declines can be mitigated as quickly as they are detected. In addition, many of the turnaround specialists can train other education professionals, further increasing the pipeline. These specialists can also help districts develop this turnaround and educational improvement capacity themselves. There are a number of leadership initiatives being implemented; however, they are fractured and may be duplicative in certain areas. We believe that it is integral to get the various groups working on leadership issues to come together for a common vision, share resources, and focus [Tasks 15, 17, 22 – D (3), E(2)].

Recommendation 13: ***Create a unified accountability system.*** Arizona has a disjointed accountability system that needs consolidation so that all Arizonans have a clear understanding of the status of their school achievement. The current system relies on one set of performance data under Arizona Learns, another set of measures under NCLB, and now a set of standards under the Persistently Low Achieving schools under the federal SIG grants. Combine these with the new school labeling statute and it creates multiple and potentially contradictory measures of performance. In order to effectively manage and improve performance, the measures used to benchmark performance must be stable and understandable. The current system of multiple measures creates confusion and weakens the ability of the state to accurately discriminate performance [Task 16 – E (1)].

Recommendation 14: ***Evaluate the need to modify the academic receivership statutes to ensure that the state has sufficient remediation authority at the school and district level***. While ADE has school improvement teams in place and has ramped-up turnaround principals trainings

through AZ Leads and ADE, more aggressive receivership options may be needed. We anticipate that the most aggressive receivership options would only be used sparingly [E (1)].

II. Overarching Reform Plan Recommendations

Recommendation 15: ***Support Arizona's Education Reform Plan through reallocation and multi-purpose funding.*** We must fund this work from multiple perspectives and sources, ensuring little to no duplication of effort and expenditures. Considerations include:

- Reviewing existing state level funds that can be utilized.
- Reviewing other significant bodies of work, currently funded, that require strong data systems, as "multi-purpose" funding opportunities. For example 1) LEA's plans to allocate funds to develop and enhance their data systems, 2) Multiple ASU Teacher effectiveness projects (PDS, TAP, NEXT), and 3) Maricopa County REIL (Rewarding Excellence in Instruction and Leadership). The extent to which elements of these plans can be used as models or "lead vehicles" for needed elements of the state system should be explored.
- Reconsidering how current funds are being used and reallocate, particularly where current investments are not getting desired results.
- Making connections with other organizations across the education and workforce-economic development enterprise. Ensuring that these connections are at least comprehended in our long range plan may also give us the opportunity to apply for funds from state and federal level agencies like Commerce, Labor and Economic Development.
- Seeking new funding, both public and private, wherever feasible

Recommendation 16: ***Create Regional Centers to address and support LEA capacity issues.*** Successful implementation of these initiatives will ultimately rely on what occurs at the LEA level. As noted in the work team's analysis, capacity issues must be addressed. "Some," as contrasted to "most," LEAs may have the capacity for implementing standards, assessments, educator evaluation systems and instructional improvement. The Regional Centers are seen as important delivery structures for locally accessible professional development and technical assistance on these high priority initiatives that need to be implemented state-wide. Coordinated support from ADE in cooperation with Regional Centers will provide a more efficient and effective approach to systemic reform efforts [Task 33 – A (2), C (3)]. This system should address as its focused priorities:

- Support to LEAs in transitioning to the common core standards and assessments. Support and assistance in curriculum alignment, standards based instruction and use of interim and formative assessments will be critical to both teachers' teaching and students' learning.
- Training and support for Arizona's SLDS and effective data use. Professional development is critical in supporting the implementation of the Arizona Growth Model, using data to inform instruction as well as the new performance review process for teachers and leaders.
- Implementation of educator evaluation systems. SB1040 requires that individual teacher and administrator evaluations be based at least 33% (and up to 50%) on student performance data with observational data and other factors accounting for the remainder. Considerable training and support will be required to effectively implement a new

evaluation system and manage the cultural change that will predictably follow in many public school environments.

- Support and assistance for struggling schools. On site assistance to struggling schools will support school efforts to improve and close achievement gaps.

Recommendation 17: ***Engage higher education at a deep level in the implementation of the Arizona reform plan.*** Colleges of Education, along with other providers of teacher pre-service programs, play a lead role in preparing a new teacher. A strong commitment from higher education will be needed to ensure pre-service programs prepare teachers to teach in a standards-based system. In addition, the PARCC assessment, of which Arizona serves as a Governing state, includes a college-ready assessment intended to be widely accepted by higher education institutions as a good indicator of a student's readiness for college-level courses. Higher education will need to be actively involved in the assessment development to ensure that happens [Task 14 – B (3)].

Recommendation 18: ***Establish, monitor and report performance measures and benchmarks that are public and transparent.*** Metrics and trajectories for student achievement have been set and will need to be monitored in order to meet identified targets at the transition years, Grades 3, 5, 8, and 10. In addition, performance measures and benchmarks need to be established for the initiatives in the plan. Public transparency and accountability will be necessary to ensure the plan is moving forward and progress is being made [A (2)].

Recommendation 19: ***Clearly articulate the role of the P-20 Coordinating Council in implementing Arizona's education reform plan***. If one considers governance across the P-20 continuum and with an understanding of the statutory authority embedded within each of Arizona's education sectors, it is without question that the Governor plays the leading role of "owning" the vision, i.e. articulating how Arizona will be transformed by systemic reform, along with the urgency and criticality of pursuing the same. The Governor is in a position to provide greater public transparency of progress on the systemic reshaping of Arizona's P-20 continuum through the timely reporting on key metrics. The Governor, in her role as the state's chief executive, is in a position to articulate education priorities reflecting a P-20 perspective through her use of the "bully pulpit", executive order, and/or legislative/budget agenda.

The P-20 Coordinating Council should continue to play a leading role in supporting the Governor's vision of education. It is recommended that as the current Council moves from a focus on transitioning Arizona's Race to the Top application to Arizona's education reform plan heavily focused on the critical role of the state's K12 system, the Governor in consultation with the Council should engage in the following:

1. Establish the mission of the P-20 Coordinating Council with consideration of the following:

    - Continue serving as an advisory council to the Governor;
    - Communicating/coordinating efforts within and across education sectors, which may include the establishment of broadly-stated P-20 goals and objectives while recognizing the role of each education sector in developing its own goals and objectives in support of the state's P-20 vision;

- Advocating for the shared reform plan to all stakeholders and constituencies;
- Strategically connecting the purpose and reshaping of education efforts to non-education key stakeholders;
- Reporting to the Governor progress on key P-20 metrics;
- Identifying areas warranting further review/analysis;
- Establishing accountability measures to inform the Council's work, which may include convening ad hoc committees and/or authorizing ad hoc research or reports; and,
- Assuming a leading role in developing strategies to support the long-term viability/sustainability of coordination, collaboration across Arizona's P20 continuum.

2. Develop in light of an agreed upon P-20 Coordinating Council mission:

- Proposed membership with the expectations of members clearly articulated, for consideration by the Governor;
- Council protocols for managing and evaluating its work, including process for establishing standing and/or ad hoc committees; and,
- Measures to be used by the Council to assess its own progress in meeting its stated mission.

Table I

Summary Table of Recommendations

The following table summarizes the relationship of the recommendations to the four foundational pillars of the reform plan.

Recommendation	Data Use	Standards and Assessment	Great Teachers and Leaders	Support for Struggling Schools
1	x			
2	x			
3	x		x	
4	x	x	x	
5		x		
6	x	x	x	
7		x		
8			x	
9			x	
10			x	
11			x	x
12			x	x
13				x
14				x
15	x	x	x	x
16	x	x	x	x
17	x	x	x	x
18	x	x	x	x
19	x	x	x	x

Table II. Arizona Educational Reform Task/Timeline: Four Year Implementation Plan – High Priority Tasks*

Tasks	Year 2011				Year 2012				Year 2013				Year 2014			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1. Establish Data Governance (C(2)1.2	★															
2. Provide authorized users with single sign-on access to student-level data. C(2)1.4	★															
3. Implement Instructional Improvement Systems: Survey LEAs to identify instructional improvement systems currently in place and determine satisfaction C(3)(i)1.1	★															
4. Develop process for monitoring, evaluating, and identifying areas of effective teacher and principal shortages; prepare teachers and principals to fill these shortages D(1)(iii)			★													
5. Enhance access privilege components to authorized researchers. C(3)(iii)3.2								★								
6. Establish a research agenda consistent with AZ reform initiatives and student achievement goals C(3)(iii)3.1								★								
7. Conduct data capabilities analysis																
8. Establish a clear approach to measure student growth D(2)(i)																
9. Develop a consistent, rigorous, fair and transparent educator evaluation system D(2)(ii)																
10. Improve existing systems based on data capabilities analysis, e.g. data dashboards and tools (state, parent/teacher, leaders) C(2)1.2																
11. Implement transition plan to enhanced standards by implementing the common core, B(3); B(3)																
12. Align curriculum to common core standards and other state standards. B(3)1.1																
13. Participate in consortium of multiple states to develop high-quality balanced assessments system aligned to the common core B(3)2.1																

*Priority Score 1= High Need: This is a high need project and critical to Arizona's education reform plan.

LEGEND

☆ **= One Time Event Completed**

★ **= Regional Centers**

Reform Pillars (colored bars): **State Data Systems "Blue"** **Great Teachers and Leaders "Green"** **Standards and Assessments "Red"** **Struggling Schools "Yellow"**

Table II: Arizona Educational Reform Task/Timeline: Four Year Implementation Plan – High Priority Tasks*

Tasks	Year 2011				Year 2012				Year 2013				Year 2014			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
14. Engage institutions of higher education to support transition to and implementation of common core standards and assessments in teacher preparation and continuing education programs																
15. Staff high need schools with highly effective teachers D(3)(i) D(3)(ii)																
16. Consolidate state's accountability statutes, including establishing state's remediation authority at the school and district level E.1																
17. Support persistently low-achieving schools (SIG) E(2)(ii) 1.1																
18. Enhance data quality, access and utility. C (2) 1.2																
19. Meet America Competes Act elements: additional 5 of 12 elements to enhance quality, access and utility C(1)(i)																
20. Provide training and support to LEAs to use data: Convene leading districts to collect and share lessons learned. C(3)(ii)2.1; connect protégés with mentor LEAs C (3) (ii)2.2																
21. Develop new items and forms for the current AIMS that align with common core B(3)2.3																
22. Build a turnaround pipeline of highly specialized educators E(2)(ii)1.2																
23. Implement Instructional Improvement Systems: Provide system quality standards and guidance to LEAs C(3)(i)1.2																
24. Build infrastructure in rural/high poverty areas. C(2)1.3																
25. Maintain and increase ongoing communication to promote use of assessment results to enhance learning. B(3)2.2																
26. Conduct annual evaluations of teachers and principals that provide timely and constructive feedback and reports of student growth. D(2)(iii)																

*Priority Score 1= High Need: This is a high need project and critical to Arizona's education reform plan.

Table II. Arizona Educational Reform Task/Timeline: Four Year Implementation Plan – High Priority Tasks*

Tasks	Year 2011				Year 2012				Year 2013				Year 2014			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
27. Provide teachers and principals data informed induction, professional development, coaching and common planning and collaboration time D5(i)																
28. Expand and/or develop formative and interim assessment systems B(3)2.5																
29. Measure, evaluate, improve supports by incorporating evaluation results into the above strategies.																
30. Use evaluation results to drive decisions including professional growth, compensation, incentives, advancement and dismissal D(2)(iv)																
31. Transition to enhanced high-quality assessments. B(3)																
32. Ensure implementation of common core standards with fidelity. B(3)1.4																
★ = Regional Centers																
33. Regional Centers: • Release RFP for Regional Centers and make awards. • Hire and train center a coordinator and 4 specialists for each center: standards and assessment, data use, educator evaluation, struggling schools. • Center staff, in coordination with ADE, provides training to LEAs. • Center staff, in coordination with ADE, provides assistance to LEAs to implement key initiatives (common core standards and assessments, data use, educator evaluation systems and support for struggling schools).																

*Priority Score 1= High Need: This is a high need project and critical to Arizona's education reform plan.

See Appendix D for implementation details for each of the tasks/initiatives listed.

ARIZONA STEM NETWORK

BUSINESS PLAN

DRAFT

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OVERVIEW: THE MISSION

It is time for a bold plan and inspired action that can transform Arizona education and dramatically escalate the state's economic trajectory. That means breaking from the status quo. That means pursuing ambitious solutions that are not hindered by a failure of strategy or an inability to execute. This will take the right resources and motivated, proven partners. It demands vision, competence and an unwavering commitment to excellence.

We believe that we have arrived at a singular moment to accomplish this through the combination of Science Foundation Arizona (SFAz), the Helios Education Foundation and others who share our desire to dramatically improve outcomes for kids in Arizona. SFAz offers a proven track record of innovation and success, a uniquely qualified staff and a Board of Directors that is world renowned for its expertise and experience in science, technology, engineering and mathematics (STEM) research and education. Helios offers a unique dedication to transforming education in Arizona and enriching the lives of Arizona's students and families from early grades through college. Together we have the opportunity to reframe and reshape our state's future.

Let's begin now.

With the central objective of creating a globally competitive education system that gives Arizona's students an opportunity to succeed, this plan outlines the role of the Arizona STEM Network to help build a common agenda for STEM education and strategically reach more students and teachers at an accelerated rate. Achieving this will demand a combination of grass roots participation, statewide coordination and alignment of resources across a broad spectrum of government, education, business and philanthropic interests. This plan -- which draws on input from across Arizona's 15 counties, involving more than 800 participants from education, business and government -- is organized around four Strategic Platforms. These Strategic Platforms focus on the overarching goal of supporting the successful implementation of the state-adopted, internationally-benchmarked Standards and Assessments to produce results and help students reach the high bar set in Arizona that truly prepares them for success in the 21st century work place.

The platforms are organized around (1) integrating STEM into schools throughout Arizona; (2) strengthening teacher effectiveness and supports for quality STEM learning; and (3) establishing understanding, support and participation of business and industry for the higher standards and assessments. These activities are underpinned by the need to capture and manage knowledge in a more sophisticated and useful way to help all teachers, students, administrators, families and funders understand the impacts of their efforts.

INTRODUCTION

Arizona must have in place a globally competitive education system to prosper in a rapidly changing and increasingly demanding global economy. This will require significant advancement in science, technology, engineering and mathematics (STEM) education. Achieving this is neither easy nor quick and it poses a major challenge to a system not yet

equipped to provide students with the skills and knowledge they need to succeed in today's global economy.

Starting in 2008 with a commitment from Freeport-McMoRan Copper & Gold Foundation and then-Governor Janet Napolitano, Science Foundation Arizona (SFAz) began an initiative to improve student outcomes and advance Arizona's economy by focusing on STEM education. The SFAz STEM Initiative resulted in more than $18 million in STEM education grant programs for K-12 and community colleges and another $18 million for graduate students to create a competitive edge for our research universities and build a pipeline of science and engineering talent. Through a highly competitive grant process and guided by the SFAz Board of Directors, those investments produced cutting-edge models for STEM teaching and learning, impacting hundreds of thousands of students. Yet, those investments, along with significant investments by other organizations, were made without coordination, and lacked a means by which to measure overall student outcomes. Most importantly, Arizona had yet to see measurable gains in improving student achievement.

Acknowledging the need for coordination and prioritization, Governor Jan Brewer asked SFAz to create an **Arizona STEM Network** that would unify and align resources around STEM education and more rapidly prepare students to meet the challenges of college and 21st century careers. Helios Education Foundation joined the effort, as did other education champions, including JPMorgan Chase, Intel Corporation and Research Corporation for Science Advancement. The objective: Create a plan that captures the urgent need and ignites a sharper and more expansive attack that will last.

THE ARIZONA STEM NETWORK

The purpose of the STEM Network is to provide access to effective STEM education opportunities for all Arizona students that prepare them for success in careers and life and bolster the economic strength of local communities and the state. The Network strategically leverages individual, disparate efforts around STEM education and moves them toward a common agenda that will accelerate improved student outcomes. That common agenda must be tied to internationally benchmarked standards and assessments.

Arizona and the Nation are at a critical juncture. For the first time, states have agreed and adopted a set of common standards in mathematics, language arts and, in the very near future, science. These standards present an opportunity for students, regardless of where they live or happen to have been born, to achieve at levels that are competitive internationally and it is our job to help Arizona and the kids here achieve those levels successfully. To do less would be a missed opportunity and a great disservice.

A successful STEM Network is a combination of grass roots participation, statewide coordination and alignment of resources across a broad spectrum of government, education, business and philanthropic interests -- supported by a common culture of achievement that will help students achieve at the highest level under new Standards, assist teachers deliver coursework to get them there, and mobilize business and community interests to support them.

The following are the overarching GOALS and metrics of the STEM Network:

- **Align and support the successful implementation of the internationally benchmarked, state-driven Common Core Curriculum and Assessments.**[1] *Awareness around the substance and importance with common language; fluency of administrators and teachers; and visible support for increased standards by business.*
- **Increase math and science achievement for all Arizona students**. *Improvements in NAEP scores.*[2]
- **Establish STEM as a priority in communities across Arizona**. *Number of schools and districts integrating STEM learning; percent of school and district budgets spent on STEM; increase in business participation with schools; support and participation of business and other private sector partners in STEM.*
- **Improve coordination and information management to accelerate replication and scale of best practices.** *Development of a robust knowledge management system with key metrics to track and measure impacts; number and pace at which proven STEM practices are integrated into schools.*
- **Increase the number of students graduating with STEM credentials and degrees at the post-secondary level**. *Number of STEM credentials and degrees.*

BUILDING THE PLAN

A STEM Network plan that can be truly embraced by multiple stakeholders needed for successful implementation requires broad public consensus. Over the course of a year, SFAz built this plan carefully and strategically to reflect real solutions to real issues presented by a broad spectrum of interests. Building from the SFAz Board and STEM Advisory Council, SFAz STEM staff organized Expert Work Groups to dive deeply into important policy and practice issues that have either prevented or promoted the realization of improved student outcomes in STEM[3]. A National STEM Forum was convened to learn from experts in states across the country that had created similar networks and organizations. Exemplary leaders and teachers throughout Arizona provided consultation on effective practices for integrating STEM into schools and classrooms that raise student scores and levels of engagement.

Working across Arizona's 15 counties, SFAz STEM staff conducted a series of town-hall style meetings, involving more than 800 participants from education, business and government sectors, to gather input and better understand the current education and economic development landscape and how communities perceive STEM. A SWOT analysis and outreach summary was completed for each county. (*See* Attachment 1 for the complete

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[1] The Common Core State Standards provide consistent and clear measure of college readiness benchmarked to international standards. The standards are designed to be robust and relevant to the real world, reflecting the knowledge and skills that our young people need for success in college and careers. With Arizona students fully prepared for the future, our communities will be best positioned to compete successfully in the global economy.

[2] Because NAEP is administered every two years with a random sampling of students, this section will be amended and tied to the new assessments developed through Common Core Mathematics and Science standards as they are implemented in Arizona to better measure individual, school, district and regional achievement annually.

[3] Funders to the planning effort, Freeport-McMoran Copper and Gold Foundation, Intel, Helios, JPMorgan Chase and Research Corporation, assisted.

Outreach Summary). This outreach revealed a dire need for ongoing support and relationships with SFAz and the state, particularly in rural and remote areas. It also exposed a significant desire to pursue STEM activities in schools; build stronger partnerships with local businesses and between higher education and K-12; have access to substantive information on how to integrate STEM education into classrooms; and coordinate multiple initiatives all aimed at improving education.

An important result of the outreach was the elevation of STEM as a core pillar of the Governor's Education Reform Plan (now labeled "Arizona Ready").[4] And, SFAz was asked to join the Governor's Office of Education Innovation, the Arizona Department of Education and County Superintendents to implement a key component of the Reform Plan -- the development of Regional Education Centers to hasten improvement in STEM education at the local and regional level.[5]

ORGANIZATIONAL STRUCTURE

The Arizona STEM Network will be an integration of schools, families, higher education, business, industry, elected officials, tribal officials, philanthropy and foundations -- with SFAz STEM staff serving as the operational management hub to bring focus and commitment to achieving the stated goals. While networks have been viewed historically as flat, self-organizing, completely interdependent entities, case studies of successful networks demonstrate that the effectiveness is based, in part, on the extent to which the network was coordinated centrally through a core agency (Provan and Milward 1995).

SFAz will function as the leader, facilitator and hub for the STEM Network, taking advantage of its brand recognition, Board and finance management expertise supported by a STEM staff with a broad range of policy, program and academic experience. SFAz's Vice President, Darcy Renfro, will serve as the Director of the Arizona STEM Network and additional staff will be added to support the Network plan. (*See* Attachment 2 for the STEM Network Staff outline) Funding decisions will be managed collaboratively and with direction from the STEM Advisory Council. The current STEM Advisory Council will be repurposed with three missions (business and industry, teachers, and fundraising) whose members will be determined based on the needed expertise. (*See* Attachment 3 for the Advisory Council explanation). In addition, the SFAz STEM staff is working to develop a comprehensive Messaging Strategy, inclusive of branding, communications and the Business Plan rollout activity. (*See* Attachment 4 for additional detail).

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[4] As identified in Governor Brewer's Education Reform Plan, "Arizona Ready" reform goals include: Increasing the percent of third graders meeting state standards in reading from 69% to 94%; increasing the high school graduation rate from 75% to at least 93%; increasing the percent of eighth graders achieving at or above basic on the National Assessment of Educational Progress (NAEP) from 67% in to 85%; and doubling the amount of students receiving baccalaureate degrees. These goals are consistent with the STEM Network goals.

[5] *azgovernor.gov/dms/upload/PR_011811_**Arizona**Edu**ReformPlan**.pdf*

THEORY OF CHANGE

Both in our state and nationally, the lessons learned from investing billions in searching for "silver bullets"[6], proofs of concept and program development have yielded few actual improvements. Too many programs have suffered from lack of scalability and sustainability, resulting in very few models achieving a critical mass of support and achievement. The solution requires more than just money, good ideas or high-powered incentives. Arizona, SFAz and other investors in education must reframe and align efforts to create a **culture of achievement**: A culture that values performance, embraces high expectations and high standards (i.e., Common Core Standards), cultivates the ability to transfer knowledge from one school to a large number of districts, builds teacher and leader excellence and capacity and fosters the will and determination to not only implement but continue to support performance objectives that can create a competitive edge for Arizona's future.

STEM education is an intra-disciplinary approach to learning that provides project-based and relevant experiences for students. STEM challenges students not just to "know" and "learn" but also to "do". In the context of broader education reform, STEM is a vehicle for improving education outcomes not only in math and science but also in language, social studies and art. "STEM" means to employ a method of teaching and learning that goes beyond mere transfer of knowledge – it aims for a deep understanding of subject matter and its implications in answering questions and solving problems of local and global importance.[7]

The Arizona STEM Network plan shifts from randomized, high-dollar grant programs to targeted efforts that embed STEM education into schools, districts and communities throughout the state, focusing on replication and scale of models with evidence of success. As such, SFAz will no longer fund STEM programs based its the original financial model. Instead, Network investments will be leveraged across multiple sources and demand integration of STEM into classrooms, schools, districts, budgets and cultures. A high value and focus will be placed on implementation and execution within the schools, with specific outputs that help Arizona children be successful in school, careers and life. (*See* Attachment 5 for Funding Model).

The Arizona STEM Network is built around the following STRATEGIC PLATFORMS that are "operationalized" through specific actions designed to support the implementation of the Common Core and create critical mass behind producing Arizona students who are college and career ready. The strategic platforms are:

1. <u>Develop knowledge management tools</u> to enable access to quality information, enable real-time interventions to target critical focus areas, and provide a strategic means for scaling and replicating programs and curricula that improve student outcomes.

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[6] Newsweek/ICT study [May 2011] on the $4 Billion dollars invested in education on behalf of Gates, Dell, Walton and Broad foundations have resulted in minimal improvements to education in the last decade. There is no one answer- including large infusions of funds- to improve educational outcomes.

[7] The Common Core Standards and Assessments are consistent with this definition and will require teachers have more content knowledge and more context to enable students to "do" in science and math.

2. Integrate STEM learning in schools by bringing together teachers, administrators, families, elected leaders, civic groups, colleges, businesses and industry to build common agendas for educational excellence and implementation of Common Core curricula.
3. Strengthen teacher effectiveness by improving STEM content and pedagogical content knowledge of pre-and in-service education programs, improving access to expertise, tools and training that will help teachers meet Common Core standards, and filling critical STEM gaps in schools.
4. Create the opportunity for Businesses to meaningfully engage in education and build critical support for higher standards and assessments as a business necessity.

The overall success of this plan depends on an integrated approach that recognizes the importance of each of the parts. (*See* Attachment 6 for a Timeline for Implementation.) Each piece and player within these platforms has a critical role in implementing, teaching, and supporting internationally benchmarked, college ready STEM standards and curriculum. To remind, if Arizona is to truly shift its economic trajectory and invigorate its prospects for global relevance, the goal is nothing less than a change in consciousness -- a renewed belief in the state's potential for excellence on a global scale. Achieving this will require an "all hands on deck" commitment. The Arizona STEM Network and the strategies proposed in this plan are but one, albeit very important, component of a larger, "Expect More Arizona" and the Arizona Education Reform efforts needed to change the status quo and inspire a new culture of excellence and achievement where first-rate education is fully recognized as Arizona's highest priority. (*See* Attachment 7 for information on related efforts).

ARIZONA STEM NETWORK – WORK PLAN

Within each Strategic Platform are specific actions for implementation that will guide the work of the Arizona STEM Network for the next five years.[8] These platforms offer a framework to put in place a coherent and comprehensive STEM system that will help Arizona achieve short- and long-term goals for improving student outcomes and strengthening local economies. (*See* Attachment 8 for Network Systems Model).

PLATFORM 1 – KNOWLEDGE CAPTURE AND DISSEMINATION

Underlying this entire plan is the recognition and desire to create a means to communicate, measure, improve, use and reuse quality information, models and data to limit so much of what we have done in the past – recreate the wheel. So much is lost in the space between what we do and what we know. Often we fail to recognize and capture what works; and often we lack the tools to determine exactly what needs to be changed. But this can and must be done. While hundreds of STEM activities are happening in Arizona already, what is sorely needed is a means to create, capture and analyze information toward improvements, replication and scale that will increase the return on investment of both public and private dollars. The STEM Network needs an intentional approach to knowledge management that will strategically accelerate our efforts.

[8] This plan contemplates ongoing evaluation toward improvement and adjustments made in Years 3, 4 and 5.

Knowledge Management is the process by which the STEM Network creates, captures, acquires and uses knowledge and evidence to improve Network and Network partner performance. Working with technology specialists, SFAz STEM staff will develop and support data analytics and a technology infrastructure for management of knowledge throughout the STEM Network. The result will be an innovative system for capturing and disseminating the right knowledge from the classroom level all the way to state and federal policy level, enabling real-time improvements as well as scale and replication. With input from Network funders, key stakeholders and technology specialists, SFAz STEM staff will develop a performance management system to track key performance indicators and other measurable data for the Network. This makes possible continuous improvement necessary to generate meaningful and accurate outcomes for programs and operations.

Outcome: A successful Arizona STEM Network could serve as a viable model for an active knowledge capture and dissemination infrastructure to advance and sustain state and national education priorities. It will put data and technology together in ways that become a solid basis for real-time, re-tooling supports, improving delivery and developing more systemic interventions at the school, community and Network level.

Metrics: *Produce a robust knowledge management system with key performance indicators to track and measure impacts; increase number and pace at which proven STEM practices are integrated into schools.*

PLATFORM 2 – INTEGRATE STEM INTO SCHOOLS

To be truly sustainable and bring effective approaches to scale, STEM needs to be integrated into schools from top to bottom with the active involvement of parents, teachers, principals, trustees and local leaders. For this to work, there must be a local common agenda to drastically improve student outcomes in STEM using proven strategies and methods. With priority on rural and remote areas where needs are most urgent, SFAz will provide and align tools, technical assistance and resources for integrating STEM through the following interrelated actions:

A. Work with the Governor's Office and Department of Education to extend STEM expertise through Regional Centers for education that will become part of a statewide infrastructure and points of connection for the STEM Network.
B. Create a STEM School Immersion Guide with Arizona specific case studies that illustrate exemplary STEM practices and detailed steps for incorporating STEM in schools and districts as well as STEM curriculum and lesson plan and leadership development for both administrators and teachers.
C. Implement a Project Quality Initiative to identify programs that are research-based and have evidence of success, then match them with the specific needs of schools and districts.

To support this work, seed funds will be awarded through the Network and actively managed by SFAz with enhanced focus on impacts, not simply reporting of activities. SFAz STEM staff will provide continued technical assistance, linking schools and districts to best practices and quality information, measuring progress based on student outcomes and

broadening community collaboration to achieve a shared purpose and to sustain the work long term. In addition, a structural whole school approach will replace randomized involvement of teachers or administrators where individual impacts are hard to measure and sustain. This work also will leverage existing programs proven to positively impact math and science achievement and student engagement.

A. Regional Centers. The Arizona STEM Network is an important piece in the development process of the Regional Centers. *Attachment 9* provides a complete summary of the Regional Centers and our role in their development.

Outcome: The Regional Centers will build local capacity and bring much-needed STEM content specialists to these communities. SFAz STEM staff will work with the Regional Centers to coordinate delivery of professional development opportunities to teachers, quality information about STEM curriculum design and fundraising, plus grants and partnerships through the STEM Network.

Measures: *Three regional staff members hired and trained to coordinate with local schools and Regional Centers. Thirty (30) schools each year with increased STEM immersion levels.* ***Metrics:*** *Increase number of schools and districts integrating STEM learning; increase percent of school and district budgets spent on STEM; increase business participation with schools.*

B. STEM School Immersion Guide. Statewide, education leaders expressed interest in integrating more STEM into schools at a variety of levels. They need detailed information on what works and how to do it. To bring effective STEM learning to scale more rapidly, SFAz STEM staff will help to build local capacity and establish STEM school and district models throughout Arizona.[9]

SFAz worked with education experts and leaders of successful STEM schools to create a "how to" guide for integrating STEM using exemplary models that represent a continuum of "STEM immersion levels".[10] (*See* Attachment 10 for the STEM School Immersion Guide). Principals, superintendents and teachers will be led through a step-by-step guide to mapping current STEM assets and identifying and implementing STEM models that best advance their students consistent with the Network goals. Local business and community leaders will participate in the design and implementation process as partners, assuming the roles of advisor, advocate and provider of resources, such as equipment, internships, funds and volunteer time.

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[9] Initial focus of the STEM Network will be rural communities, specifically those outside of Maricopa County. However, SFAz STEM is working with the Maricopa County Educational Service Agency (MCESA) on the STEM Immersion Guide and will share information and resources to build these STEM schools within Maricopa County.

[10] Examples include: Entire schools integrating STEM throughout their curriculum at every grade level (Metro Tech High in Phoenix); integration of STEM across a grade band throughout a district (Hands-On Optics for 5th graders throughout Flagstaff Unified School District); implementation of effective after-school STEM programs that link back to the classroom (FIRST Robotics, science and engineering fairs, STEM Clubs); service learning opportunities (Engineering Projects in Community Service- EPICs); and creation of STEM Pathways that provide early college courses in high school linked to community college and university degrees and credentials (Running Start Academy at Cochise College).

Performance based seed funds will be awarded for three years at varying levels with specific benchmarks met each year to ensure adequate progress toward integrating STEM in the school. School and district applicants will be expected to provide strategic plans that support necessary activities, such as teacher development and technology upgrades, as well as sustainability plans that incorporate STEM into local budgets to support the work long term. SFAz STEM staff will guide plan development and implementation, provide materials and strategies to build family and community support and monitor and measure the progress toward specific outcomes. SFAz STEM staff will work with participating schools to identify existing resources that can support the integration of STEM and maintain it over time.

Additionally, in conjunction with professional teacher associations in science, mathematics and career and technical education (CTE), teachers and industry will jointly develop locally relevant, intra-disciplinary and Common Core standards-based STEM curricula and lesson plans to be shared with other teachers across the state. Funding provided by the Network will seed these activities and provide an online repository for materials vetted for quality and impact.[11] Together, these efforts will enable effective STEM education to permeate classrooms from the top down and bottom up.

Outcome: The initial goal is to target 5 percent per year of all rural schools (approximately 30 new schools per year) starting in Year 1. This number of schools will double to 60 by Year 2 and after five years 25 percent or 150 rural schools will have achieved some level of STEM immersion. The success of these schools will create competition in the system, breed more STEM school models throughout the state and accelerate student improvements. STEM Institutes led by professional STEM teacher organizations will occur in Years 1 and 2 to produce STEM curricula and lesson plans directly impacting 600 teachers and classrooms across the state. The end result will be improved teacher effectiveness and resulting improvements in student achievement and outcomes.

Metrics: *Schools demonstrate increased student retention and improved teacher quality based on performance; improve school state-evaluated C, D and F rankings; improved student math and science NAEP scores and Common Core assessments; increase number of schools and districts integrating STEM learning; increase percent of school and district budgets spent on STEM; increase business participation with schools; increase number of students earning STEM credentials and degrees.*

C. Project Quality Initiative. There is no shortage of STEM education programs in Arizona. A review of STEM K-12 outreach programs at Arizona's three public universities alone totals more than 300. Simply finding these programs remains a challenge. However, the bigger challenge is finding quality programs with evidence of success in impacting student outcomes.[12] Additionally, even if student outcomes are actually measured, which is most often not the case, very few successful programs ever last beyond a typical grant cycle.

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[11] SFAz STEM staff will continue to identify model curricula and lesson plans nationally as well that can be "borrowed" and integrated in Arizona schools.

[12] Quality should be defined by student outcomes – higher test scores, increased attendance, participation in advanced math, science and engineering courses and pursuing STEM degrees and certifications.

SFAz STEM staff worked with education evaluation and research specialists to develop three self-assessment tools (teacher professional development, formal classroom and informal learning). These tools enable programs to be reviewed in a consistent manner using research to identify specific components found to positively impact student outcomes. The tools will be distributed to program directors across the state, require evidence to support assertions and be updated regularly. Administered and reviewed by SFAz STEM staff, the information gathered will be made available through the Network website and STEM School Immersion Guides to help schools and districts make informed decisions about which programs work, best fit and support their STEM goals. (*See* Attachment 11 for additional detail on the Project Quality Initiative)

Outcome: STEM program information will be coordinated, accessible and qualified. The information will enable better decision-making and help scale and replicate programs that work more rapidly across Arizona.

Metrics: *Increase number and pace at which proven STEM practices are integrated into schools; increase number of schools and districts integrating STEM learning; increase percent of school and district budgets spent on STEM; increase business participation with schools.*

PLATFORM 3 – STRENGTHEN TEACHER EFFECTIVENESS

Arizona must focus on filling critical gaps in STEM teaching across Arizona, finding quality teachers to meet current school demands, improving STEM capability of existing teachers and modernizing the way Arizona educates new teachers consistent with the pressing urgency around Common Core standards. As research shows, *students are disadvantaged and actually learn less when their teachers do not understand the content (Goldhaber & Brewer, 2000; Monk, 1994).* Equipping teachers with STEM skills both before and after they receive their teaching credentials must remain a focus of the STEM Network.

A. *Teacher Pre-Service – Colleges of Education*

In Arizona, efforts to improve STEM pre-service teaching have focused largely on building math and science content in college. Yet requiring an undergraduate teaching candidate to take another biology or chemistry course does not imbue real understanding of the scientific discovery process nor, more importantly, how to translate that scientific thinking into the classroom. In a few short years, teachers in Arizona will be asked to teach new state-adopted common math and science standards aligned to college readiness and international benchmarks from early grades through high school. This will require deeper content and a contextual understanding of how to use math and science – building fluency through problem solving, creative and critical thinking, deep conceptual understanding, accurate and efficient procedural manipulation and peer collaboration.

On behalf of the STEM Network, SFAz will support a Request for Proposals (RFP) from public, non-profit teacher colleges in Arizona to develop innovative elementary (K-8) STEM education course offerings. The courses will be aligned to the new standards and focus on project-based, intra-disciplinary STEM learning, including integration and use of technology. The quality of design as well as the quantity of teachers impacted will be

considered. Additionally, collaborations between institutions, particularly with those in rural and remote communities, will be required.

Successfully developed courses will be converted to online modules and made available to existing teachers as in-service programs. The modules will be delivered using current technology infrastructures for teachers such as IDEAL and Intel Engage as well as through Arizona's Regional Education Centers. SFAz STEM staff and Network partners will also work with the State Board of Education and Arizona Department of Education to explore the potential to transition these course sequences into a STEM Endorsement for teachers that counts in many districts toward salary increases and tenure.[13]

To support the delivery of these new STEM courses as well as ongoing research and innovations toward cutting edge teaching models, a STEM Teacher Scholars program will be established to assist our higher education research institutions to recruit and support 2-3 faculty positions.[14] These faculty positions will be joint appointments between Education and Science and/or Engineering Colleges and require STEM education research and teaching expertise to drive continuous improvements and modernization of teacher curriculum. This could become a national model for teaching.

Outcome: New and existing teachers in Arizona will have a better understanding of STEM content, pedagogical content and integration of technology into the classroom to improve student learning and achievement levels toward college readiness and career preparation.

Metrics: *Schools demonstrate increased retention of students and improved teacher performance; improvements in school state-evaluated C, D and F rankings; improved student math and science NAEP scores and Common Core assessments; and Increase number of students earning STEM credentials and degrees.*

B. *Teach For America Partnership for High-Quality Rural STEM Teachers and Leaders*

While the shortage of qualified teachers in rural areas is not a new phenomenon, the passage of the No Child Left Behind Act of 2001 brought an added sense of urgency.[15] (*See* Attachment 12 for a summary of the Teacher Workforce Survey). Teachers not qualified in each content area they teach are now required to seek the necessary credentials if they are to continue teaching in those content areas. This compounds the problem of finding qualified teachers and advancing existing teachers where coursework is often not available to meet No Child Left Behind Act's "highly qualified teacher" requirement.

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[13] Currently, Arizona has a Math Endorsement and a Reading Endorsement. There is no Science Endorsement. A STEM Endorsement would integrate project-based learning and applications of math and science in areas such as engineering that build complex decision-making skills and improve student understanding and achievement in math and science.

[14] Depending on the source of funds, approximately $150,000/year, this program could be renamed to memorialize the contributor.

[15] A recent survey commissioned by SFAz in July 2011 found that, of the Arizona school districts responding, 82% were from rural communities and of those, 90% needed math, science and/or career and technical education teachers. These rural districts indicated 70 current openings for STEM teachers in K-12 and 24 STEM positions were eliminated because of budget cuts. The overall response rate for the survey was 17 percent.

SFAz and Teach for America (TFA) will work together to develop and drive three interconnected projects: Strategically train and deploy TFA corps members to teach STEM subjects throughout rural Arizona; repurpose TFA's corps training model to establish an alternative certification program for encore STEM professionals interested in teaching; and translate this learning into a new TFA STEM model for professional development programs that will be delivered through the Regional Education Centers.[16] (*See* Attachment 13 for the full SFAz-TFA proposal). These projects will integrate TFA's teacher leadership model with SFAz's STEM content to address the state's most pressing academic challenges and meet the expectations for a 21st century workforce to support strong local economies.

Over the next five years, SFAz and TFA will work with the Governor's Office, Arizona Department of Education, County Superintendents and Regional Alliances and Centers to train and deploy TFA corps members specialized in STEM as well as recruit and place newly certified STEM teachers in rural communities that demonstrate:

- Need based on student academic performance in math and science
- Inability to fill critical STEM teacher positions
- District, school and teacher support for STEM improvement, integration and coordination
- Community support for increased focus on STEM education

TFA will lead the expansion of Corps members. SFAz will coordinate the design and development of STEM curriculum incorporated into TFA training and the recruitment and placement of newly certified teachers. SFAz will also take the lead in deploying professional development through its regional work. In leveraging key program strengths with a goal of sustaining excellence, SFAz and TFA will demonstrate that coordinating efforts to support excellent teachers will result in greater impacts and better outcomes for students.

Outcome: A coordinated approach that leverages resources to bring 40 new TFA corps members specialized in STEM and certifies another 20 new STEM professionals as teachers each year to rural Arizona. Over five years, there will be hundreds of new and highly effective STEM teachers in rural schools throughout the state to improve student outcomes and the number of individuals entering STEM degrees and careers.

Metrics: *Schools demonstrate increased retention of students and improved teacher performance; improvements in school state-evaluated C and D rankings; improved student math and science NAEP scores and Common Core; increase number of students earning STEM credentials and degrees.*

C. *Engage Teachers and Students in STEM Learning and Career Exploration*

Teachers and students alike indicate very limited access to information about degrees and careers in STEM -- a fact that lessens their capacity to grasp the critical connections between their schoolwork and the needs of employers in particular and the economy in general. Urgently recognizing this must change, teachers in every part of the state say there

[16] While the Regional Education Centers are under development, SFAz will look to utilize existing infrastructure, such as the UA Cooperative Extension Offices located in rural areas across the state.

would be great value in experts coming into the classroom to provide context for STEM lesson plans, facilitate hands-on experiments and assist with STEM career exploration. This plan proposes a teacher support program that borrows from and links the best current options for broadening STEM knowledge and career exploration by rapidly bringing STEM undergraduate and graduate students into K-12 classrooms.[17]

SFAz will coordinate with the universities to recruit science and engineering graduate and undergraduate students and enable them to receive university course credit for their work in K-12 classrooms. In addition, we will coordinate with Business through the STEM Advocates program described below interested in working with teachers in the classroom. Developed by the Maricopa Country Education Service Agency (MCESA), SFAz will incorporate a 90-minute training course that introduces college students to communicating to a younger audience and helps guide their projects in the classroom. Both SFAz and MCESA will recruit advisors and locate schools and teachers interested in participating in the program. Computer software will be developed to match classrooms with college students and employees based on content expertise and appropriate grade-level lessons. This software will also monitor, track and evaluate the activity utilizing surveys for participating college students and teachers. The potential for expansion to true tiered mentoring programs with college and K-12 students will be explored in Year 3.[18]

Outcome: In the first three years, involve 250 college students and employees, and 250 teachers, impacting as many as 16,000 students with new, first-hand knowledge of STEM and STEM careers.

Metrics: *Schools demonstrate increased retention of students and improved teacher performance improved student math and science NAEP scores and Common Core; and increase number of students earning STEM credentials and degrees.*

PLATFORM 4 – CREATE MEANINGFUL BUSINESS ENGAGEMENT OPPORTUNITIES

The quality of our communities is defined by the strength of our schools. While students and families are the most important stakeholders of schools, every business in Arizona has a vested and urgent interest in schools a well as a stake in the STEM workforce pipeline.[19] While there will always be a need for business to be a philanthropic partner to schools, there exists a need for schools and business to form a true partnership. Yet, most schools have few connections to business leaders and businesses do not know how to engage, particularly small and medium size companies without resources to employ community

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[17] Since 2008, as part of SFAz's Graduate Research Fellowship (GRF) program, the GRFs have participated in K-12 outreach efforts, which have yielded both intermittent and deep participation in engineering and science programs in Arizona schools. In the 2010-11 school year, Maricopa County Educational Service Agency, led by Superintendent Don Covey in conjunction with Dr. Jeremy Babendure and the Arizona SciTech Festival, piloted *The Next Generation of Innovators* program in Maricopa County Schools that brought undergraduate science and engineering students into K-12 classrooms. Initial results are promising as demonstrated through surveys of both teachers and the college students that participated. The model also borrows from the National Science Foundation GK-12 program.

[18] Our model allows for the use of technology to deliver some of this experience so that teachers and students in rural and remote areas can still benefit from this program.

[19] STEM occupations are projected to grow by 17% from 2008 to 2018 compared to 98% growth for non-STEM occupations. STEM workers command higher wages, earning 26% more than their non-STEM counterparts.

development or education staff. This disconnect was confirmed in every STEM outreach meeting in every part of the state. As employers, businesses also offer excellent venues for educating families about the need and value of a STEM education.

As part of the STEM Network, SFAz STEM staff will develop and manage a STEM Advocates Program where businesses of any size and mission can participate in education through meaningful and practical actions. Businesses will be recruited to become STEM Advocates and commit to a set of specific actions that help students, build relationships with schools and provide a venue to broaden understanding of the STEM education imperative. Ultimately, STEM Advocates will be called upon to support leaders and teachers working to successfully help students achieve under internationally benchmarked standards.

SFAz STEM staff will work with CEO groups and chambers of commerce to develop the program and recruit participants. STEM Advocates will be recognized through public relations activities throughout the year.

STEM Advocate Actions could include:

- Distribute monthly articles about STEM education to employees that Network partners and staff will write.
- Invite teachers to spend time at the company either as paid or unpaid interns.
- Support informal STEM activities, such as FIRST Robotics, by hosting, volunteering or mentoring.
- Contribute to curriculum and program development for K-12, community college and universities.
- Speak at school functions and to classrooms about STEM jobs.
- Publicly advocate and defend high standards for kids across Arizona.

Outcome: As many as 300 employers across the state participating as STEM Advocates in the first 3 years, which will result in significant (currently nonexistent) relationships between business and education. Employers and employees will learn about schools, the challenges they face, and the complexity of the enterprise and the importance of engaging directly around STEM and contribute to developing a STEM culture and expansion of the Network.

Metrics: *Business directly impacts STEM learning and opportunity awareness in the classroom; increased understanding of applications of STEM knowledge; improved student understanding and interest in STEM in the workplace; and increase number of students earning STEM credentials and degrees.*

FINANCIAL PLAN AND CONSIDERATIONS

To implement the Arizona STEM Network Fund, SFAz STEM is seeking $300,000 in Year 1 (2012) in operational and $7M in Year 1 in program funds. This is in addition to the funds already committed by Freeport-McMoRan Copper and Gold Foundation and others (*see* accompanying budget for a breakdown of costs for Years 1 -5). Consistent with SFAz's overall fundraising plan, SFAz considers the strategic actions in this plan as "high impact activities." Initial fundraising and outreach to seed the operations and programs will start

with current Network sponsors, including Helios, Intel, Freeport and JPMorgan Chase. Additional efforts will be made to raise funds with organizations that show a commitment to Arizona communities, such as, Bank of America, APS, SRP, TEP, Research Corporation, Boeing and IBM to fund this work. SFAz understands the importance of expanding our base of financial support and will undertake a fundraising effort to reach out to industries with an interest in STEM to support our implementation efforts. Ongoing, funds will be raised with other private sector organizations interested in STEM education across a number of industry sectors.

Teach For America and SFAz will work with the Governor and legislators to include a $2M appropriation in the upcoming FY 2013 budget to support the Rural STEM Teachers program with a possible commitment for another four years at the same level. Helios has agreed to match any state appropriation to support this work.

SFAz STEM staff intends to continue seeking grant funds for new programs needed to fill existing gaps. For example, it submitted a $14.6M grant on behalf of Arizona, New Mexico and Washington State to bring Intel Math to schools throughout rural and low-income communities, validate the program's impact on student achievement and assess its ability to meet the new Common Core Math Standards.[20] SFAz was asked to be the submitting agency because of its history of managing large grant portfolios, its proven impact on education and its nationally recognized Board of Directors. SFAz anticipates continued and expanding federal funds to support STEM education and it will continue to leverage its assets for future federal grant opportunities on behalf of the State and the Network.

Additionally, SFAz and the Arizona STEM Network are part of an emerging Multi-State STEM Network supported by 11 additional states as well as Battelle and Innovate-Educate, a national CEO organization working to align industry investments in STEM education. Other relationships are being developed at the national level, such as the U.S. Department of Education, National Governors' Association and Change the Equation. The goal in these cases is to align efforts and investments and advance knowledge capture and dissemination to accelerate and scale programs that work. The Arizona STEM Network will continue active participation in and benefit from this work.

[20] Should this grant application not be successful, SFAz STEM staff will work to replicate Intel Math more rapidly through its STEM School Immersion plans.

ARIZONA STEM NETWORK PROGRAM COST PROJECTIONS

STEMAz-General Operations	2012 COSTS	2013 COSTS	2014 COSTS	2015 COSTS	2016 COSTS	TOTAL
COSTS						
Program Costs/STEM Network Programs						
Knowledge Management						
Development and Maintenance	100,000	40,000	40,000	40,000	40,000	**260,000**
Integrate STEM in Schools						
Est. cost to integrate STEM into 30 new schools/yr @ $123/student[1,2]	4,485,000	4,485,000	4,485,000	4,485,000	4,485,000	**22,425,000**
Regional Coordination	300,000	300,000	300,000	300,000	300,000	**1,500,000**
Project Quality Initiative	45,000	45,000	45,000	45,000	45,000	**225,000**
STEM Professional Development	300,000	300,000				**600,000**
Strengthen Teacher Effectiveness						
Pre-service, Teacher Scholars	400,000	400,000	150,000	150,000	150,000	**1,250,000**
SFAz/TFA Alt Certification	484,000					**484,000**
Tiered mentoring/content advisors[3]	67,500	47,500	47,500	37,500	37,500	**237,500**
Business and Community STEM Advocates						
Industry Liaison and Collateral	80,000	80,000	80,000	80,000	80,000	**400,000**
Total STEM Network Program Costs	$6,261,500	$5,697,500	$5,147,500	$5,137,500	$5,137,500	**27,381,500**

[1] **Additional donor funds may be provided directly to schools or via the STEM Network. These numbers may be adjusted if school funding is increased.**
[2] **Calculations supporting these projected costs are attached.**
[3] **$12,500/year in-kind commitment from MCESA for college student training and webhosting in years 2012 - 2014.**

PLATFORM 2 - STEM School Implementation Detail - Average cost per student is $123

Premise:
1938 - total Arizona schools
591 (31%) - total rural schools
1,078,901- total students[1]
242,647 (23%) - total rural students
Estimated Cost Per Student $123

Implementation Options	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Total**	
Annual Impact: **5%** rural schools[2]	30	30	30	30	30	150	schools
Number of students impacted each year[3]	12132	24264	36396	48528	60660	181980	students
3-yr seed funding allocated each year[4]	$4,485,000	$4,485,000	$4,485,000	$4,485,000	$4,485,000	$22,425,000	cost
Annual Impact **10%** rural schools	60	60	60	60	60	300	schools
Number of students impacted	24264	48528	72792	97056	121320	363960	students
3-yr seed funding allocated each year[4]	$8,970,000	$8,970,000	$8,970,000	$8,970,000	$8,970,000	$44,850,000	cost
Annual Impact **20%** rural schools[5]	120	120	120	120	120	600	schools
Number of students impacted	48528	97056	145584	194112	242640	727920	students
3-yr seed funding allocated each year[4]	$17,940,000	$17,940,000	$17,940,000	$17,940,000	$17,940,000	$89,700,000	cost

[1]Student and school numbers are from the 2010-2011 school year, as reported in the Arizona Department of Education website, Research and Evaluation section

[2]The goal is to impact 5% rural schools each year with targeted immersion levels as follows:
6 schools at Full STEM Immersion
12 schools at Partial STEM Immersion
7 to 8 schools at Introductory STEM Immersion, and
4 to 5 schools at Exploratory Immersion

[3]Calculated as 5% of 242,647 rural students each year, with recurring impact on students every year after initial start up year.

[4]One-time seed-funding allocations for a 3-yr period are determined by a STEM immersion scale:
$250K for Full STEM Immersion schools (target 20%)
$200K for Partial STEM Immersion schools (target 40%),
$75K for Introductory STEM Immersion schools (target 25%), and
$5K for Exploratory Immersion schools (target 15%)

[5] Impacts **100%** of rural schools in 5 years

DRAFT

Budget Justification for SFAz STEM

PLATFORM 1 – KNOWLEDGE MANAGEMENT
The Arizona STEM Network will establish an active knowledge management infrastructure to advance and sustain state and national education priorities. A contract data analyst will be hired part time at $40,000/year to establish this resource in Year 1 and maintain it in Years 2-5. $60,000 is budgeted in Year 1 for the analytics software required to support this knowledge management initiative.

Program Costs: *$100,000/Y1, $40,000/Y2-5, 5yr total: $260,000*

PLATFORM 2 – INTEGRATE STEM INTO SCHOOLS
This is the estimated COST required to impact 25% of the 592 rural schools across Arizona with STEM tools and resources over 5 years (150 total schools), about $123/student. The level of STEM integration will vary between the schools depending on current STEM assets at the school and district. The budget is based on funding a cohort of 30 schools per year with seed funding for each school to last over a 3-year period. The performance-based seed funding grant sizes range from $5K to $250K per school. Because the level of STEM immersion will vary among the schools, the budget for impacting 5% rural schools per year is estimated on an average total seed funding totaling $4.5M/year. *The entire cost will come from a variety of funding sources leveraged to support the work, including resources from schools themselves and program providers who may redirect their efforts toward schools that are part of the STEM Network.*

To accelerate the pace of this work, the information below shows the average cost of impacting 25% as proposed, 50% or 100% of the 592 rural schools across Arizona over 5 years:

- $4.8M/year at 5%/year totaling $23.9M over 5 years impacting 25% of all rural schools.
- $9.3M/year at 10%/year totaling $46.4M over 5 years impacting 50% of all rural schools.
- $18.2M/year at 20%/year totaling $91.2M over 5 years impacting 100% of all rural schools.[21]

Other programmatic costs include the implementation and maintenance of the Project Quality Initiative at $45,000/year for data software and management. Funds at $300,000/year for Years 1 and 2 are also needed to support STEM professional teacher organizations in developing model STEM curricula and lesson plans.

To manage provide outreach on all of the programs outlined in this plan and support schools integrating STEM, $300,000 is budgeted for three regional liaisons in Year 1 to serve as regional implementation and outreach managers through Years 2-5. The need for additional regional staff will be determined in Year 3 as the Regional Education Centers are implemented.

Operational Costs: *$300,000/Y1-5; 5yr total: $1,500,000*
Program Costs: *$5,130,000/Y1-2; $4,830,000/Y3-5; 5yr total: $24,750,000*

[21] Additional detail on costs and assumptions for scaling beyond 5 percent/year is available attached at the conclusion of the budget justification section.

DRAFT

PLATFORM 3 – STRENGTHEN TEACHER EFFECTIVENESS AND SUPPORTS

A. Teacher Pre-Service – Colleges of Education
$250,000/year is budgeted for the first two years to fund colleges of education through a competitive RFP process to develop elementary (K-8) STEM education course offerings that are aligned to the Common Core standards. A Teacher Faculty Scholars program will be established at a cost of $150,000/year. Existing operations will support the RFP and program management as well as the Teacher Faculty Scholars program.

Program Costs for SFAz STEM portion of total budget: *$400,000/Y1-Y2, $150,000/Y3-5, 5yr total: $1,250,000*

B. Teach for America Partnership
The SFAz and Teach for America (TFA) rural proposal expands STEM-based TFA corps members, certification and placement of STEM content experts as teachers and professional development training for in-service teachers. Funding for this SFAz/TFA partnership program is budgeted at $2M/year, much of which will come from a legislative appropriation. To jumpstart this program, an additional $484,000 is budgeted in Year 1 to design, develop and pilot an Certification program using TFA's 90-day "boot camp" model to retrain encore STEM professionals to be teachers. This portion of the Year 1 cost will be funded with private contributions.

Program Costs for SFAz STEM portion of total budget: *$484,000/Y, 5yr total: $484,000*

C. Engage Teachers and Students in STEM Learning and Career Exploration
Strengthening teacher effectiveness is also defined by bringing experts into the classroom. In the first three years, we will impact at least 16,000 students with new knowledge of STEM and STEM careers through a tiered mentoring program that involves 250 college students and 200 teachers. Costs include $20,000/year for a program coordinator, $30,000/Y1 for software development and subsequent upgrades at $10,000/year in Y2 & Y3, and at $5,000/year in Y4 & Y5. Outreach and Evaluation materials are budgeted at $5,000/year. College student training is budgeted at $5,000/year and webhosting at $7,500/year, both of which will be provided as in-kind for the first three years by the Maricopa County Education Services Agency (MCESA) who is a partner in this effort. All funding years include costs for evaluation.

Program Costs: *$67,500/Y1, $47,500/Y2-3, $37,500/Y4-5, 5yr total: $237,500*

PLATFORM 4 – CREATE MEANINGFUL BUSINESS ENGAGEMENT OPPORTUNITIES
As many as 300 employers across the state will participate as STEM Advocates in the first 3 years, which will result in significant (currently nonexistent) relationships between business and education. $30,000/year is needed for part-time business outreach staff, and $50,000/year for publications and collateral for STEM Advocates

Program Costs: *$80,000/Y1-Y5*

ATTACHMENT 1

arizona
science technology
stem
engineering math
network

OUTREACH MEETING SUMMARY 2011

SCIENCE foundation ARIZONA
Innovation at Work

Helios Education Foundation

FREEPORT-MCMORAN COPPER & GOLD FOUNDATION

CHASE

RESEARCH CORPORATION for SCIENCE ADVANCEM
A foundation dedicated to science since 19

intel

Arizona STEM Network Regional Outreach Meetings Summary

In order to gain input regarding the strategic priorities for the Arizona STEM Network, we implemented a statewide strategy for engaging communities on the local level. In using this approach we were able to promote sustainable decisions by recognizing and communicating the needs and interests of the participants, allowing those who are affected by the decisions being made to be involved in the decision making process, and ensuring those involved that their contributions to this process will influence the outcome.

We have met with all15 counties, concluding our first round of outreach. The first stage of the process entailed convening key education, community and business stakeholders, allowing them to give voice to their local needs. Through a SWOT analysis, we have been able to create a summary of each community's strengths, weaknesses, opportunities and threats.

Three key priorities have emerged from these discussions. Each of these priorities presents multi-level opportunities for growth and change. Meeting these needs specific to the nuances expressed in each community will have a tremendous impact on student achievement. The three priorities identified are:

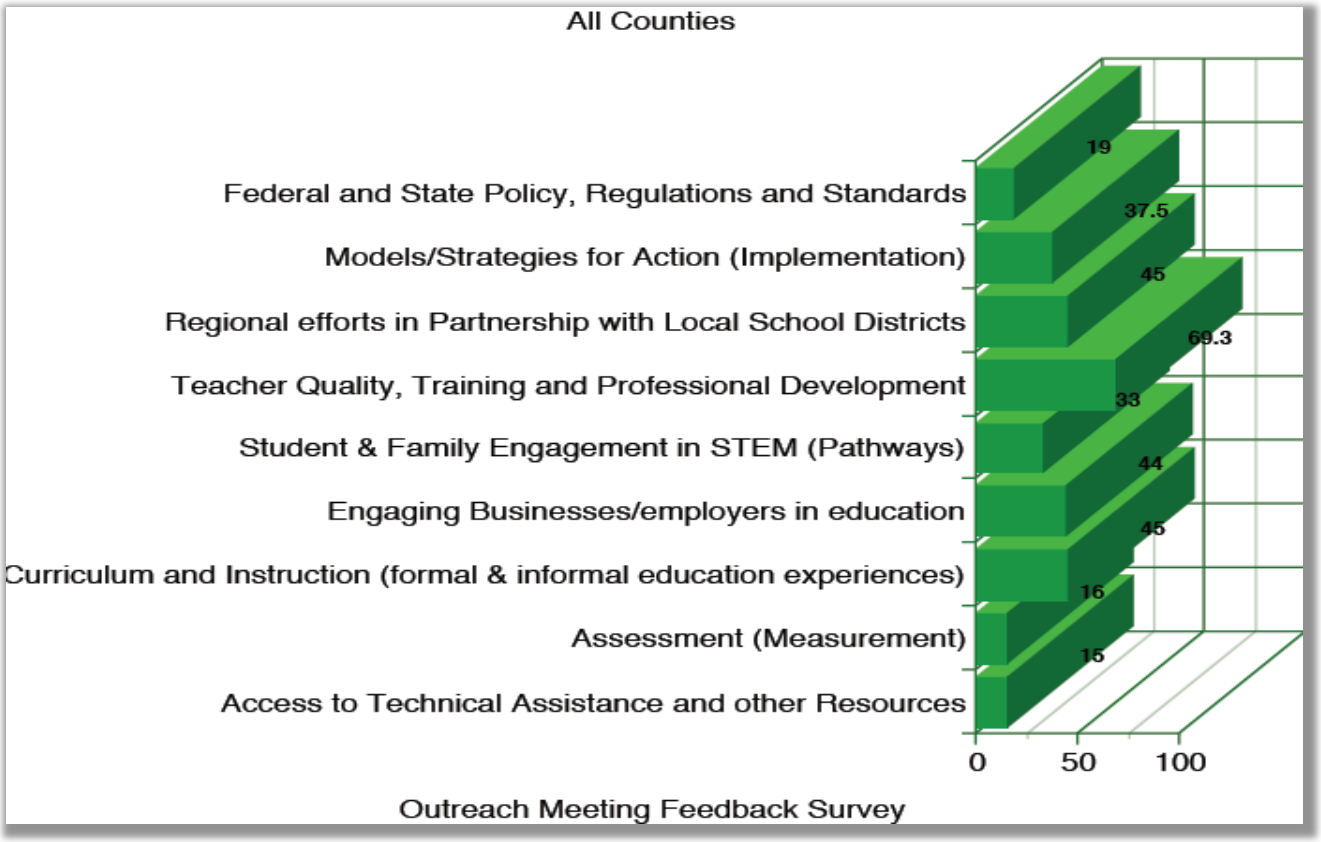
1. **Teacher Quality, Training and Professional Development:** Including strategies to recruit and retain qualified Math and Science teachers in the rural and remote areas of the State, and the need for content rich, quality professional development in all STEM areas, as well as the need to embed STEM standards in curriculum.
2. **Regional Efforts in Partnership with Local School Districts:** Developing a cohesive strategy to move forward on the local level, including a comprehensive communications and implementation plan, was identified as a key priority, especially given the lack of resources and leadership available, as expressed in many rural and remote areas.
3. **Engaging Business and Employers in Education:** The need for clear career pathways, career exploration and compatible skills learning opportunities, teacher/industry internships, student/industry internships, using STEM related professionals in the classroom, and funding or in-kind opportunities all come under this category.

In addition to the meeting discussions, we received feedback in the form of a survey from the meeting participants. The surveys and discussion notes were compiled and are detailed in two ways in this report. The first is a compilation survey chart of all community responses and a table showing the rankings, by percentage of all 9 of the priority areas presented. Following the graphs are summaries of comments from the feedback forms. These comments represent those most often repeated (Section 1) and those that are most representative of the meeting discussions (Section 2). The second way we have presented the information is to identify them by county. Each discussion is broken down into a summary, a SWOT analysis and a priority-ranking chart.

We will work with the Governor's Office of Education Innovation to complete the second phase of this process. This phase will begin in September, and will entail meeting with a smaller group of key stakeholders in each community, inclusive of education, local government and economic and community development officials.
County Education Reform Plans will be developed in each community, and should be completed by late October. This process will conclude with County Plans that establish clear goals, sequence priorities, and assess the level of technical assistance needed for successful implementation, evaluation, measurement and improvement at the local levels.

We will work with each region and/or community to help implement these County Education Reform Plans. We will accomplish this by providing assistance to the community that is specific to their plans, as well as being able to provide technical assistance, instructional resources, coordination, teacher quality assistance, systems development, marketing and communications and access to funding assistance.

Combined County Priority Rankings (%)



Combined County Priority Rankings (ALL)

The following table shows the percentage of ranking, in order of priority (1 highest, 9 lowest) from all survey respondents.

PRIORITY:	1	2	3	4	5	6	7	8	9
Federal & State Policy, Regulations & Standards	9	4.3	2.3	3.8	7.2	8.6	3.2	8.2	34.3
Models/Strategies for Action (Implementation)	8.1	14.1	14.1	12	8.6	9.2	8.8	7.7	2.7
Regional efforts in Partnership with Local School Districts	11.4	10.3	18	6.5	17.5	8.2	12	7.4	2.7
Teacher Quality, Training & Professional Development	26	15.7	18.5	4.8	14	4.9	8.1	1.1	0
Student & Family Engagement in STEM (Pathways)	7	16	11.4	7.1	18	7.4	15.2	6	2.1
Engaging Business & Employers in Education	15.8	18	9	6	21	15.7	2.7	9	1.6
Curriculum & Instruction (formal & informal education experiences	9	21	14.7	17.5	11	9.2	5.1	6.5	2.7
Assessment (Measurement)	5	4.3	5.4	7.7	7.2	6	11.4	19	22
Access to Technical Assistance & other Resources	1.6	3.8	8.7	8.2	7.4	9	13.5	18	11

Combined County Survey Comments

The following are a sampling of comments that were received on the feedback forms from the Outreach Meetings. The comments noted in the first section are those that were mentioned frequently. The comments in the second section are useful to further inform the STEM Network formation discussion.

Section 1:

What was the most significant piece of information you learned today?

- I learned what STEM is all about.
- We need to increase communication from the pilot programs **(**Biosphere, Echo Tech, Star Parties**,** Beyond Textbooks, etc.) to the rest of us.
- Communication is critical.
- Being able to hear what is available in other areas that can help students be successful.
- Partnership potentials.
- Networking with others who had common goals.
- Perhaps the fact that we are focusing our collective energy to bring this effort beyond the talking stage will really make this work.
- Resources are available and collaborative efforts do exist but we need outreach and organization.
- I think a huge factor in the success of STEM will be more collaboration between teachers, especially science and math.
- STEM is going to be a stronger part of education. If done right, this will be well received.
- Significant efforts to bring STEM to rural areas.
- Hearing about the formation of the STEM Network – connecting the dots.
- Need to coordinate efforts. Everyone is working in silos, doing good things that do not reach capacity because they are not developmentally synergistic. We need communication and connections.
- Need for collaboration.
- Networking with others in our county.
- The whole idea will assist students for the 21st century workplace. Getting everyone on the same page is critical, but will be a great undertaking.
- The JTED can supply funding for projects outside of schools.
- Willingness of business and industry to not only provide resources, but professional development and training as well.
- That SFAz is working on a holistic plan for STEM- to get beyond the patchwork process.
- That someone out there is interested in hearing our thoughts and is willing to help organize the same to move STEM forward in our region.

Section 2:

Additional Comments

- Professional Development is squeezed on after school and on weekends. No time is given to integrate what has been learned. Programs and workshops stand up as bookends if we do not have sustained professional development during the workweek and if we do not have time to integrate it into the curriculum.
- I am still not convinced that we have the power to move forward with STEM without legislative, business and community support. I believe you have the support of the education community. Keep extending the net.

- We have built a foundation of collaboration and trust among our stakeholders. We are poised to go up.
- Too many programs are not connected to a holistic system. A systems approach is definitely needed, not just a pulling of pieces together, but creating a system where these many pieces fit into a whole state framework and a system that says:
    - Teachers are valued professionals and have salaries that match;
    - Standards and expectations are high and measured, not tested, and aligned with all educational systems;
    - Education post K-12 is critical for both jobs and higher education;
    - K-12, community college and universities work in partnerships without constraints that punish these collaborations.
- Parental involvement is critical, and would increase positive political pressure and involvement.
- Current AZ legislative cuts are really hampering school districts.
- I see video training or web-based classes for rural areas as having great potential. Rural areas are not well served.
- As a state we need to provide both incentives and rising expectations for STEM training and certification for all teachers.
- Why would a large company want to move to Arizona when public education is so poorly funded?
- Form a coaching cohort and put some qualified science and math teachers in our Middle and High School classrooms.
- Over-emphasis on how educators should serve industry. The primary role of education should be to serve and prepare democratic citizens. Students should be prepared to understand and navigate the various forms of STEM data in our society and use it to question/analyze polices and social issues. Many programs seem to need a more permanent source of funding. If education is to serve the public, this funding should be public so programs are not beholden to corporate interests.
- You will never recruit any significant number of STEM teachers as long as the state is not competitive in salary compared to private industry.
- We need to get serious. There are toes that are going to have to be stepped on to get education and resources in line. For instance, combine small school districts; re-direct college funds to STEM, etc.
- Get the word out, connect people to information and resources, do not run programs directly or you will dilute the message.
- The best way to help rural areas is to educate students/schools about jobs and training opportunities for different careers.
- Technology devices need to become almost invisible in classrooms, viewed much like a book is now.

ATTACHMENT 2

ARIZONA STEM NETWORK OPERATIONS

The Arizona STEM Network will be made up of multiple Partners throughout the State of Arizona. The SFAz STEM team will staff the operational hub of the Network and provide the essential elements necessary to implementing the Priorities identified in this Plan. Five staff will operate out of SFAz, and three staff will operate in the regions.

The Director of the Arizona STEM Network will be responsible for the overall success and sustainability of the organization. The Director will represent the Arizona STEM Network in external communications on the state and national level, and will act as the liaison to the state and local partners (Board of Education, Arizona Department of Education, Governor's Office of Education Innovation, Funders, etc.)

Three of the additional staff and an Executive Assistant will support the Director in the implementation of the strategic priorities. Collectively, we will be responsible for the day-to-day operations of the organization including implementation, management, assessment, evaluation and improvement of this Plan. Immediately, we will focus on building staff capacity and long-term sustainability. The uniqueness of the services we will offer, and the quality of our delivery will help create sustainability options.

Three staff who will work at the Regional level, implementing the STEM School strategy, and being the primary point of contact for the STEM Advocate and STEM Champions programs will be added to the existing staff. These staff will support the local communities in implementing the goals of the Regional Plans that are in alignment with the Priorities of the Arizona STEM Network Plan.

The financial management, grant management and human resources management portions will be the responsibility of existing SFAz staff, and is funded under the current operations portion of the budget.

The operations staff of the Arizona STEM Network will grow as the scope of the Network scales.

ATTACHMENT 3

ADVISORY COUNCILS

The Arizona STEM Network will have an Oversight Board, which will oversee funding decisions will be managed through a newly created Joint Board Committee made up of members of the SFAz Board and a representative from Helios Education Foundation, the current STEM Advisory Council will be repurposed with three mission-specific focus areas that will drive membership. To the extent that it is possible, given the level of expertise needed, Advisory Council members will be representative of the various geographic regions of the state.

The Advisory Council will meet Quarterly during the first year of operation, but meeting frequency and mission will be defined as the Network develops. The following areas of focus and membership will be developed prior to the close of the first year of operations:

Fundraising Advisory
The Council will advise and give direction to the STEM Center Director, assisting in the implementation and further development of a fundraising strategy. Members of the Council will assist the STEM staff with fundraising. The Advisory Council will also assist with identifying and matching grant opportunities.

Competitive Business
The Council will include a group of business leaders who consume STEM services to advise and give input to the Director on how closely aligned the Arizona STEM Network educational outcomes are with industry standards. The Council will also assist in the forecasting of industry needs and trends for future programming.

Teacher Advisory
The Council will include representatives from the STEM Teacher Professional Associations and Higher Education institutions involved in key elements of STEM education. The Council will advise and inform the Network regarding teacher professional development, policies, recruitment, alternative certification needs and other matters related to teaching.

ATTACHMENT 4

MESSAGING AND COMMUNICATIONS STRATEGY

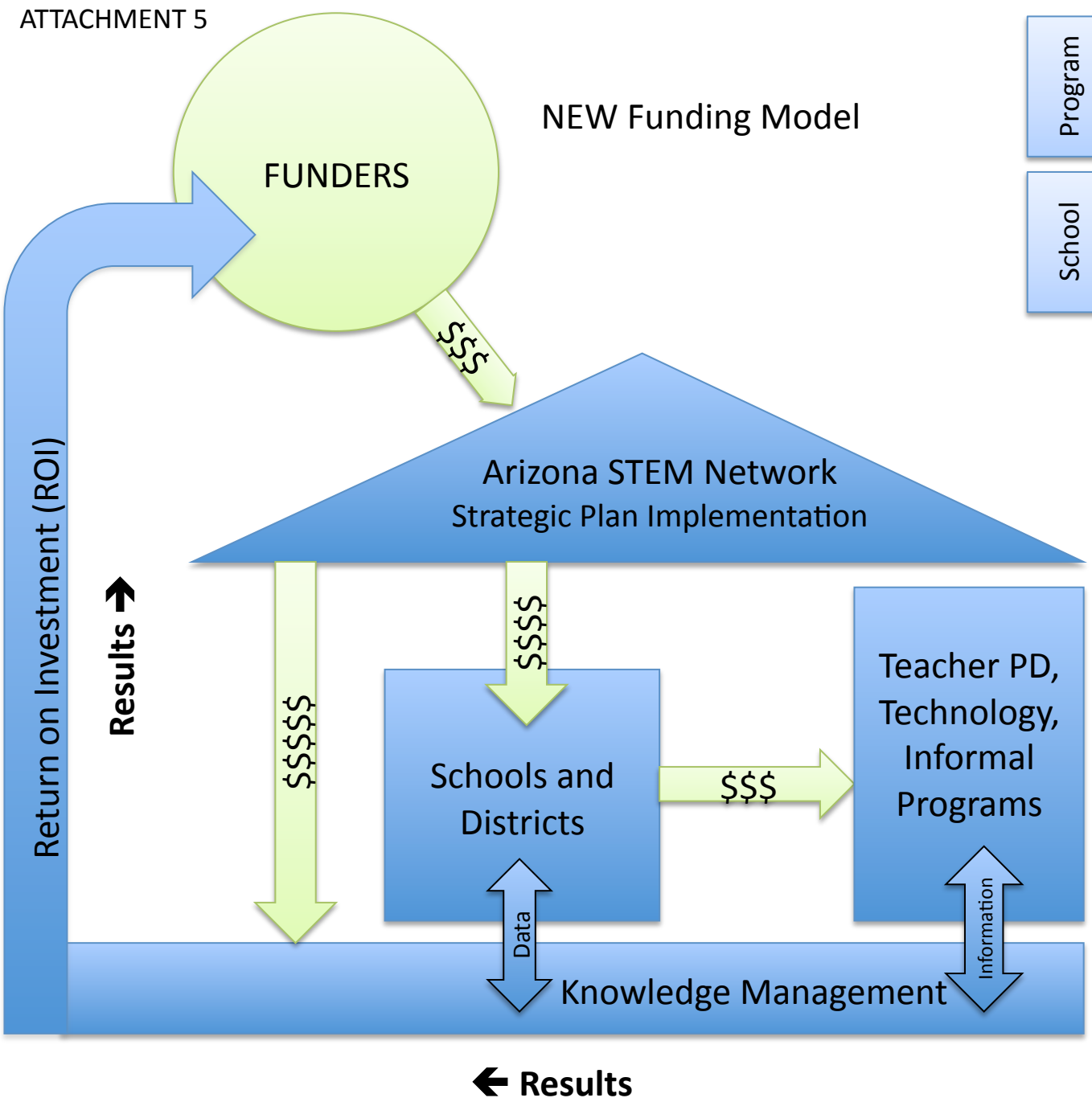
SFAz is working with the Lavidge Company to develop a comprehensive Messaging and Communications strategy.

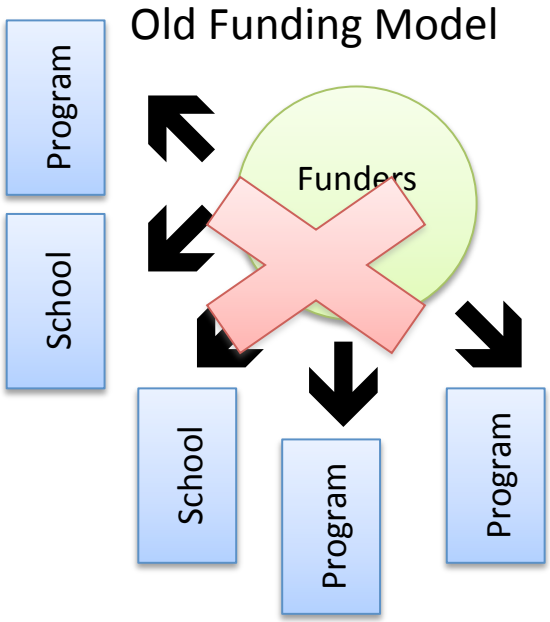
The STEM Network communications strategy will focus primarily on assisting schools to build support for STEM integration efforts and the Common Core standards and assessments, building family and community understanding around the need for STEM and high expectations. Additionally, the Knowledge Management platform will be a significant source of information with our Network Partners.

We will also work with Lavidge to incorporate a marketing strategy to assist in branding and promoting the Arizona STEM Network. We will develop concise and clear messaging to be delivered to schools and districts, business and industry, community and elected officials, students and families, funders' philanthropic agencies and other potential Network Partners. We will also incorporate the recruitment of STEM advisors and STEM Advocates as part of this strategy. The final piece of the marketing strategy will include assistance with the rollout strategy for the Network and this Plan.

Finally, in conjunction with Lavidge, we will develop MOU's for our various Network Partners. These MOU's will detail the relationship between the Arizona STEM Network and its various partners.

ATTACHMENT 5





ATTACHMENT 6

ARIZONA STEM NETWORK IMPLEMENTATION TIMELINE

Platform and Implementation Description	Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
***Platform 1* KNOWLEDGE CAPTURE AND DISSEMINATION**												
Develop system for recordation of key performance indicators, metrics and analytical information identified through Analytics Workshop for internal and external operations	■											
Create templates of analytics to be recorded and collected by each Network Partner	■	■										
Build, Acquire and train staff on infrastructure and software usage	■	■	■									
Develop process for information access	■	■										
Develop communications process		■	■									
Evaluate efficiency, relevance and effectiveness				■				■				■
Refine and upgrade system				■	■			■	■			■
Operate system with assistance from tech experts	■	■	■	■	■	■	■	■	■	■	■	■
Transfer total responsibility for operation, upkeep and upgrades to Network									■	■	■	■
***Platform 2* INTEGRATE STEM INTO SCHOOLS**												
A. REGIONAL CENTERS												
Support development of Regional Planning Process	■	■	■	■	■	■	■	■	■	■	■	■
Weigh in on STEM sections of final Regional Plans	■	■	■	■	■	■	■	■	■	■	■	■
Hire and locate staff in "regional" areas	■											
B. STEM SCHOOLS	■											
Identification of schools		■										
Begin development of plans			■									
Finalize plans and review applications				■								
Convene leadership teams in selected schools				■								
Develop recruitment and conversion strategies	■	■										
Assist with implementation					■	■	■	■	■	■	■	■
Evaluate process				■				■				■
Create metrics and key performance indicators	■				■				■			
Evaluate programmatic impact				■				■				■

ATTACHMENT 6

ARIZONA STEM NETWORK IMPLEMENTATION TIMELINE

Platform and Implementation Description	Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Evaluate and upgrade collateral				■				■				■
C. PROJECT QUALITY INITIATIVE												
Finalize on-line implementation	■											
Continued measurement of programs in landscape analysis		■	■	■	■	■	■	■	■	■	■	■
Continued development of landscape analysis			■				■				■	
Evaluate and upgrade protocols				■				■				■
***Platform 3* STRENGTHEN TEACHER EFFECTIVENESS**												
A. TEACHER PRE-SERVICE												
Develop RFP Process	■											
Meet with Public Universities to discuss program intent	■	■										
Awards announced			■									
Monitor course development			■	■	■	■						
Convert courses to on-line PD modules							■					
Collaborate with BOE and ADE to develop STEM endorsement			■	■	■							
B. TFA PARTNERSHIP FOR HQ RURAL STEM TEACHERS AND LEADERS												
Design Develop and Pilot STEM Alt Cert	■											
Evaluate, Upgrade Monitor		■										
Recruit, Train, Ongoing support and evaluation			■	■								
Assist in Planning, Recruiting and design of Rural TFA Corps			■	■	■	■	■	■	■	■	■	■
Design, Develop, Deliver, Evaluate and Upgrade PD COURSE DEVELOPMENT					■	■	■	■	■	■	■	■
C. ENGAGE TEACHERS AND STUDENTS IN STEM LEARNING AND CAREER EXPLORATION												
Develop recruiting process	■											
Finalize training	■											
Develop delivery system	■	■										
Pilot in 3 counties			■	■								
Start a new cohort 2x per year					■	■	■	■	■	■	■	■

ATTACHMENT 6

ARIZONA STEM NETWORK IMPLEMENTATION TIMELINE

Platform and Implementation Description	Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
***Platform 4* - CREATE MEANINGFUL BUSINESS ENGAGEMENT OPPORTUNITIES**												
Design and develop STEM Advocate collateral												
Recruit Schools and business												
Pilot initial cohort												
Evaluate, upgrade												
Meet with CEO groups and Business Coalitions to recruit, inform												
Continue program implementation												

Attachment 7

ARIZONA READY

ARIZONA STUDENTS PREPARED TO SUCCEED IN COLLEGE AND CAREERS

DATA USE
Governor's Office
Arizona Department of Education
State Board of Education
Governor's Office

STANDARDS & ASSESSMENTS
Governor's Office
State Board of Education
Center for the Future of Arizona
PARCC (AIMS)
Governor's Office

GREAT TEACHERS GREAT LEADERS
Arizona Department of Education
School Districts
Teach For America
Governor's Office

SUPPORTING STRUGGLING SCHOOLS
Arizona Department of Education
Governor's Office
State Board of Education
Governor's Office

REGIONAL CENTERS
Governor's Office • SFAz/STEM Network • Arizona Department of Education • County Superintendents

STEM
Governor's Office • SFAz/STEM Network

HIGHER EDUCATION
Governor's Office • Arizona Board of Regents • Getting AHEAD • Center for the Future of Arizona • ACCA

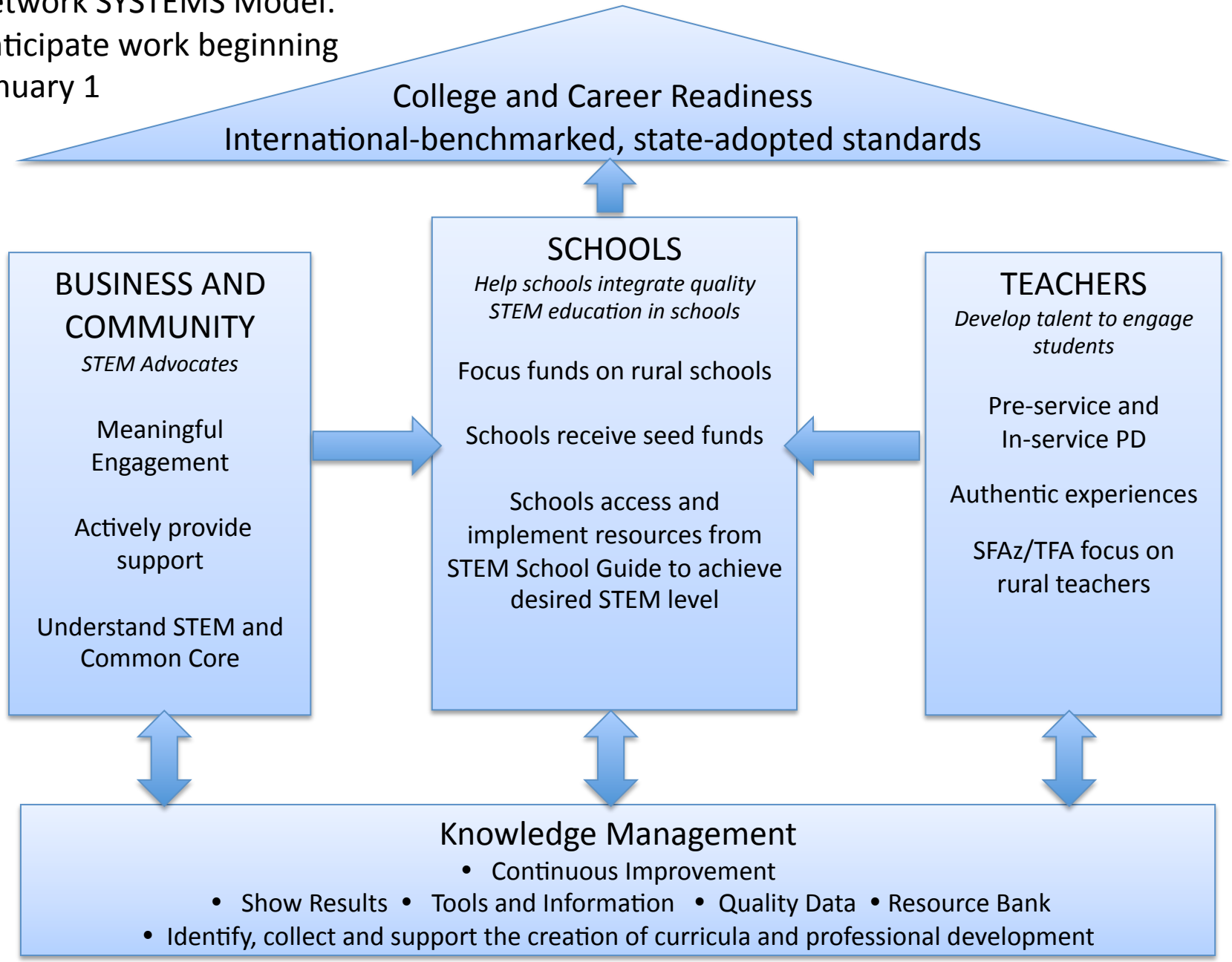
DATA SYSTEMS & TECHNOLOGY
Governor's Office • Arizona Department of Education • State Board of Education • Center for the Future of Arizona

LEADERSHIP, COHESIVENESS & FUNDING
Governor's Office • Arizona Business and Education Coalition • Stand For Children • Expect More Arizona

PUBLIC TRANSPARENCY & ACCOUNTABILITY
Governor's Office • Expect More Arizona

ATTACHMENT 8

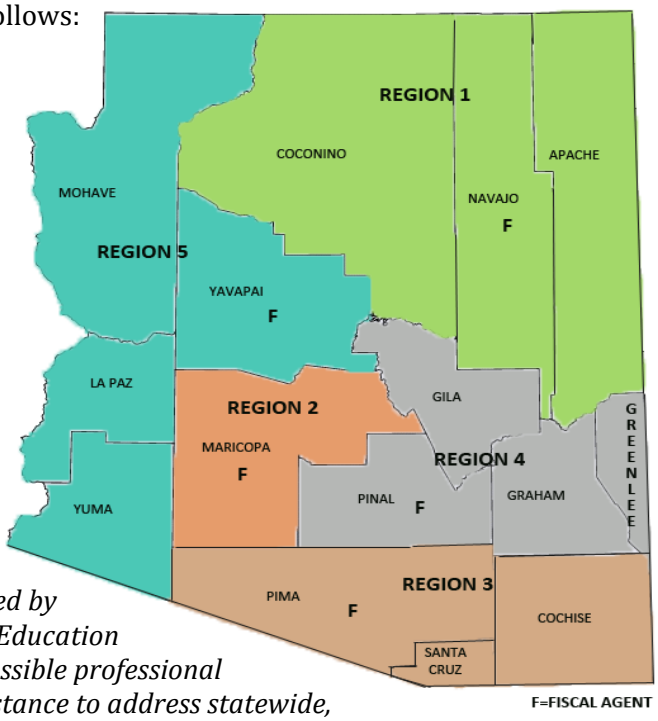
Network SYSTEMS Model: Anticipate work beginning January 1



ATTACHMENT 9 – Regional Education Service Centers

The Regional Education Service Centers are a key component of Arizona's Education Reform Plan. The Reform Plan, currently being re-branded as *ArizonaReady.org*, is the implementation strategy for Arizona's Race to the Top application established by Governor Brewer.

Five Regional Centers will be developed, becoming the localized outlet for training and technical assistance to help all communities reach common goals for improving education. Arizona's 15 counties have been divided up into five regions, as follows:



Region 1: Northeastern Regional Center
Serving: Apache, Coconino and Navajo counties

Region 2: MCESA Regional Center
Serving Maricopa County

Region 3: Southern Arizona Regional Center
Serving: Cochise, Pima and Santa Cruz counties

Region 4: East Central Regional Center
Serving: Gila, Graham, Greenlee and Pinal counties

Region 5: West Central Regional Center
Serving Mohave, La Paz, Yavapai and Yuma counties

Regional Centers are voluntary structures implemented by County School Superintendents and/or an alliance of Education Service Agencies that provide locally defined and accessible professional development, educational services, and technical assistance to address statewide, high priority initiatives, including but not limited to, Data Use, Standards and Assessments, Great Teachers/Great Leaders, Struggling Schools, and STEM.

As a result of SFAz STEM outreach and planning efforts, the County Superintendents elevated STEM as a priority component in the design of the Regional Centers. As such, SFAz STEM staff will be a part of each County and Regional Symposium, where key stakeholders from each community will be brought together to determine priorities most critical to the region and the design of each Center. On behalf of the Arizona STEM Network and in conjunction with the Governor's office and Department of Education, SFAz STEM staff will guide discussions in approximately 20 Symposiums that will be held between mid-September and late-October. It is anticipated that Regional Centers will be fully operational within three years. SFAz STEM will begin our work immediately, capitalizing on the foundations laid during our outreach, and working through existing infrastructure such as the U of A Cooperative Extension Services as local points of contact through which to advance the STEM Network Plan.

ATTACHMENT 10

STEM SCHOOL IMMERSION GUIDE AND RESOURCE BANK

The most consistent need identified throughout our outreach was the need for assistance in integrating STEM into schools. The STEM School Immersion Guide and Resource Bank was developed in response to this need and will help schools identity where they fit and where they want to go, including a "road map" for helping school leaders engage businesses and the broader community in designing goals, programs and models to best fit local needs consistent with the overall goals of the Network.

There are four levels of STEM School Immersion: Exploratory, Introductory, Partial, and Full. These multiple levels of immersion allow school incorporation of STEM, taking in to account the school's current and future capacity and resources to support the work long term. Each immersion level is fluid so as to allow for upward movement when districts/schools have increased their capacity to upgrade the level at which they incorporate STEM.

The STEM School Guide is a working, living tool that captures information and case studies of STEM school and program models with evidence of success. The Guide delves into detailed information on what, when and how to bring STEM learning into schools at the varying immersion levels. The Guide is being developed by experienced school leaders and curriculum specialists and has been vetted by experts from other states. The final work product will be an online integrated rubric, which will be used by the local planning teams as they work through the STEM school conversion process. This web based tool will have a resource bank embedded in the document, as well as links directing the user to model programs, providing multiple options and information for STEM integration.

Schools will utilize the STEM School Guide to identify levels of immersion best suited to meet student and community needs. Once determined, schools then will access the Guide for definitions, a road map for design, development and implementation, as well as descriptions, roles and responsibilities of school leaders, teachers, and students. The road map will further provide guidelines for building community support and evaluating progress and keys to sustainability. SFAZ STEM staff will begin working with schools or districts that self-select during our next phase of outreach, and will recruit additional schools and districts as needed.

The current plan for the Network contemplates seed funds for schools to begin the integration of STEM in rural communities only. However, the tools and information will be available for all schools throughout Arizona. The SFAz STEM staff will provide technical assistance to schools, primarily in rural and remote areas, throughout the STEM school development process. The seed funding will be allocated over a three-year period, and a large portion of this funding will be set aside for teacher training and technology integration. With adequate funding we will be able to impact a minimum of 25 percent of the rural schools over five years.

A copy of the current draft rubric and road map examples are attached.

STEM Program Implementation Model	
Exploratory Level Elementary (Grades K-6)	
Level Description:	• Minimal Immersion • This level includes experimental, outside the traditional school curriculum, type programming. • A school or district may be interested in this level if it has limited financial and human resources to devote to STEM development, but has identified it as a priority. • Specific program content can vary, but the program will focus on the integration of thematic STEM curriculum. • Includes family engagement
Roadmap/ How to Guide/ Timeline	One to six months prior to implementation: • Secure administrative permission to host a club/program • Identify Club/ Program leader • Identify specific program content/objectives/activities to be offered • Establish budget* and program time line • Establish targeted participants (primary, intermediate, K-6), and the number of participants the club/program can serve based on budget, facilities and number of projected staff • Establish a location (classroom, lab, after school room, cafeteria) • Plan for one field trip/business connection (can include having a guest speaker(s). Include requests for transportation to and from, if necessary • Plan for one family engagement event • Design a registration form/permission slip for participants. Include all parent permissions/contact/ and emergency information. One month prior: • Advertise: club/program information, dates, targeted audience, fees (if applicable), where program will be offered (location), objectives and outcomes • Open registration for participants • Depending on number of registered participants, determine if additional support staff will be necessary, and secure support staff • Order all materials and supplies for projected registration numbers. • Confirm dates/ agendas for field trip and family connection events including transportation if necessary. One week prior: • Confirm registration roster • Prepare location logistics, materials, and supplies (delivery and storage) • Confirm objectives and program agenda. Confirm duration of planned instructional time and activities.

	• Confirm transportation logistics if you are including a field trip • If using any technology in the program, make sure connections are establish and presentation materials are working (computers, projectors, skype, simulations, etc.) Day of Program: • Prepare and stage learning areas and activity centers, including technology • Check in participants • Assign groups/supervisory personnel • Go over agenda/timeline and goals with group • Have FUN!
Budget *	Identify costs related to personal, facilities, equipment and supplies. (Specific examples are provided, see resources) Budget considerations include: • Lead Facilitator • Support Staff • Materials and supplies (dependant on labs and planned activities) • Location space (if necessary) • Determine if you will charge participants a registration fee, apply for grants, donations, or outside funding • Travel costs (if necessary) • Specific budgets for canned programs are also available from Community Education Centers, outside vendors as well as a variety of grant programs
Assessment and Evaluation	• Align content to match standards in science, technology, and mathematics. • Provide pre and post assessment surveys in both content and attitudes. • Provide feedback surveys from participants and parents • Because clubs and after school programs are designed to provide enrichment and exploration, assessment may be informal.
Menu of options	Examples include: • An after STEM school club • Summer school program • STEM vendor programs such as ADE 21st Century Community Learning Centers/AZ Science Center STEM clubs http://www.ade.az.gov/21stcentury/ • Future Cities competition http://www.futurecity.org/competition.shtm • Lego League http://www.firstlegoleague.org/event/worldfestival • Specific program content can vary (oobleck, bottle rockets, spaghetti towers, Lego league, Future Cities, etc.) as long as program focuses on the integration of thematic STEM curriculum.

STEM Program Implementation Model	
Exploratory Level Middle School (Grades 6-8)	
Level Description:	• Minimal Immersion • This level includes experimental, outside the traditional school curriculum, type programming. • A school or district may be interested in this level if it has limited financial and human resources to devote to STEM development, but has identified it as a priority. • Specific program content can vary, but the program will focus on the integration of thematic STEM curriculum. • Includes family engagement.
Roadmap/ How to Guide/ Timeline	One to six months prior to implementation: • Secure administrative permission to host a club/program • Identify Club/ Program leader • Identify specific program content/objectives/activities to be offered • Establish budget* and program time line • Establish targeted participants (ex: boys, girls, co-ed, honors, remediation, Title students), and the number of participants the club/program can serve based on budget, facilities and number of projected staff • Establish a location (classroom, lab, after school room, cafeteria) • Plan for one field trip/business connection (can include having a guest speaker(s) from local businesses and industry. Include requests for transportation to and from, if necessary • Plan for one family engagement event • Design a registration form/permission slip for participants. Include all parent permissions/contact/ and emergency information. • If competition is part of the program goals secure needed information, registration and requirements (Future Cities, Lego League, etc.) One month prior: • Advertise: club/program information, dates, targeted audience, fees (if applicable), where program will be offered (location), objectives and outcomes • Open registration for participants • Depending on number of registered participants, determine if additional support staff will be necessary, and secure support staff • Order all materials and supplies for projected registration numbers. • Confirm dates/ agendas for field trip and family connection events including transportation if necessary. One week prior: • Confirm registration roster

	• Prepare location logistics, materials, and supplies (delivery and storage) • Confirm objectives and program agenda. Confirm duration of planned instructional time and activities. • Confirm transportation logistics if you are including a field trip • If using any technology in the program, make sure connections are establish and presentation materials are working (computers, projectors, skype, simulations, etc.) Day of Program: • Prepare and stage learning areas and activity centers, including technology • Check in participants • Assign groups/supervisory personnel • Go over agenda/timeline and goals with group • Have FUN!
Budget	Identify costs related to personal, facilities, equipment and supplies. (Specific examples are provided, see resources) Budget considerations include: • Lead Facilitator • Support Staff • Materials and supplies (dependant on labs and planned activites) • Location space (if necessary) • Determine if you will charge participants a registration fee, apply for grants, donations, or outside funding • Travel costs (if necessary) • Budgets for "canned" programs are also available from Community Education Centers, outside vendors as well as a variety of grant programs
Assessment and Evaluation	• Align content to match standards in science, technology, and mathematics. • Provide pre and post assessment surveys in both content and attitudes. • Provide feedback surveys from participants and parents • Because clubs and after school programs are designed to provide enrichment and exploration, assessment may be informal.
Menu of options	Examples include: • An after STEM school club • Summer school program • Intel Science and Engineering Fair http://www.societyforscience.org/isef/ • STEM vendor programs such as ADE 21st Century Community Learning Centers/AZ Science Center STEM clubs http://www.ade.az.gov/21stcentury/ • Future Cities competition http://www.futurecity.org/competition.shtm • Lego League http://www.firstlegoleague.org/event/worldfestival • Biotech • Forensics • Specific program content can vary as long as program focuses on the integration of thematic STEM curriculum.

STEM Program Implementation Model	
Exploratory Level High School (Grades 9-12)	
Level Description:	• Minimal Immersion • This level includes experimental, outside the traditional school curriculum, type programming. • A school or district may be interested in this level if it has limited financial and human resources to devote to STEM development, but has identified it as a priority. • Specific program content can vary, but the program will focus on the integration of thematic STEM curriculum. • Includes family engagement
Roadmap/ How to Guide/ Timeline	One to six months prior to implementation: • Secure administrative permission to host a club/program • Identify Club/ Program leader • Identify specific program content/objectives/activities to be offered • Establish budget* and program time line • Establish targeted participants (ex: boys, girls, co-ed, honors, remediation, Title students, content specific-physics, biotech, etc.), and the number of participants the club/program can serve based on budget, facilities and number of projected staff • Establish a location (classroom, lab, after school room, cafeteria) • Plan for one field trip/business connection (can include having a guest speaker(s) from local businesses and industry. Include requests for transportation to and from, if necessary • Plan for one family engagement/outreach event • Design a registration form/permission slip for participants. Include all parent permissions/contact/ and emergency information. • If competition is part of the program goals secure needed information, registration and requirements (Future Cities, First Robotics, Siemens, etc.) One month prior: • Advertise: club/program information, dates, targeted audience, fees (if applicable), where program will be offered (location), objectives and outcomes • Open registration for participants • Depending on number of registered participants, determine if additional support staff will be necessary, and secure support staff • Order all materials and supplies for projected registration numbers. • Confirm dates/ agendas for field trip and family connection events including transportation if necessary.

	One week prior: • Confirm registration roster • Prepare location logistics, materials, and supplies (delivery and storage) • Confirm objectives and program agenda. Confirm duration of planned instructional time and activities. • Confirm transportation logistics if you are including a field trip • If using any technology in the program, make sure connections are establish and presentation materials are working (computers, projectors, skype, simulations, etc.) Day of Program: • Prepare and stage learning areas and activity centers, including technology • Check in participants • Assign groups/supervisory personnel • Go over agenda/timeline and goals with group • Have FUN!
Budget	Identify costs related to personal, facilities, equipment and supplies. (Specific examples are provided, see resources) Budget considerations include: • Lead Facilitator • Support Staff • Materials and supplies (dependant on labs and planned activites) • Location space (if necessary) • Determine if you will charge participants a registration fee, or apply for grants, donations, or outside funding • Travel costs (if necessary) • Budgets are also available from Community Education Centers, outside vendors as well as a variety of grant programs
Assessment and Evaluation	• Align content to match standards in science, technology, and mathematics. • Provide pre and post assessment surveys in both content and attitudes. • Provide feedback surveys from participants and parents • Because clubs and after school programs are designed to provide enrichment and exploration, assessment may be informal.
Menu of options	Examples include: • An after STEM school club • Summer school program • Intel Science and Engineering Fair http://www.societyforscience.org/isef/ • First Robotics http://www.usfirst.org/roboticsprograms/frc/default.aspx?id=966 • Lego League http://www.firstlegoleague.org/event/worldfestival • Siemens http://www.siemens-foundation.org/en/competition.htm • Biotech • Forensics • Specific program content can vary as long as program focuses on the integration of thematic STEM curriculum. • Xavier Girls Preparatory STEM clubs (various).

STEM Program Implementation Model	
Introductory Level Elementary (Grades K-6)	
Level Description:	• ***STEM Implementation, at one grade level with a school or district-wide grade band, within a traditional school curriculum*** • This level takes place in one or more subject areas, at one grade level, at a single site, or in a district wide grade band. • This level also allows for STEM units/projects to be designed and integrated into the existing curriculum at either or all grade levels. • Opportunities are provided for student participation in problem-solving and project-based instruction. • Results in teaching through product development (school/parent presentations, science fairs, evening STEM nights, etc.) • Initial collaboration with one or more business partners, mentors, and/or STEM advocates established. • The introductory level will include multiple points of contact with the families of the STEM participants, and at least one family integration activity.
Roadmap/ How to Guide/ Timeline	One to six months prior to implementation: • Meet with site/district Administrator to discuss STEM unit integration into the existing school/district curriculum • Identify teacher leaders in one or more subject areas, at one grade level, at a single site, or in a district wide grade band that will be offering the STEM unit. • Identify specific STEM program content/objectives/activities to be offered (i.e. a two-three week STEM unit in a 4th grade classroom, a district wide STEM recycling contest for 5th grade) • Establish budget* and STEM unit time line • Establish assessments and program evaluation, can include rubrics for student scoring, surveys, efficacy studies. • Plan for one field trip/business connection (can include having a guest speaker(s). Include requests for transportation to and from, if necessary • Plan for one family engagement event • Design a registration form/permission slip for participants. Include all parent permissions/contact/ and emergency information. One month prior to unit integration: • Identify where program will be offered (single school location, or district wide in one grade level) • Confirm objectives and outcomes • Confirm participants • Depending on number of participants, determine if additional support staff will be necessary, and secure support staff • Order all materials and supplies for projected participant numbers.

	• Confirm dates/ agendas for field trip and family connection events including transportation if necessary. One week prior to unit integration: • Confirm participants • Prepare location logistics, materials, and supplies (delivery and storage) • Confirm objectives and program agenda. Confirm duration of planned instructional time and activities. • Confirm transportation logistics if you are including a field trip • If using any technology in the program, make sure connections are establish and presentation materials are working (computers, projectors, skype, simulations, etc.) • Prepare and stage learning areas and activity centers, including technology •
Budget *	Identify costs related to personal, facilities, equipment and supplies. (Specific examples are provided, see resources) Budget considerations include: • Lead Facilitator at each site • Support Staff • Materials and supplies (dependant on labs and planned activities). District wide programs can save by buying materials in bulk. • Location space (if necessary) • Determine if you will need to find funding support from business connections, apply for grants, donations, or additional outside funding • Travel costs (if necessary) • Specific budgets for canned programs are also available from Community Education Centers, outside vendors as well as a variety of grant programs
Assessment and Evaluation	• Align content to match standards in science, technology, engineering and mathematics. (See Common Core Standards) • Provide pre and post assessment surveys in both content and attitudes. • Assessment and program evaluation can include rubrics for project scoring, surveys, and efficacy studies. • Provide feedback surveys from participants and parents
Menu of options	Examples include: • Hands-on Optics embedded into 5th grade classrooms across and entire district that includes a culminating “Star Party” to engage parents and families. • A district wide Recycling contest sponsored by a waste management company in which 4th grade students learn about recycling, collect recyclables and engineer them into new innovative products. Winning class/team and their parents are invited to local sporting event where their design process and new innovative products are displayed.

STEM Program Implementation Model	
Introductory Level Middle School (Grades 6-8)	
Level Description:	• ***STEM Implementation, at one grade level with a school or district wide grade band, within a traditional school curriculum*** • This level takes place in one or more subject areas, at one grade level, at a single site, or in a district wide grade band. • Units are designed that integrate STEM curriculum into existing content. • Opportunities are provided for student participation in problem-solving and project-based instruction. • Results in teaching through product development (school/parent presentations, science fairs, evening STEM nights, etc.) • Initial collaboration with one or more business partners, mentors, and/or STEM advocates established. • The introductory level will include multiple points of contact with the families of the STEM participants, and at least one family integration activity.
Roadmap/ How to Guide/ Timeline	One to six months prior to implementation: • Meet with site/district Administrator to discuss STEM unit integration into the existing school/district curriculum • Identify teacher leaders in one or more subject areas, at one grade level, at a single site, or in a district wide grade band that will be offering the STEM unit. • Identify specific STEM program content/objectives/activities to be offered (i.e. a two-three week STEM unit in a 4th grade classroom, a district wide STEM recycling contest for 5th grade) • Establish budget* and STEM unit time line • Establish assessments and program evaluation, can include rubrics for student scoring, surveys, efficacy studies. • Plan for one field trip/business connection (can include having a guest speaker(s). Include requests for transportation to and from, if necessary • Plan for one family engagement event • Design a registration form/permission slip for participants. Include all parent permissions/contact/ and emergency information. One month prior to unit integration: • Identify where program will be offered (single school location, or district wide in one grade level) • Confirm objectives and outcomes • Confirm participants • Depending on number of participants, determine if additional support staff will be necessary, and secure support staff

	• Order all materials and supplies for projected participant numbers. • Confirm dates/ agendas for field trip and family connection events including transportation if necessary. One week prior to unit integration: • Confirm participants • Prepare location logistics, materials, and supplies (delivery and storage) • Confirm objectives and program agenda. Confirm duration of planned instructional time and activities. • Confirm transportation logistics if you are including a field trip • If using any technology in the program, make sure connections are establish and presentation materials are working (computers, projectors, skype, simulations, etc.) • Prepare and stage learning areas and activity centers, including technology
Budget	Identify costs related to personal, facilities, equipment and supplies. (Specific examples are provided, see resources) Budget considerations include: • Lead Facilitator at each site • Support Staff • Materials and supplies (dependant on labs and planned activities). District wide programs can save by buying materials in bulk. • Location space (if necessary) • Determine if you will need to find funding support from business connections, apply for grants, donations, or additional outside funding • Travel costs (if necessary) • Specific budgets for canned programs are also available from Community Education Centers, outside vendors as well as a variety of grant programs
Assessment and Evaluation	• Align content to match standards in science, technology, engineering and mathematics. (See Common Core Standards) • Provide pre and post assessment surveys in both content and attitudes. • Assessment and program evaluation can include rubrics for project scoring, surveys, and efficacy studies. • Provide feedback surveys from participants and parents
Menu of options	Examples include: • Specific program content can vary as long as program focuses on the integration of thematic STEM curriculum.

STEM Program Implementation Model	
Introductory Level High School (Grades 9-12)	
Level Description:	• ***STEM Implementation, at one grade level with a school or district wide grade band, within a traditional school curriculum*** • This level takes place in one or more subject areas, at one grade level, at a single site, or in a district wide grade band. • Units are designed that integrate STEM curriculum into existing content. • Opportunities are provided for student participation in problem-solving and project-based instruction. • Results in teaching through product development (school/parent presentations, science fairs, evening STEM nights, etc.) • Initial collaboration with one or more business partners, mentors, and/or STEM advocates established. • The introductory level will include multiple points of contact with the families of the STEM participants, and at least one family integration activity.
Roadmap/ How to Guide/ Timeline	One to six months prior to implementation: • Meet with site/district Administrator to discuss STEM unit integration into the existing school/district curriculum • Identify teacher leaders in one or more subject areas, at one grade level, at a single site, or in a district wide grade band that will be offering the STEM unit. • Identify specific STEM program content/objectives/activities to be offered (i.e. a two-three week STEM unit in a 4th grade classroom, a district wide STEM recycling contest for 5th grade) • Establish budget* and STEM unit time line • Establish assessments and program evaluation, can include rubrics for student scoring, surveys, efficacy studies. • Plan for one field trip/business connection (can include having a guest speaker(s). Include requests for transportation to and from, if necessary • Plan for one family engagement event • Design a registration form/permission slip for participants. Include all parent permissions/contact/ and emergency information. One month prior to unit integration: • Identify where program will be offered (single school location, or district wide in one grade level) • Confirm objectives and outcomes • Confirm participants • Depending on number of participants, determine if additional support staff will be necessary, and secure support staff • Order all materials and supplies for projected participant numbers. • Confirm dates/ agendas for field trip and family connection events including transportation if necessary.

	One week prior to unit integration: • Confirm participants • Prepare location logistics, materials, and supplies (delivery and storage) • Confirm objectives and program agenda. Confirm duration of planned instructional time and activities. • Confirm transportation logistics if you are including a field trip • If using any technology in the program, make sure connections are establish and presentation materials are working (computers, projectors, skype, simulations, etc.) • Prepare and stage learning areas and activity centers, including technology
Budget	Identify costs related to personal, facilities, equipment and supplies. (Specific examples are provided, see resources) Budget considerations include: • Lead Facilitator • Support Staff • Materials and supplies (dependant on labs and planned activities) • Location space (if necessary) • Determine if you will charge participants a registration fee, or apply for grants, donations, or outside funding • Travel costs (if necessary) • Budgets are also available from Community Education Centers, outside vendors as well as a variety of grant programs
Assessment and Evaluation	Identify costs related to personal, facilities, equipment and supplies. (Specific examples are provided, see resources) Budget considerations include: • Lead Facilitator at each site • Support Staff • Materials and supplies (dependant on labs and planned activities). District wide programs can save by buying materials in bulk. • Location space (if necessary) • Determine if you will need to find funding support from business connections, apply for grants, donations, or additional outside funding • Travel costs (if necessary) • Specific budgets for canned programs are also available from Community Education Centers, outside vendors as well as a variety of grant programs
Menu of options	Examples include: •

STEM Program Implementation Model	
Partial Immersion Level Elementary (Grades K-6)	
Level Description:	• Several classrooms within the traditional school, *at different grade levels, integrate STEM content within their existing curriculum.* • *Can also be a STEM school/program "within a school" with an imbedded STEM curriculum model as the focus of the* existing curriculum. • Some sharing between the grade levels occurs • Provides an opportunity for student participation in problem/project-based instruction with an end result of a teaching through product development. • Several collaborations with business and industry partners in the geographical area occur, along with mentors and STEM advocates. • Collaborations and partnerships with Higher Education are established. • The partial immersion level will include multiple points of contact with families of the STEM participants, and a minimum of three family integration activities. • In addition, all standards from the previous two levels are incorporated.

Roadmap/ How to Guide/ Timeline	Below are suggestions, as each educational design team must identify, design and create a program that will meet the needs of their community.
	• Identify the focus of your goals as a school/district/community
	  ○ What is the impetus for economic growth and development, and/or quality of life in the community in which you live?
	  ○ If you were to outline the strengths and weaknesses of your community, what would those be?
	  ○ What are your greatest opportunities for job growth, i.e. agriculture, mining, high tech, housing/construction?
	  ○ Generate ideas for an educational STEM program(s) that will provide support and collaboration with the businesses and resources you have in your community. Examples of programs include; engineering, agri-science, biotechnology, sustainability, electronics, bio-medical, solar power, mining
	  ○ Identify your "graduate profile". What do you want your students "to know and be able to do" when they exit your program. Determine the number of students involved and target grade levels for instruction.
	• Once a STEM content focus has been identified, establish a ***team of stakeholders to participate in leadership team, design team and advisory board.*** Recruiting representatives from businesses, Higher Education, district

	employees, parents and students will be helpful in the early stages to identify vision, mission and philosophy for the STEM program. Cast a wide net to gather input from all.
	• Identify what resources, if any, the community already possesses (i.e. content, materials, technology, school/business partnerships, structural/ building resources).
	• Identify a time line for development. This can include a preliminary brainstorming session with focus groups. (All stakeholders having input)
	• Establish ***sub-working groups*** from the stakeholder group to:
	  ○ Identify the STEM program targeted audience (K-6, English Language Learners, special needs) and level of implementation.
	  ○ Identify content resources that are currently available and those that will need to be developed. Design the curriculum, scope and sequence, and assessments/evaluation of the program before you design the learning environment. Knowing "what" you are teaching precludes knowing what facilities you will need to facilitate the instruction. Identify, design and create units/objectives that support higher order thinking skills, inter-disciplinary cross-curricular content, research practices, and rigorous, authentic workplace competency skills. Review existing curricula (i.e. NASA, GLOBE, Project WET)
	  ○ Identify what materials will be used to facilitate instruction (computers, books, lab equipment)
	  ○ Identify the modality of STEM instruction-auditory (lecture), visual (including various forms of technology/digital learning), kinesthetic /hands-on, etc.
	  ○ Identify the instruction focus, i.e. the integration of science and mathematics only, or the implementation of all four STEM (science, technology, engineering, mathematic) areas. Additional program models include the Arts and Humanities for a STEAM-based approach.
	  ○ Identify the pedagogy, i.e. inquiry based, project/problem based, collaborative learning, independent study.
	  ○ Identify and integrate 21st Century work place competency skills that are necessary to promote a knowledge-based economy within your community.
	  ○ Identify the number and types of classes each student may earn by participating in the program. An elementary program may include the integration of content within the day-to-day schedule.
	  ○ Identify necessary personnel resources. Do you need to hire new teachers or maximize potential teachers already at a school? Determine the number of academic teachers, specialist teachers, and support staff. Establish an extensive professional development plan for all faculty and

	support staff. Establish professional learning communities (PLC's) with staff and administration with a focus on student achievement. o Identify technology tools and resources. o Identify necessary structural resources/school site identification. Can you teach the program in an existing school, or would a new building/ addition need to be designed? What structural resources would be necessary to promote flexibility, adaptability, and growth within the program? If using an existing structure, what modifications, if any, would need to occur to the building/classrooms/ office spaces? If designing a new structure identify where construction will occur and find an architect. A Total Team Approach is best if building from the ground up. • Start a preliminary budget based on the implementation model you have created. Establishing three layers of budgets (sky's the limit, functioning, and acceptable) will help pinpoint what is necessary, and what is not. Identify potential funding sources, i.e. grants, district funds, community partnerships, donations, etc. • Establish beginning ties to resources in the community (i.e. business leaders, focus groups, advisory boards, STEM advocates, mentors, shadowing experiences, internships). • Establish School/Family partnership plan • Establish parameters for program evaluation. Pre-post program/course evaluations, can include; focus group discussions among instructors, external consultants/evaluators, academic gains (grades, district/state/national assessments/efficacy surveys), and input from the community. Identify strategies for student recruitment and retention. • Prepare and present scope of project/program to School Board for approval • Prepare Marketing Plan (include both recruitment and retention strategies) • (If necessary) Start project design and bid process, plan review and building permits, detail expected construction timeline and project expected opening date.
Budget *	Identify costs related to personal, facilities, equipment and supplies. (Specific examples are provided, see resources) Budget considerations include: • Personnel (all teachers salaries and benefits) • Support Staff (salaries and benefits) • Equipment (furnishings/ hardware) • Materials and supplies (dependant on labs and planned activities) • Custodial Services • Location space (if necessary) including Architectural and Plan Review and permit fees • Construction costs (if necessary) • Design a strategic plan to apply and manage grants, donations, or outside funding • Travel costs (if necessary) for researching programs, and marketing/ recruiting.

	• Specific budgets for canned programs are also available from Community Education Centers, outside vendors as well as a variety of grant programs
Assessment and Evaluation	• Align already existing school curriculum/content to match standards-based skills and knowledge in science, technology, engineering and mathematics (reference National Common Core Standards) • Design formative and summative assessments and on-going evaluations of authentic student learning and skill development • Provide pre and post assessment surveys in both content and attitudes. • Provide feedback surveys from participants and parents in outreach activities • Demonstrate competencies in state assessments (AIMS, PARCC) • Collect feedback and refine program implementation from stakeholders and content advisory boards • Establish five-seven year budget plan to assure sustainability of school/program • Establish sustained connections to businesses and industry representatives with emphasis on student mentor/internships, career counseling and work place competency skills. Provide project/product development protocols to assess success in shadowing and internships.
Menu of options	Examples include: • Whispering Wind Academy http://www.pvschools.net/wwa/ •

STEM Program Implementation Model	
Partial Immersion Level Middle School (Grades 6-8)	
Level Description:	• Several classrooms within the traditional school, *at different grade levels, integrate STEM content within their existing curriculum.* • *Can also be a STEM school/program "within a school" with an imbedded STEM curriculum model as the focus of the* existing curriculum. • Some sharing between the grade levels occurs • Provides an opportunity for student participation in problem/project-based instruction with an end result of a teaching through product development. • Several collaborations with business and industry partners in the geographical area occur, along with mentors and STEM advocates. • Collaborations and partnerships with Higher Education are established. • The partial immersion level will include multiple points of contact with families of the STEM participants, and a minimum of three family integration activities. • In addition, all standards from the previous two levels are incorporated.

Roadmap/ How to Guide/ Timeline	Below are suggestions, as each educational design team must identify, design and create a program that will meet the needs of their community.
	
	• Identify the focus of your goals as a school/district/community
	  ○ What is the impetus for economic growth and development, and/or quality of life in the community in which you live?
	  ○ If you were to outline the strengths and weaknesses of your community, what would those be?
	  ○ What are your greatest opportunities for job growth, i.e. agriculture, mining, high tech, housing/construction?
	  ○ Generate ideas for an educational STEM program(s) that will provide support and collaboration with the businesses and resources you have in your community. Examples of programs include; engineering, agri-science, biotechnology, sustainability, electronics, bio-medical, solar power, mining
	  ○ Identify your "graduate profile". What do you want your students "to know and be able to do" when they exit your program. Determine the number of students involved and target grade levels for instruction.
	• Once a STEM content focus has been identified, establish a ***team of stakeholders to participate in leadership team, design team and advisory board.*** Recruiting representatives from businesses, Higher Education, district employees, parents and students will be helpful in the early stages to identify vision, mission and philosophy for the STEM program. Cast a wide net to gather input from all.

	• Identify what resources, if any, the community already possesses (i.e. content, materials, technology, school/business partnerships, structural/ building resources).
	• Identify a time line for development. This can include a preliminary brainstorming session with focus groups. (All stakeholders having input)
	• Establish ***sub-working groups*** from the stakeholder group to:
	  ○ Identify the STEM program targeted audience (middle school, honors program, English Language Learners, special needs) and level of implementation.
	  ○ Identify content resources that are currently available and those that will need to be developed. Design the curriculum, scope and sequence, and assessments/evaluation of the program before you design the learning environment. Knowing "what" you are teaching precludes knowing what facilities you will need to facilitate the instruction. Identify, design and create units/objectives that support higher order thinking skills, inter-disciplinary cross-curricular content, research practices, and rigorous, authentic workplace competency skills. Review existing curricula (i.e. NASA, GLOBE, Project Lead the Way, U of A Jr. Biotech program)
	  ○ Identify what materials will be used to facilitate instruction (computers, books, lab equipment)
	  ○ Identify the modality of STEM instruction-auditory (lecture), visual (including various forms of technology/digital learning), kinesthetic /hands-on, etc.
	  ○ Identify the instruction focus, i.e. the integration of science and mathematics only, or the implementation of all four STEM (science, technology, engineering, mathematic) areas. Additional program models include the Arts and Humanities for a STEAM-based approach.
	  ○ Identify the pedagogy, i.e. inquiry based, project/problem based, collaborative learning, independent study.
	  ○ Identify and integrate 21st Century work place competency skills that are necessary to promote a knowledge-based economy within your community.
	  ○ Identify the number and types of credit (classes) each student may earn by participating in the program. For example, a middle school might offer STEM electives or provide integrated classes in mathematics and science.
	  ○ Identify necessary personnel resources. Do you need to hire new teachers or maximize potential teachers already at a school? Determine the number of academic teachers, specialist teachers, and support staff. Research types of certification and highly qualified status each teacher would need to teach the courses. Establish an extensive professional development plan for all faculty and support staff. Establish professional learning communities (PLC's)

	with staff and administration with a focus on student achievement. o Identify technology tools and resources. o Identify necessary structural resources/school site identification. Can you teach the program in an existing school, or would a new building/ addition need to be designed? What structural resources would be necessary to promote flexibility, adaptability, and growth within the program? If using an existing structure, what modifications, if any, would need to occur to the building/classrooms/ office spaces? If designing a new structure identify where construction will occur and find an architect. Total Team Approach is best if building from the ground up. • Start a preliminary budget based on the implementation model you have created. Establishing three layers of budgets (sky's the limit, functioning, and acceptable) will help pinpoint what is necessary, and what is not. Identify potential funding sources, i.e. grants, district funds, community partnerships, donations, etc. • Establish beginning ties to resources in the community (i.e. business leaders, focus groups, advisory boards, STEM advocates, mentors, shadowing experiences, internships). • Establish School/Family partnership plan • Establish parameters for program evaluation. Pre-post program/course evaluations, can include; focus group discussions among instructors, external consultants/evaluators, academic gains (grades, state/national assessments/efficacy surveys), and input from the community. Identify strategies for student recruitment and retention. • Prepare and present scope of project/program to School Board for approval • Prepare Marketing Plan (include both recruitment and retention strategies) • (If necessary) Start project design and bid process, plan review and building permits, detail expected construction timeline and project expected opening date.
Budget	Identify costs related to personal, facilities, equipment and supplies. (Specific examples are provided, see resources) Budget considerations include: • Personnel (all teachers salaries and benefits) • Support Staff (salaries and benefits) • Equipment (furnishings/ hardware) • Materials and supplies (dependant on labs and planned activities) • Custodial Services • Location space (if necessary) including Architectural and Plan Review and permit fees • Construction costs (if necessary) • Design a strategic plan to apply and manage grants, donations, or outside funding • Travel costs (if necessary) for researching programs, and marketing/ recruiting. • Specific budgets for canned programs are also available from

	Community Education Centers, outside vendors as well as a variety of grant programs
Assessment and Evaluation	• Align already existing school curriculum/content to match standards-based skills and knowledge in science, technology, engineering and mathematics (reference National Common Core Standards) • Design formative and summative assessments and on-going evaluations of authentic student learning, problem-based learning, and skill development • Provide pre and post assessment surveys in both content and attitudes. • Provide feedback surveys from participants and parents in outreach activities • Demonstrate competencies in state assessments (AIMS, PARCC) • Collect feedback and refine program implementation from stakeholders and content advisory boards • Establish five-seven year budget plan to assure sustainability of school/program • Establish sustained connections to businesses and industry representatives with emphasis on student mentor/internships, career counseling and work place competency skills. Provide project/product development protocols to assess success in shadowing and internships.
Menu of options	Examples include: • Explorer Middle School http://www.pvschools.net/ems/Home.html

STEM Program Implementation Model	
Partial Immersion Level High School (Grades 9-12)	
Level Description:	• Several classrooms within the traditional school, *at different grade levels, integrate STEM content within their existing curriculum.* • *Can also be a STEM school/program "within a school" with an imbedded STEM curriculum model as the focus of the* existing curriculum. • Some sharing between the grade levels occurs • Provides an opportunity for student participation in problem/project-based instruction with an end result of a teaching through product development. • Several collaborations with business and industry partners in the geographical area occur, along with mentors and STEM advocates. • Collaborations and partnerships with Higher Education are established. • The partial immersion level will include multiple points of contact with families of the STEM participants, and a minimum of three family integration activities. • In addition, all standards from the previous two levels are incorporated.

Roadmap/ How to Guide/ Timeline	Below are suggestions, as each educational design team must identify, design and create a program that will meet the needs of their community.
	
	• Identify the focus of your goals as a school/district/community
	  ○ What is the impetus for economic growth and development, and/or quality of life in the community in which you live?
	  ○ If you were to outline the strengths and weaknesses of your community, what would those be?
	  ○ What are your greatest opportunities for job growth, i.e. agriculture, mining, high tech, housing/construction?
	  ○ Generate ideas for an educational STEM program(s) that will provide support and collaboration with the businesses and resources you have in your community. Examples of programs include; engineering, agri-science, biotechnology, sustainability, electronics, bio-medical, solar power, mining
	  ○ Identify your "graduate profile". What do you want your students "to know and be able to do" when they exit your program. Determine the number of students involved and target grade levels for instruction.
	• Once a STEM content focus has been identified, establish a ***team of stakeholders to participate in leadership team, design team and advisory board.*** Recruiting representatives from businesses, Higher Education, district employees, parents and students will be helpful in the early stages to identify vision, mission and philosophy for the STEM program. Cast a wide net to gather input from all.
	• Identify what resources, if any, the community already possesses (i.e. content, materials, technology, school/business partnerships, structural/ building resources).
	• Identify a time line for development. This can include a preliminary brainstorming session with focus groups. (All stakeholders having input)
	• Establish ***sub-working groups*** from the stakeholder group to:
	  ○ Identify the STEM program targeted audience (high school, honors program, CTE, English Language Learners, special needs) and level of implementation (Exploratory, Partial Immersion, etc).
	  ○ Identify content resources that are currently available and those that will need to be developed. Design the curriculum, scope and sequence, and assessments/evaluation of the program before you

	design the learning environment. Knowing "what" you are teaching precludes knowing what facilities you will need to facilitate the instruction. Identify, design and create units/objectives that support higher order thinking skills, inter-disciplinary cross-curricular content, research practices, and rigorous, authentic workplace competency skills. Review existing curricula (i.e. NASA, GLOBE, Project Lead the Way) ○ Identify what materials will be used to facilitate instruction (computers, books, lab equipment) ○ Identify the modality of STEM instruction-auditory (lecture), visual (including various forms of technology/digital learning), kinesthetic /hands-on, etc. ○ Identify the instruction focus, i.e. the integration of science and mathematics only, or the implementation of all four STEM (science, technology, engineering, mathematic) areas. Additional program models include the Arts and Humanities for a STEAM-based approach. ○ Identify the pedagogy, i.e. inquiry based, project/problem based, collaborative learning, independent study. ○ Identify and integrate 21st Century work place competency skills that are necessary to promote a knowledge-based economy within your community. ○ Identify the number and types of credit (classes) each student may earn by participating in the program. For example, a high school program may offer a STEM collaborative class, or CTE, AP, and dual enrollment classes within a STEM content area. A middle school might offer STEM electives or provide integrated classes in mathematics and science. An elementary program may include the integration of content within the day-to-day schedule, or be an "add-on" to the weekly curriculum. ○ Identify necessary personnel resources. Do you need to hire new teachers or maximize potential teachers already at a school? Determine the number of academic teachers, specialist teachers, and support staff. Research types of certification and highly qualified status each teacher would need to teach the courses. Establish an extensive professional development plan for all faculty and support staff. Establish professional learning communities (PLC's) with staff and administration with a focus on student achievement. ○ Identify technology tools and resources. ○ Identify necessary structural resources/school site identification. Can you teach the program in an existing school, or would a new building/ addition need to be designed? What structural resources would be necessary to promote flexibility, adaptability, and growth within the program? If using an existing structure, what modifications, if any, would need to occur to the building/classrooms/ office spaces? If designing a new structure identify where construction will occur and find an architect. Total Team Approach is best if building from the ground up. • Start a preliminary budget based on the implementation model you have created. Establishing three layers of budgets (sky's the limit, functioning, and acceptable) will help pinpoint what is necessary, and what is not. Identify potential funding sources, i.e. grants, district funds, community partnerships, donations, etc. • Establish beginning ties to resources in the community (i.e. business leaders, focus groups, advisory boards, STEM advocates, mentors,

	shadowing experiences, internships). • Establish School/Family partnership plan • Establish parameters for program evaluation. Pre-post program/course evaluations, can include; focus group discussions among instructors, external consultants/evaluators, academic gains (grades, state/national assessments/efficacy surveys), and input from the community. Identify strategies for student recruitment and retention. • Prepare and present scope of project/program to School Board for approval • Prepare Marketing Plan (include both recruitment and retention strategies) • (If necessary) Start project design and bid process, plan review and building permits, detail expected construction timeline and project expected opening date.
Budget	Identify costs related to personal, facilities, equipment and supplies. (Specific examples are provided, see resources) Budget considerations include: • Personnel (all teachers salaries and benefits) • Support Staff (salaries and benefits) • Equipment (furnishings/ hardware) • Materials and supplies (dependant on labs and planned activities) • Custodial Services • Location space (if necessary) including Architectural and Plan Review and permit fees • Construction costs (if necessary) • Design a strategic plan to apply and manage grants, donations, or outside funding • Travel costs (if necessary) • Specific budgets for canned programs are also available from Community Education Centers, outside vendors as well as a variety of grant programs
Assessment and Evaluation	• Align already existing school curriculum/content to match standards-based skills and knowledge in science, technology, and mathematics (reference National Common Core Standards) • Design formative and summative assessments and on-going evaluations of authentic student learning and skill development • Provide pre and post assessment surveys in both content and attitudes. • Provide feedback surveys from participants and parents in outreach activities • Demonstrate competencies in state assessments (AIMS, PARCC) and college and career readiness (ACT, SAT, TIMSS, PISA, PIAAC) • Collect feedback and refine program implementation from stakeholders and content advisory boards • Establish five-seven year budget plan to assure sustainability of school/program • Establish sustained connections to businesses and industry representatives with emphasis on student mentor/internships, career counseling and work place competency skills. Provide project/product development protocols to assess success in shadowing and internships.
Menu of options	Examples include: • The Center for Research in Engineering, Science and Technology (CREST) on the campus of Paradise Valley High School http://www.pvschools.net/crest/ • Biotech Academy on the campus of Mesa High School http://www.mpsaz.org/mesa/departments/biotech/ • Metro Tech High School (embedded Sustainability curriculum) http://www.phxhs.k12.az.us/education/school/school.php?sectiondetailid=16556&

	• Xavier Girls Preparatory- Epics program

STEM Program Implementation Model	
Full Immersion Level Elementary (Grades K-6)	
Level Description:	• Whole school to teaching STEM education through a global mission and vision. • Full immersion requires by in by all schools staff, classroom and special area teachers. • STEM lessons are planned and aligned by grade levels to be integrated, spiraling in increased complexity and rigor, and constructive in nature. • Provides an opportunity for student participation in problem/project-based instruction with an end result of a teaching through product development. • Extensive collaboration with business, industry and Higher Education is vital to the success of this level. • This level will include multiple points of contact with the families of the STEM participants, and multiple family integration activities. • In addition, all standards from the previous three levels are incorporated.

Roadmap/ How to Guide/ Timeline	Below are suggestions, as each educational design team must identify, design and create a program that will meet the needs of their community.
	
	• Identify the focus of your goals as a school/district/community
	  ○ What is the impetus for economic growth and development, and/or quality of life in the community in which you live?
	  ○ If you were to outline the strengths and weaknesses of your community, what would those be?
	  ○ What are your greatest opportunities for job growth, i.e. agriculture, mining, high tech, housing/construction?
	  ○ Generate ideas for an educational STEM program(s) that will provide support and collaboration with the businesses and resources you have in your community. Examples of programs include; engineering, agri-science, biotechnology, sustainability, electronics, bio-medical, solar power, mining
	  ○ Identify your "graduate profile". What do you want your students "to know and be able to do" when they exit your program. Determine the number of students involved and target grade levels for instruction.
	• Once a STEM content focus has been identified, establish a ***team of stakeholders to participate in leadership team, design team and advisory board.*** Recruiting representatives from businesses, Higher Education, district employees, parents and

	students will be helpful in the early stages to identify vision, mission and philosophy for the STEM program. Cast a wide net to gather input from all.
	• Identify what resources, if any, the community already possesses (i.e. content, materials, technology, school/business partnerships, structural/ building resources).
	• Identify a time line for development. This can include a preliminary brainstorming session with focus groups. (All stakeholders having input)
	• Establish ***sub-working groups*** from the stakeholder group to:
	  ○ Identify the STEM program targeted audience (K-6, English Language Learners, special needs) and level of implementation.
	  ○ Identify content resources that are currently available and those that will need to be developed. Design the curriculum, scope and sequence, and assessments/evaluation of the program before you design the learning environment. Knowing "what" you are teaching precludes knowing what facilities you will need to facilitate the instruction. Identify, design and create units/objectives that support higher order thinking skills, inter-disciplinary cross-curricular content, research practices, and rigorous, authentic workplace competency skills. Review existing curricula (i.e. NASA, GLOBE, Project WET)
	  ○ Identify what materials will be used to facilitate instruction (computers, books, lab equipment)
	  ○ Identify the modality of STEM instruction-auditory (lecture), visual (including various forms of technology/digital learning), kinesthetic /hands-on, etc.
	  ○ Identify the instruction focus, i.e. the integration of science and mathematics only, or the implementation of all four STEM (science, technology, engineering, mathematic) areas. Additional program models include the Arts and Humanities for a STEAM-based approach.
	  ○ Identify the pedagogy, i.e. inquiry based, project/problem based, collaborative learning, independent study.
	  ○ Identify and integrate 21st Century work place competency skills that are necessary to promote a knowledge-based economy within your community.
	  ○ Identify the number and types of classes each student may earn by participating in the program. An elementary program may include the integration of content within the day-to-day schedule.

	○ Identify necessary personnel resources. Do you need to hire new teachers or maximize potential teachers already at a school? Determine the number of academic teachers, specialist teachers, and support staff. Establish an extensive professional development plan for all faculty and support staff. Establish professional learning communities (PLC's) with staff and administration with a focus on student achievement. ○ Identify technology tools and resources. ○ Identify necessary structural resources/school site identification. Can you teach the program in an existing school, or would a new building/ addition need to be designed? What structural resources would be necessary to promote flexibility, adaptability, and growth within the program? If using an existing structure, what modifications, if any, would need to occur to the building/classrooms/ office spaces? If designing a new structure identify where construction will occur and find an architect. A Total Team Approach is best if building from the ground up. • Start a preliminary budget based on the implementation model you have created. Establishing three layers of budgets (sky's the limit, functioning, and acceptable) will help pinpoint what is necessary, and what is not. Identify potential funding sources, i.e. grants, district funds, community partnerships, donations, etc. • Establish beginning ties to resources in the community (i.e. business leaders, focus groups, advisory boards, STEM advocates, mentors, shadowing experiences, internships). • Establish School/Family partnership plan • Establish parameters for program evaluation. Pre-post program/course evaluations, can include; focus group discussions among instructors, external consultants/evaluators, academic gains (grades, district/state/national assessments/efficacy surveys), and input from the community. Identify strategies for student recruitment and retention. • Prepare and present scope of project/program to School Board for approval • Prepare Marketing Plan (include both recruitment and retention strategies) • (If necessary) Start project design and bid process, plan review and building permits, detail expected construction timeline and project expected opening date.
Budget *	Identify costs related to personal, facilities, equipment and supplies. (Specific examples are provided, see resources) Budget considerations include:

	• School/Program Administrator (including benefits) • School/Program Curriculum Specialist (including benefits) • Personnel (all teachers salaries and benefits) • Support Staff (salaries and benefits) • Equipment (furnishings/ hardware) • Materials and supplies (dependant on labs and planned activities) • Custodial Services • Location space (if necessary) including Architectural and Plan Review and permit fees • Construction costs (if necessary) • Design a strategic plan to apply and manage grants, donations, or outside funding • Travel costs (if necessary) for researching programs, and marketing/ recruiting. • Specific budgets for canned programs are also available from Community Education Centers, outside vendors as well as a variety of grant programs
Assessment and Evaluation	• Align already existing school curriculum/content to match standards-based skills and knowledge in science, technology, and mathematics (reference National Common Core Standards) • Design formative and summative assessments and on-going evaluations of authentic student learning and skill development • Provide pre and post assessment surveys in both content and attitudes. • Provide feedback surveys from participants and parents in outreach activities • Demonstrate competencies in state assessments (AIMS, PARCC) • Collect feedback and refine program implementation from stakeholders and content advisory boards • Establish five-seven year budget plan to assure sustainability of school/program • Establish sustained connections to businesses and industry representatives with emphasis on student mentor/internships, career counseling and work place competency skills. Provide project/product development protocols to assess success in shadowing and internships.
Menu of options	Examples include: • Navajo Elementary http://susd.navajo.schoolfusion.us/ • Foothills Elementary School https://sites.google.com/a/pvlearners.net/fhes/

STEM Program Implementation Model	
Full Immersion Level Middle School (Grades 6-8)	
Level Description:	• Whole school or district-wide grade band approach to teaching STEM education through a global mission and vision. • Full immersion requires by in by all schools staff, classroom and special area teachers. • STEM lessons are planned and aligned by grade levels to be integrated, spiraling in increased complexity and rigor, and constructive in nature. • Extensive collaboration with business, industry and Higher Education is vital to the success of this level. • This level will include multiple points of contact with the families of the STEM participants, and multiple family integration activities.

Roadmap/ How to Guide/ Timeline	Below are suggestions, as each educational design team must identify, design and create a program that will meet the needs of their community.
	
	• Identify the focus of your goals as a school/district/community
	  ○ What is the impetus for economic growth and development, and/or quality of life in the community in which you live?
	  ○ If you were to outline the strengths and weaknesses of your community, what would those be?
	  ○ What are your greatest opportunities for job growth, i.e. agriculture, mining, high tech, housing/construction?
	  ○ Generate ideas for an educational STEM program(s) that will provide support and collaboration with the businesses and resources you have in your community. Examples of programs include; engineering, agri-science, biotechnology, sustainability, electronics, bio-medical, solar power, mining
	  ○ Identify your "graduate profile". What do you want your students "to know and be able to do" when they exit your program. Determine the number of students involved and target grade levels for instruction.
	• Once a STEM content focus has been identified, establish a ***team of stakeholders to participate in leadership team, design team and advisory board.*** Recruiting representatives from businesses, Higher Education, district employees, parents and students will be helpful in the early stages to identify vision, mission and philosophy for the STEM program. Cast a wide net to gather input from all.
	• Identify what resources, if any, the community already possesses (i.e. content, materials, technology, school/business partnerships, structural/ building resources).
	• Identify a time line for development. This can include a preliminary brainstorming session with focus groups. (All stakeholders having input)
	• Establish ***sub-working groups*** from the stakeholder group to:
	  ○ Identify the STEM program targeted audience (middle school, honors program, English Language Learners,

	special needs) and level of implementation. ○ Identify content resources that are currently available and those that will need to be developed. Design the curriculum, scope and sequence, and assessments/evaluation of the program before you design the learning environment. Knowing "what" you are teaching precludes knowing what facilities you will need to facilitate the instruction. Identify, design and create units/objectives that support higher order thinking skills, inter-disciplinary cross-curricular content, research practices, and rigorous, authentic workplace competency skills. Review existing curricula (i.e. NASA, GLOBE, Project Lead the Way) ○ Identify what materials will be used to facilitate instruction (computers, books, lab equipment) ○ Identify the modality of STEM instruction-auditory (lecture), visual (including various forms of technology/digital learning), kinesthetic /hands-on, etc. ○ Identify the instruction focus, i.e. the integration of science and mathematics only, or the implementation of all four STEM (science, technology, engineering, mathematic) areas. Additional program models include the Arts and Humanities for a STEAM-based approach. ○ Identify the pedagogy, i.e. inquiry based, project/problem based, collaborative learning, independent study. ○ Identify and integrate 21st Century work place competency skills that are necessary to promote a knowledge-based economy within your community. ○ Identify the number and types of credit (classes) each student may earn by participating in the program. For example, a middle school might offer STEM electives or provide integrated classes in mathematics and science. ○ Identify necessary personnel resources. Do you need to hire new teachers or maximize potential teachers already at a school? Determine the number of academic teachers, specialist teachers, and support staff. Research types of certification and highly qualified status each teacher would need to teach the courses. Establish an extensive professional development plan for all faculty and support staff. Establish professional learning communities (PLC's) with staff and administration with a focus on student achievement. ○ Identify technology tools and resources. ○ Identify necessary structural resources/school site identification. Can you teach the program in an existing school, or would a new building/ addition need to be designed? What structural resources would be necessary to promote flexibility, adaptability, and growth within the program? If using an existing structure, what modifications, if any, would need to occur to the building/classrooms/ office spaces? If designing a new structure identify where construction will occur and find an architect. Total Team Approach is best if building from the ground up. • Start a preliminary budget based on the implementation model you have created. Establishing three layers of budgets (sky's the

	limit, functioning, and acceptable) will help pinpoint what is necessary, and what is not. Identify potential funding sources, i.e. grants, district funds, community partnerships, donations, etc. • Establish beginning ties to resources in the community (i.e. business leaders, focus groups, advisory boards, STEM advocates, mentors, shadowing experiences, internships). • Establish School/Family partnership plan • Establish parameters for program evaluation. Pre-post program/course evaluations, can include; focus group discussions among instructors, external consultants/evaluators, academic gains (grades, state/national assessments/efficacy surveys), and input from the community. Identify strategies for student recruitment and retention. • Prepare and present scope of project/program to School Board for approval • Prepare Marketing Plan (include both recruitment and retention strategies) • (If necessary) Start project design and bid process, plan review and building permits, detail expected construction timeline and project expected opening date.
Budget	Identify costs related to personal, facilities, equipment and supplies. (Specific examples are provided, see resources) Budget considerations include: • School/Program Administrator (including benefits) • School/Program Curriculum Specialist (including benefits) • Personnel (all teachers salaries and benefits) • Support Staff (salaries and benefits) • Equipment (furnishings/ hardware) • Materials and supplies (dependant on labs and planned activities) • Custodial Services • Location space (if necessary) including Architectural and Plan Review and permit fees • Construction costs (if necessary) • Design a strategic plan to apply and manage grants, donations, or outside funding • Travel costs (if necessary) for researching programs, and marketing/ recruiting. • Specific budgets for canned programs are also available from Community Education Centers, outside vendors as well as a variety of grant programs
Assessment and Evaluation	• Align already existing school curriculum/content to match standards-based skills and knowledge in science, technology, and mathematics (reference National Common Core Standards) • Design formative and summative assessments and on-going evaluations of authentic student learning, problem-based learning, and skill development • Provide pre and post assessment surveys in both content and attitudes. • Provide feedback surveys from participants and parents in outreach activities • Demonstrate competencies in state assessments (AIMS, PARCC) • Collect feedback and refine program implementation from stakeholders and content advisory boards • Establish five-seven year budget plan to assure sustainability of school/program • Establish sustained connections to businesses and industry

	representatives with emphasis on student mentor/internships, career counseling and work place competency skills. Provide project/product development protocols to assess success in shadowing and internships.
Menu of options	Examples include: • Fort Huachuca Middle School http://www.fthuachuca.k12.az.us/19862021712346627/site/default.asp

STEM Program Implementation Model	
Full Immersion Level High School (Grades 9-12)	
Level Description:	• Whole school or district-wide grade band approach to teaching STEM education through a global mission and vision. • Full immersion requires by in by all schools staff, classroom and special area teachers. • STEM lessons are planned and aligned by grade levels to be integrated, spiraling in increased complexity and rigor, and constructive in nature. • Extensive collaboration with business, industry and Higher Education is vital to the success of this level. • This level will include multiple points of contact with the families of the STEM participants, and multiple family integration activities.

Roadmap/ How to Guide/ Timeline	Below are suggestions, as each educational design team must identify, design and create a program that will meet the needs of their community.
	
	• Identify the focus of your goals as a school/district/community
	  ○ What is the impetus for economic growth and development, and/or quality of life in the community in which you live?
	  ○ If you were to outline the strengths and weaknesses of your community, what would those be?
	  ○ What are your greatest opportunities for job growth, i.e. agriculture, mining, high tech, housing/construction?
	  ○ Generate ideas for an educational STEM program(s) that will provide support and collaboration with the businesses and resources you have in your community. Examples of programs include; engineering, agri-science, biotechnology, sustainability, electronics, bio-medical, solar power, mining
	  ○ Identify your "graduate profile". What do you want your students "to know and be able to do" when they exit your program. Determine the number of students involved and target grade levels for instruction.
	• Once a STEM content focus has been identified, establish a ***team of stakeholders to participate in leadership team, design team and advisory board.*** Recruiting representatives from businesses, Higher Education, district employees, parents and students will be helpful in the early stages to identify vision, mission and philosophy for the STEM program. Cast a wide net to gather input from all.
	• Identify what resources, if any, the community already possesses (i.e.

	content, materials, technology, school/business partnerships, structural/ building resources).
	• Identify a time line for development. This can include a preliminary brainstorming session with focus groups. (All stakeholders having input)
	• Establish ***sub-working groups*** from the stakeholder group to:
	  ○ Identify the STEM program targeted audience (high school, honors program, CTE, English Language Learners, special needs) and level of implementation (Exploratory, Partial Immersion, etc).
	  ○ Identify content resources that are currently available and those that will need to be developed. Design the curriculum, scope and sequence, and assessments/evaluation of the program before you design the learning environment. Knowing "what" you are teaching precludes knowing what facilities you will need to facilitate the instruction. Identify, design and create units/objectives that support higher order thinking skills, inter-disciplinary cross-curricular content, research practices, and rigorous, authentic workplace competency skills. Review existing curricula (i.e. NASA, GLOBE, Project Lead the Way)
	  ○ Identify what materials will be used to facilitate instruction (computers, books, lab equipment)
	  ○ Identify the modality of STEM instruction-auditory (lecture), visual (including various forms of technology/digital learning), kinesthetic /hands-on, etc.
	  ○ Identify the instruction focus, i.e. the integration of science and mathematics only, or the implementation of all four STEM (science, technology, engineering, mathematic) areas. Additional program models include the Arts and Humanities for a STEAM-based approach.
	  ○ Identify the pedagogy, i.e. inquiry based, project/problem based, collaborative learning, independent study.
	  ○ Identify and integrate 21st Century work place competency skills that are necessary to promote a knowledge-based economy within your community.
	  ○ Identify the number and types of credit (classes) each student may earn by participating in the program. For example, a high school program may offer a STEM collaborative class, or CTE, AP, and dual enrollment classes within a STEM content area. A middle school might offer STEM electives or provide integrated classes in mathematics and science. An elementary program may include the integration of content within the day-to-day schedule, or be an "add-on" to the weekly curriculum.
	  ○ Identify necessary personnel resources. Do you need to hire new teachers or maximize potential teachers already at a school? Determine the number of academic teachers, specialist teachers, and support staff. Research types of certification and highly qualified status each teacher would need to teach the courses. Establish an extensive professional development plan for all faculty and support staff. Establish professional learning communities (PLC's) with staff and administration with a focus on student achievement.
	  ○ Identify technology tools and resources.
	  ○ Identify necessary structural resources/school site identification. Can you teach the program in an existing school, or would a new building/ addition need to be designed? What structural resources would be necessary to promote flexibility, adaptability,

	and growth within the program? If using an existing structure, what modifications, if any, would need to occur to the building/classrooms/ office spaces? If designing a new structure identify where construction will occur and find an architect. Total Team Approach is best if building from the ground up. • Start a preliminary budget based on the implementation model you have created. Establishing three layers of budgets (sky's the limit, functioning, and acceptable) will help pinpoint what is necessary, and what is not. Identify potential funding sources, i.e. grants, district funds, community partnerships, donations, etc. • Establish beginning ties to resources in the community (i.e. business leaders, focus groups, advisory boards, STEM advocates, mentors, shadowing experiences, internships). • Establish School/Family partnership plan • Establish parameters for program evaluation. Pre-post program/course evaluations, can include; focus group discussions among instructors, external consultants/evaluators, academic gains (grades, state/national assessments/efficacy surveys), and input from the community. Identify strategies for student recruitment and retention. • Prepare and present scope of project/program to School Board for approval • Prepare Marketing Plan (include both recruitment and retention strategies) • (If necessary) Start project design and bid process, plan review and building permits, detail expected construction timeline and project expected opening date.
Budget	Identify costs related to personal, facilities, equipment and supplies. (Specific examples are provided, see resources) Budget considerations include: • School/Program Administrator (including benefits) • School/Program Curriculum Specialist (including benefits) • Personnel (all teachers salaries and benefits) • Support Staff (salaries and benefits) • Equipment (furnishings/ hardware) • Materials and supplies (dependant on labs and planned activities) • Custodial Services • Location space (if necessary) including Architectural and Plan Review and permit fees • Construction costs (if necessary) • Design a strategic plan to apply and manage grants, donations, or outside funding • Travel costs (if necessary) • Specific budgets for canned programs are also available from Community Education Centers, outside vendors as well as a variety of grant programs
Assessment and Evaluation	• Align already existing school curriculum/content to match standards-based skills and knowledge in science, technology, and mathematics (reference National Common Core Standards) • Design formative and summative assessments and on-going evaluations of authentic student learning and skill development • Provide pre and post assessment surveys in both content and attitudes. • Provide feedback surveys from participants and parents in outreach activities • Demonstrate competencies in state assessments (AIMS, PARCC) and college and career readiness (ACT, SAT, TIMSS, PISA, PIAAC) • Collect feedback and refine program implementation from stakeholders

	and content advisory boards • Establish five-seven year budget plan to assure sustainability of school/program • Establish sustained connections to businesses and industry representatives with emphasis on student mentor/internships, career counseling and work place competency skills. Provide project/product development protocols to assess success in shadowing and internships.
Menu of options	Examples include: • Bioscience High School http://www.phxhs.k12.az.us/education/school/school.php?sectiondetailid=16413&

Introductory level-STEM implementation within a traditional school curriculum. Takes place in one or more classrooms, *at one grade level,* at a site. Teachers design a unit(s) that integrates STEM curriculum into their existing content. Provides an opportunity for students to participate in problem/project-based instruction with an end result of a teaching through product development (i.e. school/parent presentation, science fair, contest, cumulative field trip). Initial collaboration with one or more business partners/mentor established.

Partial Immersion-Several classrooms within the traditional school *at different grade levels* integrate STEM content with their existing curriculum. Some sharing between the grade levels occurs (science buddies, lab partners- can occur b/w K-6 and K-12 classrooms). Provide an opportunity for students to participate in problem/project-based instruction with an end result of a teaching through product development (i.e. school/parent presentation, science fair, contest, cumulative field trip). Several collaborations with business and industry partners in the geographical area can include higher ed.

Full Immersion- Whole school, systemic approach to teaching STEM education through a global school mission and vision. Full immersion requires by in by all school staff, classroom and (if K-6) special area teachers. STEM lessons are planned and aligned by grade levels to be integrated, spiraling in increased complexity and rigor, and constructivist in nature. Extensive collaboration with business, industry and high ed.

SFAz-MCESA Webpage Table Template

Catagory	Exploratory	Introductory	Partial Immersion	Full Immersion
DESCRIPTION OF STEM IMPLEMENTATION LEVELS	Exploratory Level Descriptors: •Minimal Immersion •This level includes experimental, outside the traditional school curriculum, type programming. •A school or district may be interested in this level if it has limited financial and human resources to devote to STEM development, but has identified STEM as a priority. •Specific program content can vary, but the program will focus on the integration of a thematic STEM curriculum. •Includes family engagement and outreach	Introductory Level Descriptors: •STEM implementation, at one grade level within a school or district-wide grade band, within a traditional school curriculum •This level takes place in one or more subject areas, at one grade level, at a single site, or in a district-wide grade band. •Units are designed that integrate STEM curriculum into existing content areas. •Opportunities are provided for student participation in problem-solving and project-based instruction. •Provides opportunity for teaching through product development (school/parent presentations, science fairs, evening STEM nights, etc.) •Initial collaboration with one or more business partners, mentors, and/or STEM advocates are established. •Includes multiple points of contact with the families of the STEM participants, and at least one family integration activity.	Partial Immersion Level Descriptors: •Several classrooms within the traditional school, at different grade levels, integrate STEM content within their existing curriculum. •Can also be a STEM school/program "within a school" with an imbedded STEM curriculum model as the focus of the existing curriculum. •Some sharing between the grade levels occurs •Provides an opportunity for student participation in problem/project-based instruction with an end result of a teaching through product development. •Several collaborations with business and industry partners in the geographical area occurs, along with mentors and STEM advocates. •Collaborations and partnerships with Higher Education are established. •The partial immersion level will include multiple points of contact with families of the STEM participants, and a minimum of three family integration activities. •In addition, all standards from the previous two levels are incorporated.	Full Immersion Level Descriptors: •This level focuses on a whole school approach to teaching STEM education through a global mission and vision. •Full immersion requires "by in" and participation by all schools staff, classroom and special area teachers. •STEM lessons are planned and aligned by all grade levels and special area classes to be integrated, spiraling in increased complexity and rigor, and constructive in nature. •Provides an opportunity for student participation in problem/project-based instruction with an end result of teaching through product development. •Several collaborations with business and industry partners in the geographical area occurs, along with mentors and STEM advocates. •Collaborations and partnerships with Higher Education are established. •This level will include multiple points of contact with the families of the STEM participants, and multiple family integration activities. •In addition, all standards from the previous three levels are incorporated
FOUNDATIONS	The following components are suggested preliminary steps prior to STEM program implementation: •Flexibility of work space •Visionary leadership •Common communication between stakeholders •Establishment of STEM resources •Identification of established curriculum/development of new curriculum •Strategic community involvement/out reach •Flexible scheduling •Highly qualified staffing	The following components are suggested preliminary steps prior to STEM program implementation: •Flexibility of work space •Visionary leadership •Common communication between stakeholders •Establishment of STEM resources •Identification of established curriculum/development of new curriculum •Strategic community involvement/out reach •Flexible scheduling •Highly qualified staffing	The following components are suggested preliminary steps prior to STEM program implementation: •Flexibility of work space •Visionary leadership •Common communication between stakeholders •Establishment of STEM resources •Identification of established curriculum/development of new curriculum •Strategic community involvement/out reach •Flexible scheduling •Highly qualified staffing	The following components are suggested preliminary steps prior to STEM program implementation: •Flexibility of work space •Visionary leadership •Common communication between stakeholders •Establishment of STEM resources •Identification of established curriculum/development of new curriculum •Strategic community involvement/out reach •Flexible scheduling •Highly qualified staffing
	****adding in focus to geographical connections to business/industry			
Roadmap	***link the section on roadmap/how to guide from STEM program implementation model section here	***link the section on roadmap/how to guide from STEM program implementation model section here	***link the section on roadmap/how to guide from STEM program implementation model section here	***link the section on roadmap/how to guide from STEM program implementation model section here

LEADING	Administrative Leadership provides: •support structures for teachers (ex. club leader) •support structures for students •decide program purpose/content •select target audience •program evaluation •solo to collaborative, or shared decision making •resource allocation (materials/supplies) •program location/work space •facilitation support •implementation timelines/calendars •communication strategies •professional development plan •budget development/oversight •evaluation protocols •advocacy and marketing for program •strategies for sustainability	Administrative Leadership provides: •support structures for teachers (ex. Grade level team) •support structures for students •collaboration with parents •decide program purpose/content •select target audience •program evaluation •solo to collaborative, or shared decision making •resource allocation (materials/supplies) •program location/work space •facilitation support with classified staff •implementation timelines/calendars •communication strategies •professional development plan •budget development/oversight •evaluation protocols •outreach to business and industry •advocacy and marketing for program •strategies for sustainability	Administrative Leadership provides: •support structures for teachers (ex. Various grade levels/school within a school model) •support structures for students •collaboration with parents/families •program purpose/content •selection of grade level participation •program evaluation •establishment of end of course/program goals •establishment of a leadership cadre •establishment an advisory committee for mission, vision, scope of project •solo to collaborative, or shared decision making •resource allocation (materials/supplies) •program location/work space •facilitation support with classified staff •implementation timelines/calendars •communication strategies •professional development plan •budget development/oversight •evaluation protocols •outreach to business, industry, and higher education •advocacy and marketing for program •strategies for sustainability	Administrative Leadership provides: •support structures for teachers (ex. Various grade levels/school within a school model) •support structures for students •collaboration with parents/families •program purpose/content •selection of grade level participation •program evaluation •establishment of end of course/program goals •establishment of a leadership cadre •establishment an advisory committee for mission, vision, scope of project •solo to collaborative, or shared decision making •resource allocation (materials/supplies) •program location/work space •facilitation support with classified staff •implementation timelines/calendars •communication strategies •professional development plan •budget development/oversight •evaluation protocols •outreach to business, industry, and higher education •advocacy and marketing for program •strategies for sustainability
TEACHING	Teaching: "What is the teacher doing?" The teacher: •takes the lead role in planning and facilitating the program •provides direct instruction while leading students through investigations •selects cross-curricular content •embeds a variety of technology in the instructional process •provides authentic, real world experiences •connects business/industry skills to instruction in clubs or after school program •is involved in communities of practice •provides connections to outreach/service learning projects for students	Teaching: "What is the teacher doing?" The teacher: •takes the lead role in planning and facilitating the program within the grade level band •provides some direct instruction while leading students through investigations •provides an opportunity for students to participate in guided inquiry and problem-solving •selects cross-curricular STEM content •provides authentic, real world problems within STEM content •provides instruction with the outcome of product development. •connects business/industry skills to classroom instruction •involvement in professional learning communities with other instructors at their grade level in their school, or across their district •provides service learning projects for students •embeds a variety of technology in the instructional process, including presentation tools, i.e. PowerPoints, smart boards, multi-media,prezi, etc.	Teaching: "What is the teacher doing?" The teacher: •takes an advisory role in planning and facilitating the program •encourages student participation in identification of problem/project •provides limited direct instruction while students move through STEM investigations •provides an opportunity for students to participate in guided inquiry and problem-solving •assists in selection of cross-curricular content that is embedded into the traditional curriculum •provides authentic, real world problems within STEM content •provides instruction with the outcome of product development. •connects business/industry skills to classroom instruction •involvement in professional learning communities with other instructor at their grade level and additional grade levels, in their school or across their district •provides opportunities and protocols for students to research and participate in outreach/service learning projects •embeds a variety of technology in the instructional process, including using technology as a facilitation of student learning in investigations and problem-solving, i. e. data analysis, research, creation of multi-media.	Teaching: "What is the teacher doing?" The teacher: •takes an advisory role in planning and facilitating the program •encourages student participation in identification of problem/project •provides a guiding role while students move through STEM investigations •provides an opportunity for students to participate in open-ended inquiry and problem-solving •assists in selection of rigorous cross-curricular STEM content as the focus of the school curriculum •provides authentic, real world problems within STEM content •facilitates instruction with the outcome of product development. •connects business/industry skills to classroom instruction •involvement in professional learning communities with other instructor at their grade level and additional grade levels, in their school. •provides opportunities and protocols for students to research and participate in outreach/service learning projects •provides opportunities for students to conduct research in STEM-based content with links to university/college labs •embeds a variety of technology in the instructional process, including using technology as a facilitation of student learning in a transformative instructional manner, i.e. using technology tools such as spectrometers, PCR machines, digital microscopes, robots, etc.

LEARNING	Learning: “What is the student doing?” The student: •participates in an integration of STEM content in an "out of the traditional classroom" experience, i.e. after school club, summer program •collaborates with peers to solve teacher directed problems •participates in problem-based, teacher directed investigations •participates in teacher directed inquiry •participates in relevant/authentic learning experiences •participates in real-world connections with business/industry •uses a variety of technology in the investigative process •participates in a level of self-evaluation •participates in project/problem based instruction resulting in product development, solutions creation •has an opportunity to participate in service learning projects	Learning: “What is the student doing?” The student: •participates in an integration of STEM content within a grade level band at an individual school, or across a district •collaborates with peers to solve teacher directed authentic, real world problems •participates in problem-based, teacher directed investigations •participates in teacher directed inquiry •participates in relevant/authentic learning experiences •participates in connections with business/industry representatives •uses a variety of technology in the investigative process •participates in a level of self-evaluation •participates in project/problem based instruction resulting in product development •participates in outreach/service learning projects within the school or community •participates in multiple points of contact with the families of the STEM students, and at least one family integration activity.	Learning: “What is the student doing?” The student: •participates in an integration of STEM content embedded within the traditional school curriculum •experiences the STEM content from cross-curricular, inter-disciplinary to trans disciplinary •collaborates with peers to solve teacher/student directed problems •participates in problem-based, teacher/student directed investigations •participates in guided inquiry investigation •participates in relevant/authentic learning experiences •participates in real-world connections with business and industry •uses a variety of technology in the investigative process including; researching, data collection, and reporting •participates in a level of self-evaluation •participates in on-going project/problem based instruction resulting in product development, solutions creations •participates in outreach/service learning projects within the school or community •participates in multiple points of contact with the families of the STEM participants, and at least three family integration activities	Learning: “What is the student doing?” The student: •participates in an integration of STEM content as the focus of the traditional school curriculum •collaborates with peers to solve teacher/student directed problems •participates in problem-based, student directed, teacher facilitated investigations •participates in open-ended inquiry investigations •participates in relevant/authentic learning experiences •participates in real-world connections with business/industry •uses a variety of technology in the investigative process including; researching, data collection, and reporting •participates in a level of self-evaluation •participates in project/problem based instruction resulting in product development, solutions creation •participates in opportunities to establish protocols for research and participation in outreach/service learning projects •participates in opportunities to conduct research in STEM based content with links to university/college labs •offer multiple perspectives in content •participates in collaborative groups that foster innovation and risk in solutions creation and product/project development
EVALUATING	The Evaluative Process includes: •Aligning content to match standards in science, technology, and mathematics. •Providing pre and post assessment surveys in both content and attitudes. •Providing feedback surveys from participants and parents •Informal assessments, both formative and summative, as the result of clubs and after school programs designed to provide enrichment and exploration	The Evaluative Process includes: •Aligning content to match standards in science, technology, engineering and mathematics. •Providing pre and post assessment surveys in both content and attitudes. •developing task analysis •researching and conducting authentic assessment •integrated assessment of various content •assessing 21st century skills •developing and conducting performance assessments •developing and conducting student self-assessment •data driven student goal setting and monitoring •Providing feedback surveys from participants and parents	The Evaluative Process includes: •Align already existing school curriculum/content to match standards-based skills and knowledge in science, technology, engineering and mathematics (reference National Common Core Standards) •Design formative and summative assessments and on-going evaluations of authentic student learning and skill development developing task analysis •researching and conducting authentic assessment •integrated assessment of various content •assessing 21st century skills •developing and conducting performance assessments •developing and conducting student self-assessment •data driven student goal setting and monitoring •Providing feedback surveys from participants and parents •Provide pre and post assessment surveys in both content and attitudes. •Provide feedback surveys from participants and parents in outreach activities •Collect feedback and refine program implementation from stakeholders and content advisory boards	The Evaluative Process includes: •Align already existing school curriculum/content to match standards-based skills and knowledge in science, technology, engineering and mathematics (reference National Common Core Standards) •Design formative and summative assessments and on-going evaluations of authentic student learning and skill development developing task analysis •researching and conducting authentic assessment •integrated assessment of various content •assessing 21st century skills •developing and conducting performance assessments •developing and conducting student self-assessment •data driven student goal setting and monitoring •Providing feedback surveys from participants and parents •Provide pre and post assessment surveys in both content and attitudes. •Provide feedback surveys from participants and parents in outreach activities •Demonstrate competencies in state assessments (AIMS, PARCC) and college and career readiness (ACT, SAT, TIMSS, PISA, PIAAC) •Collect feedback and refine program implementation from stakeholders and content advisory boards

BUDGET	Identify costs related to personal, facilities, equipment and supplies Budget considerations include: •Lead Facilitator •Support Staff •Materials and supplies (dependant on labs and planned activities) •Location space (if necessary) •Determine if you will charge participants a registration fee, apply for grants, donations, or outside funding •Travel costs (if necessary) •Specific budgets for canned programs are also available from Community Education Centers, outside vendors as well as a variety of grant programs	Identify costs related to personal, facilities, equipment and supplies. Budget considerations include: •Lead Facilitator at each site •Support Staff •Materials and supplies (dependant on labs and planned activities). District wide programs can save by buying materials in bulk. •Location space (if necessary) •Determine if needed funding support from business connections, apply for grants, donations, or additional outside funding •Travel costs (if necessary) Specific budgets for canned programs are also available from Community Education Centers, outside vendors as well as a variety of grant programs	Identify costs related to personal, facilities, equipment and supplies. Budget considerations include: •Personnel (all teachers salaries and benefits) •Support Staff (salaries and benefits) •Equipment (furnishings/ hardware) •Materials and supplies (dependant on labs and planned activities) •Custodial Services •Location space (if necessary) including Architectural and Plan Review and permit fees •Construction costs (if necessary) •Design a strategic plan to apply and manage grants, donations, or outside funding •Travel costs (if necessary) for researching programs, and marketing/ recruiting. Specific budgets for canned programs are also available from Community Education Centers, outside vendors as well as a variety of grant programs	Identify costs related to personal, facilities, equipment and supplies. Budget considerations include: •School/Program Administrator (including benefits) •School/Program Curriculum Specialist (including benefits) •Personnel (all teachers salaries and benefits) •Support Staff (salaries and benefits) •Equipment (furnishings/ hardware) •Materials and supplies (dependant on labs and planned activities) •Custodial Services •Location space (if necessary) including Architectural and Plan Review and permit fees •Construction costs (if necessary) •Design a strategic plan to apply and manage grants, donations, or outside funding •Travel costs (if necessary) for researching programs, and marketing/ recruiting. •Specific budgets for canned programs are also available from Community Education Centers, outside vendors as well as a variety of grant programs
SUSTAINABILITY			Sustainability: •Establish leadership and support through common goals and mission •Establish collaborative team to provide feedback based on assessments and evaluations •Establish a continuous professional development plan for teachers and staff •Establish plan for materials replenishment •Establish building capacity •Collect feedback and refine program implementation from stakeholders and content advisory boards •Establish five-seven year budget plan to assure sustainability of school/program •Establish sustained connections to businesses and industry representatives with emphasis on student mentor/internships, career counseling and work place competency skills. •Provide project/product development protocols to assess success in shadowing and internships.	Sustainability: •Establish leadership and support through common goals and mission •Establish collaborative team to provide feedback based on assessments and evaluations •Establish a continuous professional development plan for teachers and staff •Establish plan for materials replenishment •Establish building capacity •Collect feedback and refine program implementation from stakeholders and content advisory boards •Establish five-seven year budget plan to assure sustainability of school/program •Establish sustained connections to businesses and industry representatives with emphasis on student mentor/internships, career counseling and work place competency skills. •Provide project/product development protocols to assess success in shadowing and internships.

MENU OPTIONS:CURRENT EXAMPLES	Examples include: •An after STEM school club •Summer school program •STEM vendor programs such as ADE 21st Century Community Learning Centers/AZ Science Center STEM clubs http://www.ade.az.gov/21stcentury/ •Future Cities competition http://www.futurecity.org/competition.shtm •Lego League http://www.firstlegoleague.org/event/worldfestival •Intel Science and Engineering Fair http://www.societyforscience.org/isef/ •First Robotics http://www.usfirst.org/roboticsprograms/frc/default.aspx?id=966 •Lego League http://www.firstlegoleague.org/event/worldfestival •Siemens http://www.siemens-foundation.org/en/competition.htm •Biotech •Forensics •Specific program content can vary (oobleck, bottle rockets, spaghetti towers, Lego league, Future Cities, etc.) as long as program focuses on the integration of thematic STEM curriculum. How-To-Set up Science Clubs: http://scienceclubforgirls.org/ http://www.cs.wisc.edu/~karavan/afl/home.html	Examples include: •Hands-on Optics embedded into 5th grade classrooms across and entire district that includes a culminating "Star Party" to engage parents and families. •A district wide Recycling contest sponsored by a waste management company in which 4th grade students learn about recycling, collect recyclables and engineer them into new innovative products. Winning class/team and their parents are invited to local sporting event where their design process and new innovative products are displayed. •The Science Department at a high school teams up with the CTE Automotive Department to teach a cross-curricular STEM unit on solar energy that includes physics, environmental education, chemistry and life science, resulting in the creation and testing of a solar car and how it effects the environment. A local solar energy manufacturer is included in the instruction, design, testing, and sponsorship of the prototype. •	Examples include: •The Center for Research in Engineering, Science and Technology (CREST) on the campus of Paradise Valley High School http://www.pvschools.net/crest/ •Biotech Academy on the campus of Mesa High School http://www.mpsaz.org/mesa/departments/biotech/ •Metro Tech High School (embedded Sustainability curriculum) http://www.phxhs.k12.az.us/education/school/school.php?sectiondetailid=16556& •Xavier Girls Preparatory- Epics program •Explorer Middle School http://www.pvschools.net/ems/Home.html •Whispering Wind Academy http://www.pvschools.net/wwa/ This level also includes Pathways Programs such as:	Examples include:

ATTACHMENT 11

PROJECT QUALITY INITIATIVE

The emergence of the Common Core Standards and Assessments has further propelled STEM as an educational imperative for all schools in the next few years. The urgency also underscores the need to strategically coordinate efforts and purposefully capture and disseminate useful data and information for schools. There are literally hundreds of Arizona programs currently targeted toward improving STEM content, delivery and student outcomes. However, there is no consistent measure or indicator of program quality and effectiveness available to help schools determine which programs to adopt. In response to this need, we contracted with educational experts to create a protocol and establish a means by which we could measure programs against what research and evidence tell us are the key quality indicators of best practice models.

The result was the development of a suite of ***Quality Program Identification*** tools to help gather qualified information on programs to be replicated or scaled and based on research and evidence of success. These self-assessment tools were developed to gather information on three types of programs: Teacher Professional Development, Student Engagement in Formal (Classroom) settings, and Student Engagement in Informal settings. These tools have gone through multiple iterations, and initial pilots with SFAz's 19 grant programs will be completed by the end of September. Revisions will be made in October and the process through which to assess, publish and distribute the information will be completed. When the protocols have been finalized, a permanent online version of these tools will be made available and distributed to program officers and managers across the state. Each self-assessment tool includes an easy to complete online file (in survey format) that allow for uploading the supporting documentation and data and an interpretation guide that walks the user through the process. An additional PDF file will also be available for the program manager to print or distribute as necessary before completing the on-line version.

Completed assessments will be housed in a database and programs that meet the standards established under these protocols will be made public for schools through the STEM School Guide and other Network partners. The user will be able to sort by numerous topics, and indicators as measured through the evidence of effectiveness. This will serve as a means by which we can inform our partners of existing, successful programs that will meet their specific needs, leveraging existing programs, replicating and scaling what works, and eliminating duplication of development efforts and costs.

During the same time these tools were being developed, a landscape analysis of current STEM program offerings was compiled. The initial effort focused on the over 300 programs being offered through Arizona's 3 public universities. These programs will serve as the first group to be run through the protocols. Additional programs will be added to this list as this program scales. In addition to the landscape analysis, we developed multiple contact lists that will be used as part of our communications strategy. These contact lists include all Arizona Districts, Schools, Principals and Superintendents.

Dear NAME:

As one of our STEM education program grantees, you are already a milestone marker on the STEM education landscape in Arizona. But your success needs to be documented. We need your help and encourage your participation in the development of a suite of ***Quality Program Identification Assessment*** tools to help us gather information on programs that have the capacity to be replicated or scaled and that meet the standards that research and evidence indicate fit a *best practices* model.

We call this the Project Quality Initiative. It is very important that our Network partners have this information. To that end, we have enlisted the expertise of WestEd to develop these self-assessment tools in order to gather information on three types of programs: Teacher Professional Development, Student Engagement in Formal (Classroom) settings, and Student Engagement in Informal settings.

These Project Quality self-assessment tools are now ready to be pilot tested. Because of the quality program you have delivered, Science Foundation Arizona is requesting that you complete the Project Quality tool that is reflective of your program, so that we may capture the knowledge and information you have garnered through the course of your funding cycle, and to be able to recommend your program to others around the state. **After working through the roadblocks that prevented the successful rollout of this project, we have established a new procedure for completion, and as well as an updated timeline for completion.**

A set of **procedures** for completion of the tools is attached to this email. In addition, a program **specific link** that allows you access to the Project Quality tools is included at the end of this email. The program specific link may be shared with other members of your team, and is provided so that your program alone has access to your information, so that you may complete the tools in segments and save or make changes as you work.

If you experience difficulties with the on-line component of this project, Mark Loveland from WestEd will be your point of contact. He can be reached at: mlovela@wested.org or 650-381-6447. Len Fine will be the SFAz contact for any other issues that arise. His contact information is: Lfine@sfaz.org, or 602-682-2800. All self-assessments will need to be completed by **September 23, 2011**.

At that time, the information will go into an internal database that provides shared access to both WestEd and the STEM team at Science Foundation Arizona. We will be evaluating the tool for ease of use, format and relevance to our intended outcomes. We will use this pilot process to inform the final editing process. Ultimately, SFAz will make public summary information, the format of which is yet to be decided. We will contact you for approval in advance of this step.

The information needed to complete this self- assessment should be information

you have readily available. It is in no way meant to be a hardship on your time, and is in no way reflective of any changes in the current contractual agreements you have with SFAz. This is not an evaluation. Rather it is a mechanism for us to capture and disseminate useful information to others throughout the state concerned about the quality of their STEM programming in a consistent manner based on research and evidence.

Thank you for your time and energy! We look forward to continuing the development of quality STEM Education in Arizona, and appreciate the contribution you are making to the cause!

Please note your URL Key:

http://bug-lite.com/?UID=3&rkey=BpBBjVaLYGavD3m

Instructions for Completing a Quality Programs Self-Assessment

Welcome to Science Foundation Arizona's STEM Quality Programs Initiative.

One component of the initiative is completion of a program self-assessment instrument. There are three instruments that parallel the types of STEM programs most often funded in Arizona as follows:

- STEM Professional Development Program
- STEM Professional Development Program Follow-up
- Informal STEM Program

The STEM Professional Development Program Self-Assessment is designed for programs that provide professional development for teachers. The STEM Professional Development Program Follow-up Self-Assessment is designed for professional development programs that have a follow-up component and have completed at least one cycle. It focuses both on the instruction the teachers receive as well as how teachers use what they are learning in their classrooms. The Informal STEM Program Self-Assessment is designed for informal student programs.

Here's what you do to get started.

Receive your assigned URL. Each participating program has been assigned a unique URL that will link directly to the self-assessment website. Anyone working on the self-assessment from your program can access it using this URL.

Read the descriptions of the three self-assessment instruments. The first time you access the self-assessment website using your assigned URL you will go to an introduction page. There you will find links to PDFs with detailed descriptions of the three instruments. This includes an introduction, background information, general instructions for completing the instrument, and the instrument itself with citations and a reference list. Determine which self-assessment is most closely aligned with your program. You should also read the accompanying guide for interpreting the self-assessment responses. This guide helps you, or anyone reviewing your self-assessment, to interpret your responses. There are also summary descriptions of programs at different levels of quality that serve as a rubric.

Select the instrument that most closely matches your program by clicking on the link for that self-assessment. **Once you select an instrument and start to enter your data, you cannot abandon that instrument and go to another.** If your program is a hybrid, please select the self-assessment most closely aligned with your program or contact Joyce Kaser at JKaser@WestEd.org for assistance. Therefore, be sure you have read through the PDFs and selected the correct instrument before you begin. You or your designees can, however, leave and reenter the self-assessment website as often as necessary.

Complete the program identifying information. Most of the items are self-explanatory. On the type of STEM program, please indicate if you address a discipline such as science or mathematics separately or if your focus is integrated, e.g., science and mathematics.

Save your responses! Any time you provide new information on the self-assessment form you need to click on the Save Responses button at the bottom of the page. This ensures that all of your data is saved for the next time you or someone else from your program accesses the form.

Identify the standards addressed in your program. All programs should be based on state or national standards or some sort of established guidelines. Indicate on what standards or guidelines you base your program.

Identify your program outcomes and their measurement. Each instrument has one or more components addressing program outcomes. Outcomes are the results or impact of your program. For example, an outcome for a professional development program might be that teachers have improved their questioning skills. In this component, you indicate your anticipated outcomes and how you intend to measure them, e.g., pre-/post-test, observation, etc.

Rate indicators of best practice. The remaining items are best practice indicators. You rate on a scale of 1 (low) and 5 (high); the extent to which the best practice indicator is reflected in your program. The scale is included within each instrument.

Identify and upload your data sources for each response. The instrument requests that you upload data to support your responses. Once you have indicated the type of source used for your data, click on the file upload button and a window will open up allowing you to click and drag a file to upload or select a file from your computer. If no data are checked and uploaded, the assumption will be that you have no supporting data.

Review data to identify strengths and challenges. Once you finish the instrument, go back and review. Look for strengths and challenges in each component and summarize those in the space provided. (The guide for interpreting data can help you with this task.) Then indicate areas in which you excel and can help others and areas that are more problematic and you could use help from others.

Provide an overall rating on the 1-5 scale. Use the rubric in the guide for interpreting data to help you make this determination. You may want to have your program evaluator review the data, make his or her own assessment, and then compare that overall rating with yours.

Complete the feedback form. There is a brief anonymous feedback form, which asks for your reactions to the Project Quality Initiative as well as the instrument. Please take a couple of minutes to complete this form as your responses can help us improve the instrument and the overall project.

Use the data for program improvement. There are a variety of ways in which you and SFAz can use the data for program improvement. When you do make program improvements based on the data, you bring the evaluation cycle full circle.

SCIENCE foundation ARIZONA
BUILDING THE FUTURE

Self-Assessment: STEM Professional Development Programs

Data Guide Complete Protocol

Basic Information

Name of program:

Name and contact information for the person completing this assessment:

Provide a *brief* description of the program:

Type of STEM program:

Separate discipline:
- ☐ science
- ☐ technology
- ☐ engineering
- ☐ mathematics

Integrated content:
- ☐ science
- ☐ technology
- ☐ engineering
- ☐ mathematics

Funding source and amount:

Component A: STEM Content of the Professional Development Program

This component focuses on the STEM content of the professional development program. Indicators 1 and 2 require a particular response from you.

Indicator 1: The content of learning is aligned with the local, Common Core or state standards, and/or national standards. Please list the AZ (e.g., Arizona Education Technology Standards) or other standards that the content of your professional program addresses

Indicator 2: The program articulates clear program goals, objectives, and expected outcomes that are understood by all. Below you'll find a list of possible intended outcomes that may apply to your program. An outcome is the result your program's activities are designed to achieve. Please check all that apply.

Intended Outcomes for Teachers
- ☐ Learned content knowledge of STEM
- ☐ Deepened understanding of STEM pedagogy (i.e., how students learn STEM disciplines and how to best teach)
- ☐ Strengthened STEM skills (e.g., developing and interpreting charts and graphs)
- ☐ Developed attitudes, dispositions, and habits of mind of STEM disciplines (honesty, skepticism, tolerance of ambiguity, and desire for evidence)
- ☐ Increased understanding of common student misconceptions in STEM and how to address them
- ☐ Increased understanding and skill in inquiry-based teaching and active learning techniques
- ☐ Strengthened 21st century skills (e.g., complex problem solving, critical thinking, collaboration) and how to teach these skills
- ☐ Broadened knowledge of STEM careers
- ☐ Broadened knowledge of available STEM resources (instructional materials, organizations, individuals, etc.)
- ☐ Increased level of comfort and confidence in teaching STEM
- ☐ Sought out more STEM professional development
- ☐ Brought about changes in institutional policy and/or practice
- ☐ Other (please specify below)

Other

Intended Outcomes for Students

- ☐ Increased student achievement in STEM on standards based assessments or other assessments.
- ☐ Developed attitudes, dispositions, and habits of mind of STEM disciplines
- ☐ Increased students' interest and participation in out-of-school STEM activities
- ☐ Broadened students' knowledge of STEM careers
- ☐ Increased the number of STEM courses students take
- ☐ Increased the number of students opting to major in STEM in college
- ☐ Other (please specify below)

Other

Data Sources for Component A: (Check all that apply.)

- ☐ Proposal
- ☐ Program design
- ☐ Program description
- ☐ Schedule of activities
- ☐ Observations
- ☐ Data from participants such as results of content pre- and post- tests, interviews, surveys, daily feedback forms
- ☐ Written curriculum
- ☐ External evaluation report
- ☐ Other(please specify below):

Other

Upload Supporting Documents for Component A

Upload Documents

Component B: Vision for the Teacher's Classroom

Every professional development program will have a vision for the teacher's classroom. This component conveys the program's vision for how teachers will change their classroom practice as a result of the professional development they have experienced. Using the numerical indicators listed below, rank the extent to which each indicator is reflected in your program:

1. - never or rarely reflected in your program
2. - occasionally reflected in your program
3. - reflected in your program but not consistently
4. - often reflected in your program
5. - fully reflected in your program

	Indicator 1: The content of teaching and learning is:
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Core ideas in science, technology, engineering, and/or mathematics
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Scientific, technology, engineering, and/or mathematical knowledge and skills within a 21st century skills context
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Attitudes, dispositions, and habits of mind (e.g., scientific inquiry, appreciation of numbers, use of evidence to support claims) reflecting the STEM disciplines
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 2: The content includes the use of tools, methods, and processes of scientists and engineers, such as the use of data for decision-making.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 3: The process of teaching and learning is an active learning instructional approach that includes inquiry (or student investigation) discovery, and application of relevant science, mathematics, technology, and/or engineering principles.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 4: Teachers address students' prior knowledge, including misconceptions.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 5: Teachers integrate STEM content knowledge with the science of learning, curriculum, pedagogy, and knowledge of students.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 6: Teachers employ actual or simulated real world problems or challenges that involve applying science, mathematics, technology, and/or engineering.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 7: Teachers provide instruction in literacy (reading, writing, speaking, and listening) as integral to learning STEM.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 8: Teacher's primary role is that of facilitator, coach, and mediator guided by thorough understanding of both content knowledge and pedagogical content knowledge.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 9: Teaching and learning are cooperative and collaborative activities with the goal of promoting both individual and group learning.
	Indicator 10: Teachers use materials, strategies, and perspectives sensitive to
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	different cultures

○ 1 ○ 2 ○ 3 ○ 4 ○ 5	different languages
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	both genders
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	diverse learning styles
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	levels of cognitive development
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 11: Teachers and students engage in ongoing authentic assessment of important learning outcomes.

Data Sources for Component B: (Check all that apply.)

- ☐ Program design
- ☐ Program description
- ☐ Schedule of activities
- ☐ Observations
- ☐ Data from participants such as results of content pre- and post- tests, interviews, surveys, daily feedback forms
- ☐ Written curriculum
- ☐ External evaluation report
- ☐ Diaries, logs, journals
- ☐ Other(please specify below):

Other

Upload Supporting Documents for Component B

Upload Documents

Component C: Key Design Features of a Teacher Professional Development Program

Here are several key features of professional development that will be found in effective STEM programs for teachers. The program models the vision for the teacher's classroom, i.e., the planners and facilitators exhibit the behaviors that they expect teachers to demonstrate upon their return to the classroom. In addition, critical features include best practices in professional development.

	Indicator I: The program models the vision for the teacher's classroom as outlined in Component B: Content: Indicators 1 and Indicator 2 Process: Indicators 3-11 Professional Developer Responsibilities:
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Provide hands-on/minds-on instruction (Indicator 3)
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Address participant misconceptions (Indicator 4)
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Integrate STEM content knowledge with the science of learning, curriculum, pedagogy, and knowledge of students (Indicator 5)
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Employ actual or simulated real world problems or challenges that involve application of STEM (Indicator 6)
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Provide instruction in literacy as integral to learning STEM (Indicator 7)
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Serve as group facilitator (Indicator 8)
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Demonstrate collaborative learning (Indicator 9)
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Model sensitivity to differences (Indicator 10)
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Use authentic assessment practices (Indicator 11
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 2: Models teaching STEM principles and strategies that can be transferred to the classroom (e.g., principles of investigation, using data).
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 3: Includes opportunities to practice new classroom behavior or strategies (e.g., design - test - redesign).
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 4: Includes opportunities for teachers to work together as they learn and plan for transfer to their individual classrooms (e.g., conducting a group hands-on activity, discussing how the activity can be used in their classrooms).
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 5: Builds teacher effectiveness to demonstrate outcomes defined in educator performance standards and student content standards (e.g., strategies for engaging students in STEM activities or providing them with feedback on their work).
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 6: Through self-reflection and other metacognitive activities, helps teachers learn how they best acquire new knowledge and skills (e.g., inquiry vs. direct instruction: which works best for new learning?).
	Indicator 7: Provides activities that are appropriately designed for adult learners
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Are relevant and practical (e.g., aligned to the teacher's STEM curriculum).
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Focus on teachers' interests and challenges (e.g., teaching algebra to students who have failed the course one or more times).

○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Link teachers to resources and supports (e.g., local resources for testing water quality).
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 8: Spreads out STEM learning activities for teachers over time (including follow-up that may occur during the school year).
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 9: Uses technology, equipment, or tools similar to what teachers have access to in their schools or classrooms.

Data Sources for Component C: (Check all that apply.)

- ☐ Program design
- ☐ Program description
- ☐ Schedule of activities
- ☐ Observations
- ☐ Data from participants such as results of content pre- and post- tests, interviews, surveys, daily feedback forms
- ☐ Written curriculum
- ☐ External evaluation report
- ☐ Other(please specify below):

Other

Upload Supporting Documents for Component C

Upload Documents

Component D: Program Administration

This component focuses on aspects of administration that are essential for effective operation.

The program:

○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 1: Aligns all activities (including planning time) with program goals, objectives, and desired outcomes.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 2: Clearly defines roles and responsibilities of staff.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 3: Requires teachers to participate in pairs or teams, including a building administrator.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 4: Is embedded in the teacher's workday.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 5: Establishes a professional learning community among the participating teachers.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 6: Has sufficient contact hours (approximately 50, depending on the desired outcomes) to obtain the program's goals, objectives, and desired outcomes.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 7: Has adequate resources that are well managed.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 8: Creates collaborative atmosphere with scientists, mathematicians, or engineers who are serving as resource persons.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 9: Recruits teachers representing the target population (e.g., either those representing underserved groups themselves, those teaching students from underserved groups, or both).

Data Sources for Component D: (Check all that apply.)

- ☐ Proposal
- ☐ Program design
- ☐ Program description
- ☐ Schedule of activities
- ☐ Observations
- ☐ Participant perceptions through interviews, surveys, daily feedback forms
- ☐ Descriptions of staff role and responsibilities
- ☐ Data base of participants
- ☐ Staff meeting notes
- ☐ Written curriculum
- ☐ Program budgets
- ☐ External evaluation report
- ☐ Other(please specify below):

Other

Upload Supporting Documents for Component D

Upload Documents

Component E: Evaluation of the Teacher Professional Development Program

This component focuses on the evaluation of the professional development program and use of the evaluation data.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 1: Monitoring occurs during the program.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 2: Participants have the opportunity to provide feedback and input during and after the experience.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 3: Ongoing formative evaluation involves data collection from a variety of sources.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 4: Pre- and post- program assessments gather information about impact on participants.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 5: Program administrators use evaluation results to make changes.

Data Sources for Component E: (Check all that apply.)

- ☐ Proposal
- ☐ Program design
- ☐ Observations
- ☐ Data from participants such as results of content pre- and post-tests
- ☐ Participant perceptions through interviews, surveys, daily feedback forms
- ☐ Pre-/post-data
- ☐ Descriptions of staff role and responsibilities
- ☐ Staff meeting notes
- ☐ Reports to funders
- ☐ External evaluation report
- ☐ Student work samples
- ☐ Other(please specify below):

Other

Upload Supporting Documents for Component E

Upload Documents

Summary After reviewing your responses write a brief statement of the strengths and challenges of your program by component. Also, list areas of strength and areas where you might want help.

Component A: STEM Content of the Professional Development Program

Strengths:

Challenges:

Component B: Vision for the Teacher's Classroom

Strengths:

Challenges:

Component C: Key Design Features of a Professional Development Program for Teachers

Strengths:

Challenges:

Component D: Program Administration

Strengths:

Challenges:

Component E: Evaluation of the Professional Development Program

Strengths:

Challenges:

Please check the option that best describes your program. (See SFAz's rubric in the "Guide for Interpreting Data: STEM Teacher Professional Development Programs.")

- 5 - My program reflects a very high level of best practices.
- 4 - My program has a significant number of best practices in place.
- 3 - My program has made a good start on incorporating best practices.
- 2 - My program reflects a few best practices.
- 1 - My program has not yet addressed best practices to any extent.

My strong areas in which I can help another program are:

Areas in which I could use some help include:

Save Responses | Complete Feedback Survey

Guide for Interpreting Assessment Responses
From the Quality Program Identification Assessment
STEM Teacher Professional Development Programs

Introduction

This document is a guide to interpreting the responses from the Quality Program Identification Assessment for STEM Teacher Professional Development Programs. The guide provides suggestions for examining the responses in anticipation of determining the degree to which either a planned or implemented STEM professional development program reflects quality as established by research, standards and guidelines, and the experience of expert practitioners. It outlines what to look for in reviewing an instrument that a program has completed. An individual or group completing the instrument can use the guide to help determine an overall rating for their program. An external reviewer could also use it to provide a more independent rating. The organization of this guide parallels that of the assessment.

Name of program_____ Date_____

Name and contact information for person completing the program assessment

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Name of reviewer_____ Date_____

Component A: STEM Content of the Teacher Professional Development Program

What to look for

- Professional development should be based on some standards. Does the program cite state or national standards that align with the program description?

- Do the intended outcomes align with the program description? Do they appear to be realistic, credible, and likely to be supported by the community in which the program is being conducted?

- Are the student intended outcomes a logical extension of the teacher intended outcomes? If not, why not?

- Is there a reasonable number of intended outcomes for teachers (2 – 4) as well as for students (1-3)?

- Is the measurement of each intended outcome feasible? Can the proposed measurement be done within the timeframe of the program and with existing resources?

- How many different data sources are checked? How many are attached?

- To what extent do the data support the responses for Indicators 1 and 2?[1]

Summary for Component A

Strengths:

Challenges:

[1] A reminder: Not all data carry the same weight. Data gathered by a third party through observation are generally considered more credible than anecdotal or self-report data. Data resulting from a well-designed research study with a control group will normally be considered highly credible. However, education often has to rely on types of data that are less credible. Therefore, look for convergence, multiple sources of data that suggest the same finding.

Component B: Vision for the Teacher's Classroom

What to look for

- Does the vision for the teacher's classroom align with the program description and intended outcomes? How do you know?

- Is there a pattern in response options? If so, what is it? (There should be a variety of response options from 1-5, especially in the 2-4 range. No program will score 5 on every item just as it will not score 1.

- Does this component present a vision for both content and pedagogy? How do you know?

- How many different data sources are checked? How many are attached?

- To what extent do these data support the responses to the indicators?

Summary for Component B

Strengths:

Challenges:

Component C: Key Design Features of a Teacher Professional Development Program

What to look for

- To what extent is the program modeling its vision for the classroom? What appears to be modeled well? Not so well?

- Which features of quality professional development programs does this program exhibit? Which ones appear to be absent or weak?

- How many different data sources are checked? How many are attached?

- To what extent do these data support the responses to the indicators?

Summary for Component C

Strengths:

Challenges:

Component D: Program Administration

What to look for

- Are the activities designed to achieve the goals, objectives, and intended outcomes? How do you know?

- Are there sufficient contact hours to achieve the goals, objectives, and intended outcomes? How do you know?

- Which responses lead you to believe that this is a well-run program? Which indicate the opposite?

- How many different data sources are checked? How many are attached?

- To what extent do the data support the responses to the indicators?

Summary of Component D

Strengths:

Challenges:

Component E: Evaluation of the Teacher Professional Development Program

What to look for

- What types of evaluation are taking place in this program? Is this inadequate, adequate, or comprehensive?
- Do program administrators use data to make changes in their program? How do you know?
- How many different data sources are checked? How many are attached?
- To what extent do the data support the responses to the indicators?
- Are the evaluation data the program has collected generally strong, moderate, or weak?

Summary of Component E

Strengths:

Challenges:

Overall Assessment

Based on your assessment of the data, how would you rate this program on a 1-5 scale with the following designations? (See summary rubric below.)

Best practices are:
1 - never or rarely reflected in the program
2 - occasionally reflected in the program
3 – reflected in the program but not consistently
4 - often reflected in the program
5 – fully reflected in the program

To help in answering the above question, below are descriptions of teacher professional development programs at levels 5, 3, and 1. Those at level 2 or 4 would fall in between levels 1 and 3 and 3 and 5, respectively. They are meant to be a guideline and not an exact description of any existing program. There are also exceptions: A program may not incorporate a particular best practice for a legitimate reason, e.g., it is being phased in over a three-year period or an improvement plan exists for the practice. Select the description that most closely fits the program being assessed.

Level 5 teacher professional development program: A quality professional development program addresses knowledge and skills that the teachers' students are expected to know and do. This content is related to one or more standards that guide instruction in AZ. The program's goals, objectives, and expected outcomes are clear and are understood by participants and staff. There is a reasonable number of intended outcomes for teachers, and these outcomes are reasonable and credible and are linked to intended student outcomes that are also reasonable and credible. A quality professional development program espouses an explicit vision for what the teachers do upon their return to the classroom. The vision includes both content and pedagogy. The vision incorporates all of the indicators at a level of 4 or 5. Evidence supports that all key features of quality professional development are present at a level of 4 or 5. A quality professional development program is well run with evidence supporting indicator ratings of 4 or 5. A quality program has a sound evaluation plan, and evaluation data are used for program improvement. Again, all indicator ratings are at a 4 or 5. The occasional exception are explained.

Level 3 teacher professional development program: A level 3 professional development program primarily addresses knowledge and skills that students are expected to know and do. This content is related to one or more standards that guide instruction in AZ. The program's goals, objectives, and expected outcomes are mostly clear but may not be understood by all participants and staff. There may be too many intended outcomes for participants, or all of the outcomes may not be reasonable and credible or logically linked to intended student outcomes. The professional development program espouses a vision for what the teachers do upon their return to the classroom, which may be more implicit than explicit. The vision includes both content and pedagogy, but the balance may be off. The indicators for vision of the teacher's classroom are at the 3 or above level. Evidence

supports that most of the key features of quality professional development are present at a level of three or above. The program is fairly well managed with evidence supporting most of the indicator ratings at 3 or above. There is an evaluation plan, but the plan may be incomplete. Evaluation data may or may not be used for program improvement. Again, the majority of indicator ratings should be at a three or above. Evidence exists that the indicators rated 3 or lower are being addressed in either a phased in or an improvement plan.

Level 1 teacher professional development program: A teacher professional development program at level 1 has not yet begun to address best practices. The knowledge and skills that teachers are learning are not those that their students are expected to learn. The content may not be related to any standards or guidelines. Goals, objectives, and outcomes may be fuzzy and not clearly understood by teachers. There are likely to be too many outcomes, or the outcomes are listed as outputs rather than outcomes (e.g., conduct two workshops v. teachers strengthened their skills in inquiry-based teaching). The instruction may be heavy on pedagogy and short on content. The ratings for each of the components are largely 1 and 2 with an occasional higher rating. No improvement plan exists.

Quality Program Identification Assessment
STEM* Teacher Professional Development Programs

Introduction

Welcome to the Quality Program Identification Assessment protocol for STEM Teacher Professional Development Programs. This protocol has been designed for two purposes. The first is to have instrumentation that teacher professional development programs funded by the Science Foundation Arizona, as well as other funders, can use to assess their program infrastructure according to effective practice. The second is to have a set of standards for program design and implementation available to all current and future STEM program planners in the state. The ultimate goal is to improve the quality of professional development programs across the state.

Underlying Assumption

The underlying assumption of the assessment is that the programs must be well designed and implemented if they are to achieve their desired outcomes. Programs that are poorly designed and not well implemented limit their potential to achieve the results they desire. For example, research has determined that we learn new skills best by having the opportunity to practice. If there's no opportunity to practice, the learning will be compromised. Using this instrument allows planners to assess a program at any stage of implementation or to use it as a guide in designing their program for greater benefits. Best practice is determined by research of various types, standards and guidelines, and the experience of practitioners in the field. These are the practices that appear to contribute to successful programs. Note that the indicators are footnoted, and citations appear in the attached reference list.

The instrument is structured so that the program directors and staff have to look for evidence to support the quality of their program. Those completing the self-assessment instrument must base their findings on data, not personal opinions, hunches, or expectations for the future. If directors and staff complete this self-assessment with integrity, the process will keep them anchored in the reality of their program planning or performance.

Why Self Assessment

The opportunity to use the protocol with integrity is the major reason we have designed it to be a self-assessment instrument. The focus is on the extent to which a program is aligned with best practice. The planners and implementers should be the ones who take the first look at their work to see the degree to which it aligns with best practice. Let them make the first determinations about their program. If there are some areas in which their program is not aligned with best practice, they are well positioned to explain any discrepancies and determine any actions that need to take place. This is then an opportunity to assess one's program before opening it to others.

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* As used in this document the acronym STEM can have two different meanings. It can refer to the separate disciplines of science, technology, engineering, and mathematics; or it can refer to integration of content within one or in two or more of the disciplines. Those completing this instrument will need to specify which definition of STEM best describes their program.

Completing the Instrument
Program leadership can form a work group to complete the instrument. A work group is much more effective than one or two individuals undertaking the task alone. A work group should result in more buy-in to the process while distributing the workload.

The instrument has five components of effective teacher professional development programs: content, vision for the teacher's classroom, key features of a professional development program for teachers, program administration, and evaluation of a professional development program. Each component has a number of indicators ranging from two to eleven that describe the component. Those completing the instrument rate the extent to which an indicator is contained within their program and then check the evidence on which their conclusion is based. At the end of each component you are asked to select the source(s) of data that support your answer. Common sources of data include the program description; schedule of program activities; data base of participants; observations; surveys, interviews, or other data from participants and staff. Data sources will vary with the indicator.
At the end, all pieces of evidence are uploaded and attached to the instrument. Also, there is a place at the end to document the overall strengths and challenges of the self-assessment. SFAz will provide details regarding submitting your data to its database.

Reporting the Results
The last page of the instrument can serve as a summary page that you might choose to share with others. This summary should first be shared with the program staff and then with program funders and then other stakeholders or the general public. What you have learned from this self-assessment will help you make improvements in your program that will ultimately affect its outcomes and impact. SFAz will have additional requirements regarding sharing your data with other funded STEM programs or those in development.

Quality Program Identification Assessment
STEM Teacher Professional Development Programs

Name of program:

Name and contact information for the person completing this assessment:

Provide a *brief* description of your program:

Type of STEM program:

- Separate discipline: science, technology, engineering, or mathematics (circle which one)
- Integrated content: science, technology, engineering, or mathematics (circle which ones)

Start date of program:

Funding source and amount:

Component A: STEM Content of the Professional Development Program

This component focuses on the STEM content of the professional development program. Indicators 1 and 2 require a particular response from you.

Indicator 1: The content of learning is aligned with the local, Common Core or state standards, and/or national standards. Please list the AZ (e.g., Arizona Education Technology Standards) or other standards that the content of your professional program addresses[44]:

_____

_____

_____

Indicator 2: The program articulates clear program goals, objectives, and expected outcomes that are understood by all.[26,27] Below you'll find a list of possible intended outcomes that may apply to your program. An outcome is the result your program's activities are designed to achieve. Please check all that apply.

After each outcome you've checked, indicate how it is measured, e.g., pre-/post-test, attitudinal survey, or other instrument. Note that we start with outcomes for teachers, the direct participants in the professional development program. However, since all professional development should result in outcomes for students, we have also included intended outcomes for them.

Intended Outcomes for Teachers

_____Learned content knowledge of STEM
_____Deepened understanding of STEM pedagogy (i.e., how students learn STEM disciplines and how to best teach)
_____Strengthened STEM skills (e.g., developing and interpreting charts and graphs)
_____Developed attitudes, dispositions, and habits of mind of STEM disciplines (honesty, skepticism, tolerance of ambiguity, and desire for evidence)
_____Increased understanding of common student misconceptions in STEM and how to address them
_____Increased understanding and skill in inquiry-based teaching and active learning techniques
_____Strengthened 21st century skills (e.g., complex problem solving, critical thinking, collaboration) and how to teach these skills
_____Broadened knowledge of STEM careers
_____Broadened knowledge of available STEM resources (instructional materials, organizations, individuals, etc.)
_____Increased level of comfort and confidence in teaching STEM
_____Sought out more STEM professional development
_____Brought about changes in institutional policy and/or practice
_____Other (please specify)

Intended Outcomes for Students

_____Increased student achievement in STEM on standards based assessments or other assessments.
_____Developed attitudes, dispositions, and habits of mind of STEM disciplines
_____Increased students' interest and participation in out-of-school STEM activities
_____Broadened students' knowledge of STEM careers
_____Increased the number of STEM courses students take
_____Increased the number of students opting to major in STEM in college
_____Other (please specify)

Data Sources for Component A (check all that apply).

___Proposal
___Program design
___Program description
___Schedule of activities
___Observations
___Data from participants such as results of content pre- and post- tests, interviews, surveys, daily feedback forms
___Written curriculum
___External evaluation report
___Other (please specify)

Component B: Vision for the Teacher's Classroom

Every professional development program will have a vision for the teacher's classroom. This component conveys the program's vision for how teachers will change their classroom practice as a result of the professional development they have experienced. Using the numerical indicators listed below, rank the extent to which each indicator is reflected in your program:

1 - never or rarely reflected in your program
2 - occasionally reflected in your program
3 – reflected in your program but not consistently
4 - often reflected in your program
5 - fully reflected in your program

Indicator 1: The content of teaching and learning is:

- Core ideas in science, technology, engineering, and/or mathematics[16,17,18,30,31,33,34,38] (1-5)
- Scientific, technology, engineering, and/or mathematical knowledge and skills within a 21st century skills context[2,7,28,29,32,41] (1-5)
- Attitudes, dispositions, and habits of mind (e.g., scientific inquiry, appreciation of numbers, use of evidence to support claims) reflecting the STEM disciplines[1,31,32,35] (1-5)

Indicator 2: The content includes the use of tools, methods, and processes of scientists and engineers, such as the use of data for decision-making.[26] (1-5)

Indicator 3: The process of teaching and learning is an active learning instructional approach that includes inquiry (or student investigation) discovery, and application of relevant science, mathematics, technology, and/or engineering principles.[33,43,44] (1-5)

Indicator 4: Teachers address students' prior knowledge, including misconceptions.[8,36,37] (1-5)

Indicator 5: Teachers integrate STEM content knowledge with the science of learning, curriculum, pedagogy, and knowledge of students.[3,14,38,46] (1-5)

Indicator 6: Teachers employ actual or simulated real world problems or challenges that involve applying science, mathematics, technology, and/or engineering.[26] (1-5)

Indicator 7: Teachers provide instruction in literacy (reading, writing, speaking, and listening) as integral to learning STEM. (1-5)

Indicator 8: Teacher's primary role is that of facilitator, coach, and mediator guided by thorough understanding of both content knowledge and pedagogical content knowledge.[37,43,45] (1-5)

Indicator 9: Teaching and learning are cooperative and collaborative activities with the goal of promoting both individual and group learning.[37,43,45] (1-5)

Indicator 10: Teachers use materials, strategies, and perspectives sensitive to[8,33,38,42]:

- different cultures
- different languages
- both genders
- diverse learning styles
- levels of cognitive development (1-5)

Indicator 11: Teachers and students engage in ongoing authentic assessment of important learning outcomes.[37] (1-5)

Data Sources for Component B (check all that apply).

___Program design
___Program description
___Schedule of activities
___Observations
___Data from participants such as the results of content pre- and post-tests, interviews, surveys, daily feedback forms
___Written curriculum
___External evaluation report
___Diaries, logs, journals
___Other (please specify)

Component C: Key Design Features of a Teacher Professional Development Program

Here are several key features of professional development that will be found in effective STEM programs for teachers. The program models the vision for the teacher's classroom, i.e., the planners and facilitators exhibit the behaviors that they expect teachers to demonstrate upon their return to the classroom. In addition, critical features include best practices in professional development.

Indicator l: The program models the vision for the teacher's classroom as outlined in Component B[8,14]:

Content: Indicators 1 and Indicator 2

Process: Indicators 3-11

Professional Developer Responsibilities:

- Provide hands-on/minds-on instruction (Indicator 3)
- Address participant misconceptions (Indicator 4)
- Integrate STEM content knowledge with the science of learning, curriculum, pedagogy, and knowledge of students (Indicator 5)
- Employ actual or simulated real world problems or challenges that involve application of STEM (Indicator 6)
- Provide instruction in literacy as integral to learning STEM (Indicator 7)
- Serve as group facilitator (Indicator 8)
- Demonstrate collaborative learning (Indicator 9)
- Model sensitivity to differences (Indicator 10)
- Use authentic assessment practices (Indicator 11) (1-5)

Indicator 2: Models teaching STEM principles and strategies that can be transferred to the classroom (e.g., principles of investigation, using data).[3,26] (1-5)

Indicator 3: Includes opportunities to practice new classroom behavior or strategies (e.g., design – test – redesign).[19,25] (1-5)

Indicator 4: Includes opportunities for teachers to work together as they learn and plan for transfer to their individual classrooms (e.g., conducting a group hands-on activity, discussing how the activity can be used in their classrooms).[19,25] (1-5)

Indicator 5: Builds teacher effectiveness to demonstrate outcomes defined in educator performance standards and student content standards (e.g., strategies for engaging students in STEM activities or providing them with feedback on their work).[24] (1-5)

Indicator 6: Through self-reflection and other metacognitive activities, helps teachers learn how they best acquire new knowledge and skills (e.g., inquiry vs. direct instruction: which works best for new learning?).[36] (1-5)

Indicator 7: Provides activities that are appropriately designed for adult learners[6,22,24,40]:

- Are relevant and practical (e.g., aligned to the teacher's STEM curriculum) (1-5)

- Focus on teachers' interests and challenges (e.g., teaching algebra to students who have failed the course one or more times) (1-5)
- Link teachers to resources and supports (e.g., local resources for testing water quality) (1-5)

Indicator 8: Spreads out STEM learning activities for teachers over time (including follow-up that may occur during the school year).[12] (1-5)

Indicator 9: Uses technology, equipment, or tools similar to what teachers have access to in their schools or classrooms.[16,18,24] (1-5)

Data Sources for Component C (check all that apply).

___Program design
___Program description
___Schedule of activities
___Observations
___Data from participants such as results of content pre- and post-tests, interviews, surveys, daily feedback forms
___Written curriculum
___External evaluation report
___Other (please specify)

Component D: Program Administration

This component focuses on aspects of administration that are essential for effective operation.

The program:

Indicator 1: Aligns all activities (including planning time) with program goals, objectives, and desired outcomes.[23,26,27] (1-5)

Indicator 2: Clearly defines roles and responsibilities of staff.[26,27] (1-5)

Indicator 3: Requires teachers to participate in pairs or teams, including a building administrator.[9] (1-5

Indicator 4: Is embedded in the teacher's workday.[9,26] (1-5)

Indicator 5: Establishes a professional learning community among the participating teachers.[9,10] (1-5)

Indicator 6: Has sufficient contact hours (approximately 50, depending on the desired outcomes) to obtain the program's goals, objectives, and desired outcomes.[4,5,9,10] (1-5)

Indicator 7: Has adequate resources that are well managed.[26,27] (1-5)

Indicator 8: Creates collaborative atmosphere with scientists, mathematicians, or engineers who are serving as resource persons.[26] (1-5)

Indicator 9: Recruits teachers representing the target population (e.g., either those representing underserved groups themselves, those teaching students from underserved groups, or both).[26] (1-5)

Data Sources for Criterion D (check all that apply).

___Proposal
___Program design
___Program description
___Schedule of activities
___Observations
___Participant perceptions through interviews, surveys, daily feedback forms
___Descriptions of staff role and responsibilities
___Data base of participants
___Staff meeting notes
___Written curriculum
___Program budgets
___External evaluation report
___Other (please specify)

Component E: Evaluation of the Teacher Professional Development Program

This component focuses on the evaluation of the professional development program and use of the evaluation data.

Indicator 1: Monitoring occurs during the program.[11,26] (1-5)

Indicator 2: Participants have the opportunity to provide feedback and input during and after the experience.[15,21,39] (1-5)

Indicator 3: Ongoing formative evaluation involves data collection from a variety of sources.[11,26] (1-5)

Indicator 4: Pre- and post- program assessments gather information about impact on participants.[15,21,39] (1-5)

Indicator 5: Program administrators use evaluation results to make changes.[11,26] (1-5)

Data Sources for Component E (check all that apply).

___Proposal
___Program design
___Observations
___Data from participants such as results of content pre- and post-tests,
___Participant perceptions through interviews, surveys, daily feedback forms
___Pre-/post-data
___Descriptions of staff role and responsibilities
___Staff meeting notes
___Reports to funders
___External evaluation report
___Student work samples
___Other (please specify)

Proceed to next page

Summary After reviewing your responses write a brief statement of the strengths and challenges of your program by component. Also, list areas of strength and areas where you might want help.

Component A: STEM Content of the Professional Development Program
Strengths:

Challenges:

Component B: Vision for the Teacher's Classroom
Strengths:

Challenges:

Component C: Key Design Features of a Professional Development Program for Teachers
Strengths:

Challenges:

Component D: Program Administration
Strengths:

Challenges:

Component E: Evaluation of the Professional Development Program
Strengths:

Challenges:

Please check the option that best describes your program.
(See SFAz's rubric in the "Guide for Interpreting Data: STEM Teacher Professional Development Programs.")

5 – My program reflects a very high level of best practices.
4 – My program has a significant number of best practices in place.
3 – My program has made a good start on incorporating best practices.
2 – My program reflects a few best practices.
1 – My program has not yet addressed best practices to any extent.

My strong areas in which I can help another program are:

Areas in which I could use some help include:

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SCIENCE foundation ARIZONA
BUILDING THE FUTURE

Self-Assessment: STEM Professional Development Programs Follow-up

Data Guide Complete Protocol

Basic Information

Name of program:

Name and contact information for the person completing this assessment:

Provide a *brief* description of the program emphasizing the follow-up:

Type of STEM program:

Separate discipline:
- ☐ science
- ☐ technology
- ☐ engineering
- ☐ mathematics

Integrated content:
- ☐ science
- ☐ technology
- ☐ engineering
- ☐ mathematics

Start and end dates for this cohort:

Start: End:

Funding source and amount:

Component A: Professional Development Program Follow-Up

This component lists the features of professional development follow-up that reflect best practice. Research has documented that follow-up is essential if teachers are to change their classroom behaviors in ways that lead to increased student achievement.

Indicator 1: The first indicator pinpoints the specific outcomes that are intended for teachers in the follow-up component of the professional development. In responding to this indicator, check all outcomes that apply and indicate in the box following each outcome how you will measure them, e.g., classroom observations, attitudinal survey, or other instrument.

Intended Outcomes for Teachers in the Follow-Up

- ☐ Learned content knowledge of STEM
- ☐ Deepened understanding of STEM pedagogy (i.e., how students learn STEM disciplines and how to best teach)
- ☐ Strengthened STEM skills (e.g., developing and interpreting charts and graphs)
- ☐ Developed attitudes, dispositions, and habits of mind of STEM disciplines (honesty, skepticism, tolerance of ambiguity, and desire for evidence)
- ☐ Increased understanding of common student misconceptions in STEM and how to address them
- ☐ Increased understanding and skill in inquiry-based teaching and active learning techniques
- ☐ Strengthened 21st century skills (e.g., complex problem solving, critical thinking, collaboration) and how to teach these skills

- [ ] Broadened knowledge of STEM careers
- [ ] Broadened knowledge of available STEM resources (instructional materials, organizations, individuals, etc.)
- [ ] Increased level of comfort and confidence in teaching STEM
- [ ] Sought out more STEM professional development
- [ ] Brought about changes in institutional policy and/or practice
- [ ] Other (please specify below)

Other

For the remainder of the indicators, use the following numerical scale to indicate the extent to which an indicator is reflected in your professional development follow-up.

1. - never or rarely reflected in your program
2. - occasionally reflected in your program
3. - reflected in your program but not consistently
4. - often reflected in your program
5. - fully reflected in your program

○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 2: Learning activities for teachers are spread out over time.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 3: Teachers have the opportunity to try out their new knowledge and skills in their classrooms before follow-up occurs.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 4: Teacher teams develop a plan to implement and disseminate new strategies and learning.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 5: Follow-up takes a variety of forms, including additional training, problem-solving meetings, on-site or telephone consultations, webinars, networking through newsletters or telecommunications, support of local coaches or others to provide ongoing assistance, online courses, and professional learning communities.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 6: Teachers develop professional relationships with each other and network over time.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 7: The teachers' school/district commits to and provides support for implementation of the new strategies and learning.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 8: Long-term commitment to teachers includes support from key stakeholders such as the organization sponsoring the professional development (if other than the school or district) in partnership with the district, school, and/or community.

Data Sources for Component A: (Check all that apply.)

- [ ] Program design
- [ ] Program description
- [ ] Schedule of activities
- [ ] Review of plans
- [ ] Classroom observations
- [ ] Schedule of meetings and meeting notes
- [ ] Diaries, logs, journals
- [ ] Type of support provided
- [ ] External evaluation report

Upload Supporting Documents for Component A

Upload Documents

Component B. STEM Content of the Student Learning

This component identifies standards that the student learning addresses as well as anticipated outcomes and their measurement.

Indicator 1: The content of the students' learning is aligned with the local, Common Core or state standards, and/or national standards. Please list the AZ or other standards that the content of the professional development program and the content that the students are learning address. (This

response should align with the content that the teachers are learning in their professional development program, specifically the follow-up component.)

Indicator 2: The instruction articulates clear goals, objectives, and expected outcomes that students understand. Below you'll find a list of possible student outcomes that may apply to your professional development program. An outcome is the result that your instruction is designed to achieve. Please check all that apply. After each outcome you've checked, indicate how it is measured, e.g., pre-/post standardized test, attitudinal survey, or other instrument.

Intended Outcomes for Students:

- ☐ Increased their achievement in STEM
- ☐ Developed attitudes, dispositions, and habits of mind of STEM disciplines (honesty, skepticism, tolerance of ambiguity, and desire for evidence)
- ☐ Increased interest and participation in out-of-school STEM activities (attending museums or zoos, participation in Science Bowl, volunteering at a planetarium)
- ☐ Produced a definable end product (project or presentation)
- ☐ Broadened knowledge of STEM careers
- ☐ Increased the number of STEM courses taken
- ☐ Increased the number of STEM AP courses taken
- ☐ Increased the number opting to major in STEM in college
- ☐ Other (please specify below)

Other

Data Sources for Component B: (Check all that apply.)

- ☐ Standards
- ☐ Written curriculum
- ☐ Instructional materials (text, kits, online sources, etc.)
- ☐ Pacing guides
- ☐ Lesson plans
- ☐ Classroom observations
- ☐ Videotapes of instruction
- ☐ Student work samples
- ☐ Data from formative assessments
- ☐ Data from summative assessments
- ☐ Other(please specify below):

Other

Upload Supporting Documents for Component B

Upload Documents

Component C: Nature of Instruction

These indicators describe effective STEM classroom practices. They use a rating scale of 1 to 5 to assess the extent to which the indicator is present in the teachers' instruction. Please mark the number that best describes the nature of the teachers' instruction related to your professional development program. Use the following rating scale:

1. - never or rarely reflected in your program
2. - occasionally reflected in your program

3. - reflected in your program but not consistently
4. - often reflected in your program
5. - fully reflected in your program

	Indicator 1: Student learning encompasses the following:
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Core ideas in science, technology, engineering, and/or mathematics.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Scientific, mathematical, technology, and/or engineering knowledge and skills within a 21st century skills context e.g., problem solving, critical thinking, collaboration.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Attitudes, dispositions, and habits of mind (e.g., honesty, skepticism, tolerance of ambiguity, and desire for evidence) reflecting the STEM disciplines.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 2: The content students learn includes the use of tools, methods, and processes of scientists and engineers, including the use of data for decisionmaking.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 3: Students participate in an active learning instructional approach that includes inquiry (or student investigation), discovery, and application of relevant science, mathematics, technology, and/or engineering principles.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 4: Students identify and correct their misconceptions about STEM content. (e.g., why the seasons change)..
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 5: Students solve actual or simulated real world problems or challenges that involve applying science, technology, engineering, and/or mathematics.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 6: Students strengthen their literacy skills (reading, writing, speaking, and listening) as they are learning STEM content.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 7: Students work in cooperative and collaborative groups to conduct activities and to solve problems.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 8: Students learn in an environment that is sensitive to different cultures, different languages, both genders, diverse learning styles, and different levels of cognitive development.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 9: Students have sufficient time in STEM instruction to meet the designated standards and achieved the desired outcomes.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 10: Students are intellectually engaged with the task at hand (explore meaningful questions, engage with appropriate phenomena, think of new knowledge in light of their prior knowledge).
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 11: Students have the opportunity to make sense out of the ideas that they have been exploring.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 12: Students use appropriate technology to support their work.

Data Sources for Component C: (Check all that apply.)

- ☐ Standards being addressed
- ☐ Anticipated outcomes
- ☐ Written curriculum
- ☐ Instructional materials
- ☐ Pacing guides
- ☐ Observations
- ☐ Videotapes
- ☐ Student work samples
- ☐ Data from formative assessments
- ☐ Data from summative assessments
- ☐ Other(please specify below):

Other

Upload Supporting Documents for Component C

Upload Documents

Component D: Assessment of Learning

This component lists a set of indicators for classroom assessment. STEM assessment will follow the district's and school's assessment schedule. The assessments are likely to be standards based, especially for the pre-/post summative assessment. Used more for diagnostic assessment, formative assessments vary in their alignment with state standards and the frequency that they are administered. Teachers may have other data such as unit exams or project grades. Assessments should align with the program outcomes teachers have selected for students and their way of measuring them.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 1: Pre- and post- assessments provide information to the teacher, school, and community about the achievement of outcomes and overall impact on students.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 2: Formative assessments are used to provide teachers with diagnostic data to help guide instruction.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 3: Ongoing formative evaluation involves data collection from a variety of sources..
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 4: Teachers and administrators use data to make changes in instruction and curriculum.

Data Sources for Component D: (Check all that apply.)

- ☐ Data from formative assessments
- ☐ Data from summative assessments
- ☐ Reports of classroom observations
- ☐ Analysis of student work
- ☐ Student feedback
- ☐ Documentation of changes in instruction based on evaluation data
- ☐ Other(please specify below):

Other

Upload Supporting Documents for Component D

Upload Documents

Summary After reviewing your responses write a brief statement of the strengths and challenges of your program by component. Also, list areas of strength and areas where you might want help.

Component A: Professional Development Program Follow-up

Strengths:

Challenges:

Component B: STEM Content of the Students' Learning

Strengths:

Challenges:

Component C: Nature of Instruction

Strengths:

Challenges:

Component D: Assessment of Learning

Strengths:

Challenges:

Please check the option that best describes your program. (See SFAz's rubric in the "Guide for Interpreting Data: STEM Teacher Professional Development Follow-up Programs.")

- 5 - My program reflects a very high level of best practices.
- 4 - My program has a significant number of best practices in place.
- 3 - My program has made a good start on incorporating best practices.
- 2 - My program reflects a few best practices.
- 1 - My program has not yet addressed best practices to any extent.

My strong areas in which I can help another program are:

Areas in which I could use some help include:

Save Responses | Complete Feedback Survey

Guide for Interpreting Assessment Responses
From the Quality Program Identification Assessment
STEM Teacher Professional Development Programs Follow-up

Introduction

This document is a guide to interpreting the responses from the Quality Program Identification Assessment for STEM Teacher Professional Development Programs Follow-up. The guide provides suggestions for examining the responses in anticipation of determining the degree to which either a planned or implemented STEM professional development program follow-up reflects quality as established by research, standards and guidelines, and the experience of expert practitioners. It outlines what to look for in reviewing an instrument that a program has completed. An individual or group completing the instrument can use the guide to help determine an overall rating for their program. An external reviewer could also use it to provide a more independent rating. The organization of this guide parallels that of the assessment.

Name of Program_____ Date_____

Name and contact information for person completing the assessment_____
_____

Name of reviewer_____ Date_____

Component A: Professional Development Program Follow-up

What to look for
Do the intended outcomes for teachers in the follow-up align with the intended outcomes for students? How do you know?

To what extent are teachers working together to implement their new learnings? What is the evidence?

What types of activities does the professional development provide in its follow-up program?

What supports do the teachers have?

How long is the follow-up program?

How many data sources are checked? How many are attached?

To what extent do the data support the program staff's responses to the indicators in Component A?

Summary for Component A:

Strengths:

Challenges:

Component B: STEM Content of Student Learning

What to look for

- The STEM content that students are asked to learn should be based on some standards. Does the instrument cite local, state, or national standards that align with the classroom description?

- Do the intended outcomes align with the classroom description? Do they appear to be realistic, credible, and likely to be supported by the community in which the school is located?

- Is there a reasonable number of intended outcomes for students (1-3)?

- What is the source of the intended outcomes (the curriculum, the teacher)? Are they the same for all students, or are they differentiated in some way?

- Is there evidence that students know what outcomes they are expected to achieve?

- Is the measurement of each intended outcome feasible? Can the proposed measurement be done within the timeframe of the instruction and with existing resources?

- How many different data sources are checked? How many are attached?

- To what extent do the data support the teachers' responses for Indicators 1 and 2?

Summary for Component B

Strengths:

Challenges:

Component C: Nature of Instruction

What to look for

- To what extent are students learning core ideas in STEM; STEM knowledge and skills within a 21st century skills context; and/or attitudes, dispositions, and habits of mind reflective of STEM disciplines? What is the supporting evidence?

- To what extent are students learning in a collaborative and participatory environment that relies on "hands on/minds on" activities? What is the supporting evidence?

- To what extent does the learning described align with the other indicators of effective instruction?

- How many different data sources are checked? How many are attached?

- To what extent do the data support the ratings?

Summary for Component C

Strengths:

Challenges:

Component D: Assessment of Student Learning

What to look for

- What types of evaluation are taking place for this instruction? Is this inadequate, adequate, or comprehensive? (See Component A.)

- Does the teacher use data to make changes in his/her instruction? How do you know?

- How many data sources are checked? How many are attached?

- To what extent do the data support the responses to the indicators?

- Are the evaluation data the program has collected generally strong, moderate, or weak?

Summary of Component D

Strengths:

Challenges:

Overall Assessment

Based on your assessment of the data, how would you rate this program on a 1-5 scale with the following designations? (See summary rubric below.)

Best practices are:
1 - never or rarely reflected in the program
2 - occasionally reflected in the program
3 – reflected in the program but not consistently
4 - often reflected in the program
5 – fully reflected in the program

To help in answering the above question, below are descriptions of teacher professional development follow-up programs at levels 5, 3, and 1. Those at level 2 or 4 would fall in between levels 1 and 3 and 3 and 5, respectively. They are meant to be a guideline and not an exact description of any existing program. There are also exceptions: A program may not incorporate a particular best practice for a legitimate reason, e.g., it is being phased in over a three-year period or an improvement plan exists for the practice. Select the description that most closely fits the program being assessed.

Level 5 Teacher Professional Development Program Follow-up: At level 5 teacher outcomes are closely aligned with student outcomes in a professional development program follow-up. The knowledge and skills that teachers are learning are closely related to what their students are expected to learn. The content for both teachers and students is tied to one or more standards that guide instruction in AZ. The instruction's goals, objectives, and expected outcomes are clear and are understood by the teacher and the students. There is a realistic number of intended outcomes for students (1-3), and these outcomes are reasonable, credible, and supported by the community in which the school is located. The indicators of effective follow-up, such as learning activities for teachers being spread out over time, have 4 or 5 ratings. Evidence supports that all indicators of quality instruction are present at a level of 4 or 5. Quality instruction is supported by a sound evaluation plan, and evaluation data are used to improve instruction. Again, all indicator ratings are at a 4 or 5. Exceptions to the high ratings on the indicators have a reasonable explanation (e.g., a practice is being phased in, an improvement plan exists for a practice, or the school policy or practice has priority over the best practice indicator in the assessment).

Level 3 Teacher Professional Development Program Follow-up: Although there is generally alignment between the teachers' and students' outcomes, that alignment is not exact. There are some discrepancies between what teachers are learning and what knowledge and skills students are expected to know and do. The content is related to one or more standards that guide instruction in AZ. The instruction's goals, objectives, and expected outcomes are mostly clear but may not be understood by all teachers and most students. There are too many intended outcomes for students, or all of the outcomes may not be reasonable and credible or acceptable to the community. The ratings of the best practice indicators in follow-up programs, such as teachers developing professional

relationships with one another, are 3 or above. The instructional component reflects ratings of 3 or above for most indicators such as students work in cooperative and collaborative groups to conduct activities and to solve problems. An evaluation plan exists and is followed closely. However, the program staff reports difficulty in using the evaluation data to improve instruction. Again, most of the indicator ratings are at a 3 or better. There is evidence that indicators rated 3 or lower are being addressed in either a phased-in process or an improvement plan. Instances in which school priorities take precedence over best practice are noted.

Level 1 Teacher Professional Development Program Follow-up: Alignment between the teachers' and students' intended outcomes is way off. What the teachers are learning bears only slight resemblance to what they are expected to teach their students. The content does not appear to be anchored in any guideline or standard. There are too many outcomes, and they are not realistic, given the scope of the follow-up. The best practice indicators for follow-up programs are rated 1 or 2 with a few 3s. The instructional component reflects similar ratings. An evaluation plan exists and is closely followed. However, rarely does staff attempt to use the evaluation data for program improvement. For this component most of the ratings are 3 or better. There is no improvement plan. Instances in which school priorities take precedence over best practice are not noted.

Quality Program Identification Assessment
STEM* Teacher Professional Development Programs Follow-Up

Introduction

This assessment is designed for follow-up use by teacher professional development programs that have completed at least one cycle of instruction. It is designed to assess the extent to which the teachers and schools participating in the professional development program have been able to implement the vision as described in the Quality Program Identification Assessment STEM Professional Development Programs. The instrument helps determine the extent to which the teachers' instruction incorporates best practices in STEM instruction as grounded in evidence. Science Foundation Az will make the instrument available to any educators who are interested in using it to guide their STEM follow-up instruction. The ultimate goal is to improve the quality of STEM instruction in schools across the state.

Underlying Assumption

The underlying assumption of the assessment is that instruction must be well designed and implemented if teachers and students are to achieve the outcomes the professional development and the schools have set for them, respectively. Instruction that is poorly designed and not well implemented limits teachers' and students' opportunity to learn. For example, research has determined that we learn new skills best by having the opportunity to practice. If there's no opportunity to practice, the learning will be compromised.

Why Self-Assessment

The opportunity for program staff and teachers to examine their program first is the major reason we have designed this to be a self-assessment instrument. The staff and teachers should be the ones who take the first look at their own work to see the degree to which it aligns with best practice. Let them make the first determinations about their own instruction. If there are some areas in which their instruction is not aligned with best practice, the program staff and teachers are well positioned to explain any discrepancies and determine any actions that may need to take place. This is then an opportunity to assess one's instruction before opening it to others to review.

Instrument Described

The instrument has four critical components of effective instruction. The first looks at the program's design for follow up instruction. Does the follow-up that occurred since the major professional development event took place follow the best practice guidelines? The follow-up needs to adhere to best practice guidelines to be effective. The other three components focus on what's happening in the classroom – what the students are learning:

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*As used in this document, the acronym STEM can have two different meanings. It can refer to the separate disciplines of science, technology, engineering, and mathematics; or it can refer to integration of content within one or in two or more of the disciplines. Those completing this instrument will need to specify which definition of STEM best describes their program.

the content, the nature of their instruction, and the assessment of their learning. Each component has a number of indicators ranging from two to thirteen that describe its key features. These are the practices from research, national guidelines, and the experience of expert practitioners that appear to contribute to effective instruction. The indicators are footnoted, and citations appear in the attached reference list.

The instrument is structured so that program staff and teachers have to look for evidence to support the quality of their instruction. Those completing the self-assessment instrument must base their findings on data, not personal opinions, hunches, or expectations for the future. If program staff and teachers approach this self-assessment honestly and with an open attitude, the process will keep them anchored in the reality of their instructional planning and implementation.

Completing the Instrument

Staff and teachers completing the instrument rate the extent to which an indicator is reflected within the professional development program follow-up and in their classrooms using the rating scale provided. Then they check the evidence on which their rating is based. At the end, all pieces of evidence are uploaded and attached to the instrument. Also, there's a place at the end to document the overall strengths and challenges of the self-assessment and areas for improvement.

The program staff may complete the instrument, or they may actively involve teachers in doing so. If they complete it themselves, they will likely draw from teacher observation data to do so. Regardless of who completes the instrument, responses from different classrooms should be tallied and a composite prepared. The composite can be used as one of the data points in responding to the indicators. The instrument is assessing the program, not any individual teacher or classroom. SFAz will provide details regarding submitting data to its database.

Reporting the Results

Program staff and teachers may want to write a summary of their self-assessment process and its findings. The program staff, teachers, and administrator can determine the appropriate distribution of the summary. What they have learned from this self-assessment will help them make improvements in their instruction that will ultimately affect both teacher and student outcomes. SFAz will have additional requirements regarding sharing data with other funded STEM programs or those in development.

Two Caveats

There are two caveats that influence the use of this instrument in schools. First, each STEM classroom is part of an educational system. It does not exist as an independent entity. Therefore, factors such as the school priorities, the amount of time allotted to STEM instruction, the STEM curriculum, and who teaches STEM are likely to affect the results of the self-assessment. For example, if the amount of time devoted to STEM instruction has been reduced to increase the instructional time for language arts, that will affect students' achievement. Also, issues and concerns may arise regarding who does or does not complete this instrument, whether it will be used for teacher performance

evaluation (it should not), or the focus that STEM is receiving as compared to other subjects. These issues or concerns may need to be resolved prior to using the instrument, or some adjustments may need to be made in the instrument or in the interpretation of the data from the instrument.

Second, most of the research on effective STEM instruction has been done in science and mathematics. What works in science and mathematics may well also be as effective in technology, engineering, or integrated instruction but perhaps not. The indicators in this instrument reflect what we know now, and we look forward to additional studies that can refine our understanding.

Quality Program Identification Assessment
STEM Teacher Professional Development Programs Follow-Up

Name of Program:

Name and contact information of person completing this assessment:

Provide a brief description of the program, emphasizing the follow-up:

Type of STEM program:

- Separate discipline: science, technology, engineering, or mathematics (circle which one)
- Integrated content: science, technology, engineering, or mathematics (circle which ones)

Start and ending date of program for this cohort:

Funding source and amount:

Component A: Professional Development Program Follow-Up

This component lists the features of professional development follow-up that reflect best practice. Research has documented that follow-up is essential if teachers are to change their classroom behaviors in ways that lead to increased student achievement.

Indicator 1: The first indicator pinpoints the specific outcomes that are intended for teachers in the follow-up component of the professional development. In responding to this indicator, check all outcomes that apply and indicate how you will measure them, e.g., classroom observations, attitudinal survey, or other instrument.

Intended Outcomes for Teachers in the Follow-Up

_____Learned content knowledge of STEM
_____Deepened understanding of STEM pedagogy (i.e., how students learn STEM disciplines and how to best teach)
_____Strengthened STEM skills (e.g., developing and interpreting charts and graphs)
_____Developed attitudes, dispositions, and habits of mind of STEM disciplines (honesty, skepticism, tolerance of ambiguity, and desire for evidence)
_____Increased understanding of common student misconceptions in STEM and how to address them
_____Increased understanding and skill in inquiry-based teaching and active learning techniques
_____Strengthened 21st century skills (e.g., complex problem solving, critical thinking, collaboration) and how to teach these skills
_____Broadened knowledge of STEM careers
_____Broadened knowledge of available STEM resources (instructional materials, organizations, individuals, etc.)
_____Increased level of comfort and confidence in teaching STEM
_____Sought out more STEM professional development
_____Brought about changes in institutional policy and/or practice
_____Other (please specify)

For the remainder of the indicators, use the following numerical scale to indicate the extent to which an indicator is reflected in your professional development follow-up.

1 - never or rarely reflected in your program
2 - occasionally reflected in your program
3 – reflected in your program but not consistently
4 - often reflected in your program
5 - fully reflected in your program

Indicator 2: Learning activities for teachers are spread out over time.[9] (1-5)

Indicator 3: Teachers have the opportunity to try out their new knowledge and skills in their classrooms before follow-up occurs.[11,15] (1-5)

Indicator 4: Teacher teams develop a plan to implement and disseminate new strategies and learning.[6,17] (1-5)

Indicator 5: Follow-up takes a variety of forms, including additional training, problem-solving meetings, on-site or telephone consultations, webinars, networking through newsletters or telecommunications, support of local coaches or others to provide ongoing assistance, online courses, and professional learning communities.[11] (1-5)

Indicator 6: Teachers develop professional relationships with each other and network over time.[6,7] (1-5)

Indicator 7: The teachers' school/district commits to and provides support for implementation of the new strategies and learning.[6,7] (1-5)

Indicator 8: Long-term commitment to teachers includes support from key stakeholders such as the organization sponsoring the professional development (if other than the school or district) in partnership with the district, school, and/or community.[6] (1-5)

Data Sources for Component A: (Check all that apply.)

___Program design
___Program description
___Schedule of activities
___Review of plans
___Classroom observations
___Schedule of meetings and meeting notes
___Diaries, logs, journals
___Type of support provided
___External evaluation report

Component B. STEM Content of the Student Learning

This component identifies standards that the student learning addresses as well as anticipated outcomes and their measurement.

Indicator 1: The content of the students' learning is aligned with the local, Common Core or state standards, and/or national standards.[39] Please list the AZ or other standards that the content of the professional development program and the content that the students are learning address. (This response should align with the content that the teachers are learning in their professional development program, specifically the follow-up component.)

_____

_____

_____

Indicator 2: The instruction articulates clear goals, objectives, and expected outcomes that students understand.[15,19,20,30,31,32] Below you'll find a list of possible student outcomes that may apply to your professional development program. An outcome is the result that your instruction is designed to achieve. Please check all that apply. After each outcome you've checked, indicate how it is measured, e.g., pre-/post standardized test, attitudinal survey, or other instrument.

Intended Outcomes for Students:

_____Increased their achievement in STEM
_____Developed attitudes, dispositions, and habits of mind of STEM disciplines (honesty, skepticism, tolerance of ambiguity, and desire for evidence)
_____Increased interest and participation in out-of-school STEM activities (attending museums or zoos, participation in Science Bowl, volunteering at a planetarium)
_____Produced a definable end product (project or presentation)
_____Broadened knowledge of STEM careers
_____Increased the number of STEM courses taken
_____Increased the number of STEM AP courses taken
_____Increased the number opting to major in STEM in college
_____Other (please specify)

Data Sources for Component B: (Check all that apply.)

___Standards
___Written curriculum
___Instructional materials (text, kits, online sources, etc.)
___Pacing guides
___Lesson plans
___Classroom observations
___Videotapes of instruction
___Student work samples
___Data from formative assessments
___Data from summative assessments
___Other (please specify)

Component C: Nature of Instruction

These indicators describe effective STEM classroom practices. They use a rating scale of 1 to 5 to assess the extent to which the indicator is present in the teachers' instruction Please mark the number that best describes the nature of the teachers' instruction related to your professional development program. Use the following rating scale:

1 - never or rarely reflected in your program
2 - occasionally reflected in your program
3 – reflected in your program but not consistently
4 - often reflected in your program
5 - fully reflected in your program

Indicator 1: Student learning encompasses the following:

- Core ideas in science, technology, engineering, and/or mathematics.[12,13,14,24,25,26,27,28,33] (1-5)
- Scientific, mathematical, technology, and/or engineering knowledge and skills within a 21st century skills context e.g., problem solving, critical thinking, collaboration.[2,4,22,23,26,36] (1-5)
- Attitudes, dispositions, and habits of mind (e.g., honesty, skepticism, tolerance of ambiguity, and desire for evidence) reflecting the STEM disciplines.[1,25,26,29] (1-5)

Indicator 2: The content students learn includes the use of tools, methods, and processes of scientists and engineers, including the use of data for decisionmaking.[3,8,10,21,37] (1-5)

Indicator 3: Students participate in an active learning instructional approach that includes inquiry (or student investigation), discovery, and application of relevant science, mathematics, technology, and/or engineering principles.[8,21,27,38,39] (1-5)

Indicator 4: Students identify and correct their misconceptions about STEM content. (e.g., why the seasons change).[30,31,32] (1-5)

Indicator 5: Students solve actual or simulated real world problems or challenges that involve applying science, technology, engineering, and/or mathematics.[1,16,27,38](1-5)

Indicator 6: Students strengthen their literacy skills (reading, writing, speaking, and listening) as they are learning STEM content. (1-5)

Indicator 7: Students work in cooperative and collaborative groups to conduct activities and to solve problems.[31,38,40] (1-5)

Indicator 8: Students learn in an environment that is sensitive to different cultures, different languages, both genders, diverse learning styles, and different levels of cognitive development.[5,27,33] (1-5)

Indicator 9: Students have sufficient time in STEM instruction to meet the designated standards and achieved the desired outcomes. (1-5)

Indicator 10: Students are intellectually engaged with the task at hand (explore meaningful questions, engage with appropriate phenomena, think of new knowledge in light of their prior knowledge).[34] (1-5)

Indicator 11: Students have the opportunity to make sense out of the ideas that they have been exploring. (1-5)

Indicator 12: Students use appropriate technology to support their work. (1-5)

Data Sources for Component C: (Check all that apply.)

___Standards being addressed
___Anticipated outcomes
___Written curriculum
___Instructional materials
___Pacing guides
___Observations
___Videotapes
___Student work samples
___Data from formative assessments
___Data from summative assessments
___Other (please specify)

Component D: Assessment of Learning

This component lists a set of indicators for classroom assessment. STEM assessment will follow the district's and school's assessment schedule. The assessments are likely to be standards based, especially for the pre-/post summative assessment. Used more for diagnostic assessment, formative assessments vary in their alignment with state standards and the frequency that they are administered. Teachers may have other data such as unit exams or project grades. Assessments should align with the program outcomes teachers have selected for students and their way of measuring them.

Indicator 1: Pre- and post- assessments provide information to the teacher, school, and community about the achievement of outcomes and overall impact on students.[35] (1-5)

Indicator 2: Formative assessments are used to provide teachers with diagnostic data to help guide instruction.[35] (1-5)

Indicator 3: Ongoing formative evaluation involves data collection from a variety of sources.[18] (1-5)

Indicator 4: Teachers and administrators use data to make changes in instruction and curriculum.[18] (1-5)

Data Sources for Component C (Check all that apply.)

___Data from formative assessments
___Data from summative assessments
___Reports of classroom observations
___Analysis of student work
___Student feedback
___Documentation of changes in instruction based on evaluation data
___Other (please specify)

(Proceed to next page)

Summary After reviewing your responses write a brief statement of the strengths and challenges of your program by component. Also, list areas of strength and areas where you might want help.

Component A: Professional Development Program Follow-up

Challenges:

Component B: STEM Content of the Students' Learning
Strengths:

Challenges:

Component C: Nature of Instruction
Strengths:

Challenges:

Component D: Assessment of Learning
Strengths:

Challenges:

Please check the option that best describes your program.
(See SFAz's rubric in the "Guide for Interpreting Data: STEM Teacher Professional Development Follow-up Programs.")

5 – My program reflects a very high level of best practices.
4 – My program has a significant number of best practices in place.
3 – My program has made a good start on incorporating best practices.
2 – My program reflects a few best practices.
1 – My program has not yet addressed best practices to any extent.

My strong areas in which I can help another program are:

Areas in which I could use some help include:

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Self-Assessment: Informal STEM Programs

Data Guide Complete Protocol

Basic Information

Name of informal program:

Name and contact information for the person completing this assessment:

Provide a *brief* description of the program, including age group and population served:

Type of STEM program:

Separate discipline:
- ☐ science
- ☐ technology
- ☐ engineering
- ☐ mathematics

Integrated content:
- ☐ science
- ☐ technology
- ☐ engineering
- ☐ mathematics

Funding source and amount:

Component A: STEM Content of the Student Learning

This component identifies standards that the student learning addresses as well as anticipated outcomes and their measurement.

Indicator 1: The content of students' learning is aligned with some set of standards or guidelines. They may be local, Common Core or state standards, and/or national standards. They should not duplicate the school curriculum although the program may complement the school's or may address standards that the schools may simply not be able to address. For science, the alignment may be with the six strands of science learning as explicated in Learning Science in Informal Environments (Bell, Lewenstein, Shouse, & Feders, eds., 2009). Please list the standards or guidelines that focus the content that the students are learning.

Indicator 2: The program articulates clear goals, objectives, and expected outcomes that are understood by all. Below you'll find a list of possible outcomes that may apply to your program. An outcome is the result that your program is designed to achieve. Please check all that apply. After each outcome you've checked, indicate how it is measured, e.g., pre-/post test, attitudinal survey, or other instrument.

Students:
- ☐ Increased their STEM knowledge and skills
- ☐ Developed attitudes, dispositions, and habits of mind of STEM disciplines
- ☐ Increased interest and participation in out-of-school STEM activities
- ☐ Produced a definable end-product (project or presentation) at the end of the program
- ☐ Reported that the program activities were exciting, enjoyable, and fun
- ☐ Broadened knowledge of STEM careers

- [ ] Had greater interest in and appreciation for the discipline(s)
- [ ] Achieved outcomes that may have been behavioral, social, participatory, and/or group focused. (please specify below):

Other

Data Sources for Component A: (Check all that apply.)

- [ ] Proposal
- [ ] Program design
- [ ] Written curriculum
- [ ] Program description
- [ ] Schedule of activities
- [ ] Lesson plans
- [ ] Observations of activities
- [ ] Data from students such as results of pre- and post-surveys, interviews, or other assessments, especially non-traditional assessments
- [ ] Daily feedback forms
- [ ] External evaluation report
- [ ] Other(please specify below):

Other data sources

Upload Supporting Documents for Component A

Upload Documents

Component B: Nature of the Instruction

These indicators describe effective STEM classroom practices based on what we currently know. Although there are many studies of informal STEM programs, the knowledge base remains spotty and incomplete. Also, effective practices for science, for example, may or may not apply to other STEM disciplines. We await further evidence of effective practices for informal STEM programs, but, in the meantime, work with what we have available to us.

Using the numerical indicators listed below, rank the extent to which each below indicator is reflected in your program:

1. - never or rarely reflected in your program
2. - occasionally reflected in your program
3. - reflected in your program but not consistently
4. - often reflected in your program
5. - fully reflected in your program

	Indicator 1: Students:
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Experience excitement, interest, and motivation to learn about phenomena in the natural and human-made world.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Come to generate, understand, remember, and use concepts explanations, arguments, models and facts related to science, technology, engineering and/or mathematics.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Manipulate, test, explore, predict, question, observe, and make sense of the natural and human-made world.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Reflect on how science, technology, engineering, and mathematics can lead to knowledge; on processes, concepts, and institutions of the four disciplines; and on their own process of learning about phenomena.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Participate in STEM activities and learning practices with others, using the language and tools of the four disciplines.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Think of themselves as STEM learners and develop an identity as someone who knows about, uses, and sometimes contributes to science, technology, engineering, and/or mathematics.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 2: Participate in an active learning instructional approach that includes inquiry (or student investigation), discovery, and application of relevant science, technology, engineering, and/or mathematics principles.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 3: Identify and correct their misconceptions about STEM content. (e.g., why the seasons change).
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 4: Solve actual or simulated real world problems or challenges that involve applying science, technology, engineering, and/or mathematics.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 5: Work in cooperative and collaborative groups to conduct activities and to solve problems..
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 6: Learn in an environment that is sensitive to different cultures, different languages, both genders, diverse learning styles, and different levels of cognitive development.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 7: Have sufficient time in STEM instruction to achieve the desired outcomes.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 8: Are intellectually engaged with the task at hand (explore meaningful questions, engage with appropriate phenomena, think of new knowledge in light of their prior knowledge).
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 9: Use appropriate technology to support their work.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 10: Have definable end products, such as projects and presentations to peers and adults (especially for student research experiences).
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 11: Work with a mentor for guidance, support, structure, and role modeling.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 12: Participate in activities designed to build individual self-confidence, interpersonal skills, critical thinking, problem solving, and skills in teamwork and collaboration.

Data Sources for Component B: (Check all that apply.)

- ☐ Standards or guidelines being addressed
- ☐ Desired outcomes
- ☐ Program design
- ☐ Program description
- ☐ Written curriculum
- ☐ Schedule of activities
- ☐ Observations of activities
- ☐ Data from participants such as results of pre-/post-surveys, interviews, or other assessments, especially non-traditional assessments
- ☐ Daily feedback forms
- ☐ External evaluation report
- ☐ Other (please specify)

Other data sources

Upload Supporting Documents for Component B

Upload Documents

Component C: Program Administration

This component focuses on aspects of administration that are essential for effective operation of an informal program.

	The informal STEM program:
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 1: Aligns all activities with program goals, objectives, and desired outcomes.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 2: Clearly defines roles and responsibilities of staff.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 3: Recruits several students from a single school rather than single students from several schools.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 4: Has sufficient contact hours to achieve the program's goals, objectives, and desired outcomes.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 5: Establishes and maintains a relationship with the students' teachers, schools, and/or districts.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 6: Has adequate resources that are well managed.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 7: Recruits students who are at-risk and those from underserved groups (minorities, girls, and youth who are disabled).
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 8: Gives students appropriate recognition (e.g., ceremony, awards, T-shirts, etc.).

Data Sources for Component C: (Check all that apply.)

- ☐ Proposal
- ☐ Program design
- ☐ Program description
- ☐ Schedule of activities
- ☐ Observations of activities
- ☐ Participant perceptions through interviews, surveys, daily feedback forms
- ☐ Descriptions of staff role and responsibilities
- ☐ Data base of students
- ☐ Staff meeting notes
- ☐ Written curriculum
- ☐ Program budgets

- ☐ External evaluation report
- ☐ Other (please specify below)

Other data sources

Upload Supporting Documents for Component C

Upload Documents

Component D: Assessment of Learning

Assessment of informal programs tends to be more casual in nature. Rather than using formal pre-/post-assessments of achievement, attitudinal surveys or surveys of behaviors and/or interests are more common. At minimum, students should receive feedback on the quality of their work. Any content assessments used are likely to be casual in nature and brief. Assessment should be tied to the desired outcomes, which often are more informal, e.g., students have a higher level of participation in out-of-school STEM activities (attending museums, watching science-related programs on television, learning computer skills from their friends, etc.). Because these programs are voluntary, student opinion is highly valued.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 1: Monitoring of program activities and student participation occurs during program.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 2: Students have opportunities to provide feedback and input during and after the experience.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 3: Pre- and post- program surveys or other assessments gather information about the achievement of outcomes and overall impact on students.
○ 1 ○ 2 ○ 3 ○ 4 ○ 5	Indicator 4: Program staff use evaluation results to make changes.

Data Sources for Component D: (Check all that apply.)

- ☐ Proposal
- ☐ Program design
- ☐ Observations of activities
- ☐ Data from students such as results of pre-/post surveys, interviews, daily feedback forms
- ☐ Data from students such as results of pre-/post surveys, interviews, daily feedback forms
- ☐ Staff meeting notes
- ☐ Reports to funders
- ☐ External evaluation report
- ☐ Other (please specify below)

Other data sources

Upload Supporting Documents for Component D

Upload Documents

Summary

After reviewing your responses, write a brief statement of the strengths and challenges of your program by component. Also, list areas of strength and areas where you might want help.

Component A: STEM Content of the Student Learning

Strengths:

Challenges:

Component B: Nature of Instruction

Strengths:

Challenges:

Component C: Program Administration

Strengths:

Challenges:

Component D: Assessment of Learning

Strengths:

Challenges:

Please check the option that best describes your program. (See SFAz's rubric in the "Guide for Interpreting Data: Informal STEM Programs.")

- 5 - My program reflects a very high level of best practices.
- 4 - My program has a significant number of best practices in place.
- 3 - My program has made a good start on incorporating best practices.
- 2 - My program reflects a few best practices.
- 1 - My program has not yet addressed best practices to any extent.

My strong areas in which I can help another program are:

Areas in which I could use some help include:

Save Responses | Complete Feedback Survey

Guide for Interpreting Assessment Responses
From the Quality Program Identification Assessment
Informal STEM Programs

Introduction

This document is a guide to interpreting the responses from the Quality Program Identification Assessment for Informal STEM Programs. The guide provides suggestions for examining the responses in anticipation of determining the degree to which either a planned or implemented STEM informal program reflects quality as established by research, standards and guidelines, and the experience of expert practitioners. It outlines what to look for in reviewing an instrument that a program has completed. An individual or group completing the instrument can use the guide to help determine an overall rating for their program. An external reviewer could also use it to provide a more independent rating. The organization of this guide parallels that of the assessment.

Name of program_____ Date_____

Contact information for person completing the assessment

Name of reviewer_____ Date_____

Component A: STEM Content of the Student Learning

What to look for

- The STEM content that students are asked to learn should be based on some standards or guideline. Does the instrument cite the standards or guidelines, and do they align with the program description? Do they complement or go beyond the standards addressed by the school rather than duplicate the school's curriculum?

- Do the intended outcomes align with the program description? Do they appear to be realistic, credible, and likely to be supported by the community in which the school is located?

- Is there a reasonable number of intended outcomes for students (1-3)?

- What is the source of the intended outcomes (the standards or guidelines, the curriculum, the student, the instructor)? Are they the same for all students, or are they differentiated in some way?

- Is there evidence that students know what outcomes they are expected to achieve?

- Is the measurement of each intended outcome feasible? Can the proposed measurement be done within the timeframe of the program and with existing resources?

- How many data sources are checked? How many are attached?

- To what extent do the data support the program staff's' responses for Indicators 1 and 2?[1]

Summary for Component A

Strengths:

Challenges:

[1] A reminder: Not all data carry the same weight. Data gathered by a third party through observation are generally considered more credible than anecdotal or self-report data. Data resulting from a well-designed research study with a control group will normally be considered highly credible. However, education often has to rely on types of data that are less credible. Therefore, look for convergence, multiple sources of data that suggest the same finding.

Component B: Nature of Instruction

What to look for

- To what extent are students learning the STEM content as described in Indicator 1? What is the supporting evidence?

- To what extent are students learning in a collaborative and participatory environment that relies on "hands on/minds on" activities? What is the supporting evidence?

- To what extent does the learning described align with the other indicators of effective instruction?

- How many data sources are checked? How many are attached?

- To what extent do the data support the ratings?

Summary for Component B

Strengths:

Challenges:

Component C: Program Administration

What to look for

- To what extent are the goals, objectives, and desired outcomes aligned? Are there sufficient contact hours for the program to achieve its outcomes?

- What are the demographics of the student participants? Do they come from underserved groups? Do they come in pairs, teams, or a larger group from a single school?

- What evidence is there that the program staff maintains a relationship with the students' school(s)?

- Does the program appear to have adequate funding?

- Is there some form of recognition/award ceremony for students?

Component D: Program Assessment

What to look for

- What types of evaluation does this program have in place? Is this inadequate, adequate, or comprehensive? (See Component A.)
- Does the staff use data to make changes in the program? How do you know?
- How many data sources are checked? How many are attached?
- To what extent do the data support the responses to the indicators?
- Are the evaluation data the program has collected generally strong, moderate, or weak?

Strengths:

Weaknesses:

Overall Assessment

Based on your assessment of the data, how would you rate this program on a 1-5 scale with the following designations? (See summary rubric below.)

Best practices are:
1 - never or rarely reflected in the program
2 - occasionally reflected in the program
3 – reflected in the program but not consistently
4 - often reflected in the program
5 – fully reflected in the program

To help in answering the above question, below are descriptions of informal STEM programs at levels 5, 3, and 1. Those at level 2 or 4 would fall in between levels 1 and 3 and 3 and 5, respectively. They are meant to be a guideline and not an exact description of any existing program. There are also exceptions: A program may not incorporate a particular best practice for a legitimate reason, e.g., it is being phased in over a three-year period or an improvement plan exists for the practice. Select the description that most closely fits the program being assessed.

Level 5 Informal STEM program: The STEM content of a quality informal program is related to one or more standards or guidelines and complements and extends, rather than duplicates, the schools' curriculum. The program specifies the desired outcomes for students, or the students may select individual outcomes for themselves. These outcomes are often broader and more casual than those for academic programs. The program's goals, objectives, and expected outcomes are clear and are understood by the staff and the students. There is a realistic number of intended outcomes for students (1-3), and these outcomes are reasonable, credible, and supported by the community in which the school is located. Evidence supports that indicators of quality instruction are present at a level of 4 or 5. Appropriate and adequate technology is available. The program is well managed as evidenced by 4s and 5s on the indicators under program administration. Quality instruction is supported by a sound evaluation plan, and evaluation data are used to improve instruction. Again, most indicator ratings are at a 4 or 5. All exceptions to the 4 or 5 ratings on the indicators have a reasonable explanation (e.g., a practice is being phased in, or an improvement plan exists for a practice). The focus of the program is a positive experience for every student.

Level 3 Informal STEM program: The source of the STEM content of a level 3 informal program may not be explicit. Although the program basically complements and extends, rather than duplicates, the schools' curriculum, there may be some crossover. A developing program has established desired outcomes for students, but staff and especially students may not be clear as to what these outcomes are. There may be too many outcomes for students, and these outcomes may fall short on one or more of the criteria of reasonable, credible, and supported by the community in which the school is located. For example, an outcome may be too academic for an informal program or

inappropriate for the age group. Evidence supports that most of the indicators of quality instruction are present at a level of 3 or above. Students have the appropriate technology, but it is in short supply. The program is fairly well managed as evidenced by 3 and above on most of the indicators under program administration. An evaluation plan exists, but the data are often not used to improve instruction. Again, majority of the indicator ratings are at a 3 or above. Lower ratings on the indicators may occur if there is some reasonable explanation (e.g., a practice is being phased in, or an improvement plan exists for a practice). The program intends that every student has a positive experience, but that is not always the case.

Level 1 Informal STEM program: An informal STEM program at level 1 has not yet begun to address best practices. The knowledge and skills that the students are to acquire may not be clearly delineated. The content may not be related to any standard or guideline. Goals, objectives, and outcomes may be fuzzy and not clearly understood by students. The program may duplicate the school's curriculum in part and/or be too academic and formal. There are likely to be too many outcomes, or the outcomes are listed as outputs rather than outcomes (e.g., students visit a zoo and a wildlife refuge vs. students can explain the difference in philosophy between a zoo and a wildlife refuge). Adequate and appropriate technology is not available. The ratings for the indicators of each component will be largely 1 or 2 with an occasional higher rating. No improvement plan exists. The program focuses more on itself (e.g., perhaps covering the content or completing certain activities) rather than ensuring that every student has a positive experience.

Quality Program Identification Assessment
Informal STEM* Programs

Introduction

Welcome to the Quality Program Identification Assessment for Informal STEM programs. This assessment was designed for two purposes. The first was to have instrumentation that informal STEM programs funded by the Science Foundation Az, as well as other funders, could use to assess their program infrastructure according to effective practice. The second was to have a set of standards for program design and implementation available to all current and future STEM program planners in the state. The ultimate goal is to improve the quality of informal STEM education programs across the state.

Informal STEM programs are defined as those that have an identifiable structure, have voluntary participation, offer no formal credit, take place after school hours or in the summer, are learner-driven, are free from performance demands, and have outcomes that are cognitive in nature, attitudinal, behavioral, social, and /or participatory.[1] The instrument provides a way of aligning key components of instruction with what we know about best practices.

An example of an informal program is a Saturday Science Day sponsored once a month by the local museum of natural history. Mid-level students participate in a variety of activities from September through May. Another example is a robot club that meets after school every other Monday. The sponsor is a high technology company located in the city close to the high school. Such informal programs can exert an influence on formal programs, and educators are recognizing their value. Young people may acquire knowledge and skills in many places: in school, in educational programs conducted after school or in the summer, or in their day-to-day interactions with friends, family, and their community.

Underlying Assumption

The underlying assumption of the assessment is that an informal program must be well designed and implemented if students are to achieve the outcomes the program has set for them. A program that is poorly designed or not well implemented limits students' opportunity to learn. For example, research has determined that we learn new skills best by having the opportunity to practice. If there's no opportunity to practice, the learning will be compromised.

Why Self-Assessment

The opportunity for program staff to examine their program first is the major reason we have designed this to be a self-assessment instrument. Program staff should be the ones who take an initial look at their own work to see the degree to which is aligns with best practice. Let them make the first determinations about their own instruction If there are some areas in which their instruction is not aligned with best practice, program staff are well positioned to examine any

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* As used in this document, the acronym STEM can have two different meanings. It can refer to the separate disciplines of science, technology, engineering, and mathematics; or it can refer to integration of content within one or in two or more of the disciplines. Those completing this instrument will need to specify which definition of STEM best describes their program.

discrepancies and determine actions that may need to take place. This is then an opportunity to assess one's instruction before opening it to others to review.

Instrument Described

The instrument has four critical components of effective structured informal instruction: content, nature of instruction, administration, and assessment. Each component has a number of indicators ranging from two to twelve that describe its key features. These indicators of best practice are determined by research of various types, standards and guidelines, and the experience of practitioners in the field. They are the practices that appear to contribute to effective instruction. The indicators are footnoted, and citations appear in the attached reference list.

The instrument is structured so that program staff has to look for evidence to support the quality of their instruction. Those completing the self-assessment must base their findings on data, not personal opinions, hunches, or expectations for the future. If staff approaches this self-assessment honestly and with an open attitude, the process will keep them anchored in the reality of their instructional planning and implementation.

Completing the Instrument

Program leadership can form a work group to complete the instrument. A work group is much more effective than one or two individuals undertaking the task alone. A work group should result in more buy-in to the process while distributing the workload.

Project staff completing the instrument rate the extent to which an indicator is reflected in their program using a rating scale of 1 (low) to 5 (high). Then they check the evidence on which their rating is based. At the end, all pieces of evidence are uploaded and attached to the instrument. Also, there's a place at the end to document the overall strengths and challenges of the self-assessment and areas for improvement. SFAz will provide details regarding submitting data to its database.

Reporting the Results

Staff may want to write a summary of their self-assessment process and its findings. They can also determine the appropriate distribution of the summary. What they have learned from this self-assessment will help them make improvements in their program that will ultimately affect student outcomes. SFAz will have additional requirements regarding sharing data with other funded STEM programs or those in development.

Quality Program Identification Assessment
Informal STEM Programs

Name of informal program:

Name and contact information for the person completing this assessment:

Provide a *brief* description of the program, including age group and population served:

Type of STEM program:

- Separate discipline: science, technology, engineering, or mathematics (circle which one)
- Integrated content: science, technology, engineering, or mathematics (circle which ones)

Start and ending date of program:

Funding source and amount:

Component A: STEM Content of the Student Learning

This component identifies standards or guidelines that the student learning addresses as well as anticipated outcomes and their measurement.

Indicator 1: The content of students' learning is aligned with some set of standards or guidelines. They may be local, Common Core or state standards, and/or national standards. They should not duplicate the school curriculum although the program may complement the school's or may address standards that the schools may simply not be able to address.[2,12,23] For science, the alignment may be with the six strands of science learning as explicated in *Learning Science in Informal Environments*[20]. Please list the standards or guidelines that focus the content that the students are learning.

_____

_____

_____

Indicator 2: The program articulates clear goals, objectives, and expected outcomes that are understood by all.[2,3,4,10,12,13,20,23] Below you'll find a list of possible outcomes that may apply to your program. An outcome is the result that your program is designed to achieve. Please check all that apply. After each outcome you've checked, indicate how it is measured, e.g., pre-/post test, attitudinal survey, or other instrument.

Students:

_____Increased their STEM knowledge and skills
_____Developed attitudes, dispositions, and habits of mind of STEM disciplines (honesty, skepticism, tolerance of ambiguity, and desire for evidence)
_____Increased interest and participation in out-of-school STEM activities
_____Produced a definable end-product (project or presentation) at the end of the program
_____Reported that the program activities were exciting, enjoyable, and fun
_____Broadened knowledge of STEM careers
_____Had greater interest in and appreciation for the discipline(s)
_____Achieved outcomes that may have been behavioral, social, participatory, and/or group focused. (please specify)

Data Sources for Component A: (Check all that apply.)

___Proposal
___Program design
___Written curriculum
___Program description
___Schedule of activities
___Lesson plans
___Observations of activities
___Data from students such as results of pre- and post-surveys, interviews, or other assessments, especially non-traditional assessments
___Daily feedback forms
___External evaluation report
___Other (please specify)

Component B: Nature of the Instruction

These indicators describe effective STEM classroom practices based on what we currently know. Although there are many studies of informal STEM programs, the knowledge base remains spotty and incomplete. Also, effective practices for science, for example, may or may not apply to other STEM disciplines. We await further evidence of effective practices for informal STEM programs, but, in the meantime, work with what we have available to us.

Using the numerical indicators listed below, rank the extent to which each below indicator is reflected in your program:

1 - never or rarely reflected in your program
2 - occasionally reflected in your program
3 – reflected in your program but not consistently
4 - often reflected in your program
5 - fully reflected in your program

Indicator 1: Students:

- Experience excitement, interest, and motivation to learn about phenomena in the natural and human-made world.[2,8,10,20,26] (1-5)
- Come to generate, understand, remember, and use concepts explanations, arguments, models and facts related to science, technology, engineering, and/or mathematics.[17,18,19,20] (1-5)
- Manipulate, test, explore, predict, question, observe, and make sense of the natural and human-made world.[4,10,18,20,26,27] (1-5)
- Reflect on how science, technology, engineering, and/or mathematics can lead to knowledge; on processes, concepts, and institutions of one or more of the four disciplines; and on their own process of learning about phenomena.[16,17,20,22] (1-5
- Participate in STEM activities and learning practices with others, using the language and tools of one or more of the four disciplines.[4,10,26] (1-5)
- Think of themselves as STEM learners and develop an identity as someone who knows about, uses, and sometimes contributes to science, technology, engineering, and/or mathematics.[4,20] (1-5)

Indicator 2: Participate in an active learning instructional approach that includes inquiry (or student investigation), discovery, and application of relevant science, technology, engineering, and/or mathematics principles.[8,20,23,27,28] (1-5)

Indicator 3: Identify and correct their misconceptions about STEM content. (e.g., why the seasons change).[17,18,19] (1-5)

Indicator 4: Solve actual or simulated real world problems or challenges that involve applying science, technology, engineering, and/or mathematics.[27] (1-5)

Indicator 5: Work in cooperative and collaborative groups to conduct activities and to solve problems.[18,27,29] (1-5)

Indicator 6: Learn in an environment that is sensitive to different cultures, different languages, both genders, diverse learning styles, and different levels of cognitive development. [11,14,24,25](1-5)

Indicator 7: Have sufficient time in STEM instruction to achieve the desired outcomes. (1-5)

Indicator 8: Are intellectually engaged with the task at hand (explore meaningful questions, engage with appropriate phenomena, think of new knowledge in light of their prior knowledge).[2,21] (1-5)

Indicator 9: Use appropriate technology to support their work. (1-5)

Indicator 10: Have definable end products, such as projects and presentations to peers and adults (especially for student research experiences).[4] (1-5)

Indicator 11: Work with a mentor for guidance, support, structure, and role modeling.[2,15] (1-5)

Indicator 12: Participate in activities designed to build individual self-confidence, interpersonal skills, critical thinking, problem solving, and skills in teamwork and collaboration.[22] (1-5)

Data Sources for Component B: (Check all that apply.)

___Standards or guidelines being addressed
___Desired outcomes
___Program design
___Program description
___Written curriculum
___Schedule of activities
___Observations of activities
___Data from participants such as results of pre-/post-surveys, interviews, or other assessments, especially non-traditional assessments
___Daily feedback forms
___External evaluation report
___Other (please specify)

Component C: Program Administration

This component focuses on aspects of administration that are essential for effective operation of an informal program.

The informal STEM program:

Indicator 1: Aligns all activities with program goals, objectives, and desired outcomes.[5,13] (1-5)

Indicator 2: Clearly defines roles and responsibilities of staff.[5,13] (1-5)

Indicator 3: Recruits several students from a single school rather than single students from several schools. (1-5)

Indicator 4: Has sufficient contact hours to achieve the program's goals, objectives, and desired outcomes. (1-5)

Indicator 5: Establishes and maintains a relationship with the students' teachers, schools, and/or districts.[2,23] (1-5)

Indicator 6: Has adequate resources that are well managed.[7,23] (1-5)

Indicator 7: Recruits students who are at-risk and those from underserved groups (minorities, girls, and youth who are disabled).[3,6,20,21] (1-5)

Indicator 8: Program gives students appropriate recognition (e.g., ceremony, awards, T-shirts, etc.) (1-5)

Data Sources for Component C: (Check all that apply.)

___Proposal
___Program design
___Program description
___Schedule of activities
___Observations of activities
___Participant perceptions through interviews, surveys, daily feedback forms
___Descriptions of staff role and responsibilities
___Data base of students
___Staff meeting notes
___Written curriculum
___Program budgets
___External evaluation report
___Other (please specify)

Component D: Assessment of Learning

Assessment of informal programs tends to be more casual in nature. Rather than using formal pre-/post-assessments of achievement, attitudinal surveys or surveys of behaviors and/or interests are more common. At minimum, students should receive feedback on the quality of their work. Any content assessments used are likely to be casual in nature and brief. Assessment should be tied to the desired outcomes, which often are more informal, e.g., students have a higher level of participation in out-of-school STEM activities (attending museums, watching science-related programs on television, learning computer skills from their friends, etc.). Because these programs are voluntary, student opinion is highly valued.

Indicator 1: Monitoring of program activities and student participation occurs during program.[2,9,23] (1-5)

Indicator 2: Students have opportunities to provide feedback and input during and after the experience.[2,9,23] (1-5)

Indicator 3: Pre- and post- program surveys or other assessments gather information about the achievement of outcomes and overall impact on students.[2,9,23] (1-5)

Indicator 4: Program staff use evaluation results to make changes.[2,9,23] (1-5)

Data Sources for Component D: (Check all that apply.)

___Proposal
___Program design
___Observations of activities
___Data from students such as results of pre-/post surveys, interviews, daily feedback forms
___Student work samples or projects
___Staff meeting notes
___Reports to funders
___External evaluation report
___Other (please specify)

(Proceed to next page)

Summary After reviewing your responses, write a brief statement of the strengths and challenges of your program by component. Also, list areas of strength and areas where you might want help.

Component A: STEM Content of the Student Learning
Strengths:

Challenges:

Component B: Nature of Instruction
Strengths:

Challenges:

Component C: Program Administration
Strengths:

Challenges:

Component D: Assessment of Learning
Strengths:

Challenges:

Please check the option that best describes your program.
(See SFAz's rubric in the "Guide for Interpreting Data: Informal STEM Programs.")

5 – My program reflects a very high level of best practices.
4 – My program has a significant number of best practices in place.
3 – My program has made a good start on incorporating best practices.
2 – My program reflects a few best practices.
1 – My program has not yet addressed best practices to any extent.

My strong areas in which I can help another program are:

Areas in which I could use some help include:

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ATTACHMENT 12

STEM Teacher Workforce Needs Survey Results

The Arizona Education Reform Plan (Arizona Ready) articulates the fundamental need to increase teacher effectiveness, improve student achievement in math and science, and embed STEM throughout our education system. Recent conversations around the state have reaffirmed these priorities. Additionally, a critical priority emerged indicating a shortage of STEM content teachers. A recent Workforce Needs Survey validated this articulation.

Behavior Research Center recently conducted a survey to determine what the needs of school districts are for a STEM teacher workforce. An online survey was sent to all Arizona school superintendents in July 2011. We received survey responses from 42 Arizona school districts of which 82% were from rural communities.

The inability to fill positions for math teachers for the 2011 - 2012 school year was the largest unfilled gap, at 42 math teachers, 86% of which were needed by schools in rural districts. 30 science teacher positions remained unfilled, 60% by schools in rural districts. These rural districts indicated 10 unfilled openings for other STEM related teachers in K-12, including technology specialists and CTE teachers for school year 2011-2012. The need for STEM teachers in rural schools is high, with multiple opening remaining unfilled, even after respondents reported a collective elimination of 22 STEM teachers from their rosters. Additionally, only rural districts indicated the elimination of STEM teachers due to budget cuts.

While the number of districts responding to the survey was low (a total response rate to this survey was 17%), the trend indicated is such that rural schools have a desperate need to fill openings for math, science and technology teachers.

ATTACHMENT 12

STEM TEACHER WORKFORCE NEEDS SURVEY QUESTIONNAIRE

1. *How many openings, if any, for each of the following teacher specialties did you have at the beginning of the Spring Semester of 2011?*

Math

High School 28 positions from zip codes:

85122	86033	85345	86403	86337
85140	85364	86025	85641	86025
86005	85338	85348	86426	85941
85306				

Middle School 20 positions from zip codes:

85364	85670	86033	86337	85140
85086	85641	86434	85332	85337
86005	85354			

Elementary School 1 position zip code:

86510

TOTAL 49 positions

Science

High School 19 positions from zip codes:

85122	86403	85310	86025	86025
86005	85552	86033	85140	85301
85338				

Middle School 13 positions from zip codes:

85364	85670	85345	85635	86403
85086	86025	86025	86005	

Elementary School 2 positions from zip codes:

86510 85337

TOTAL 44 positions

CTE TOTAL 9 positions from zip codes:

85641 85306 85353 86403

OTHER TOTAL 21 positions from the following zip codes:

86033 86336 86403 86025

3 High School English

2 Guidance Counselors
6 Elementary
1 School Psychologist
1 **High School Earth Science**
1 Spanish
1 Middle School Social Studies
1 **General Science**
5 Not Specified

2. *How many openings, if any, for each of the following teacher specialties do you have now (8/1/11) to fill for Fall semester 2011?*

Math

High School 29 positions from the following zip codes

86323	86033	85635	86336	86403
85364	86025	85641	86025	85337
86005	85338	85941	85266	

Middle School 12 positions from the following zip codes:

86323	85364	85353	86336	85086
86025	85641	85337		

Elementary School 1 position from the following zip code:
86323

TOTAL MATH POSITIONS CURRENTLY AVAILABLE 42

Science

High School 15 total positions from zip codes: 85635

86364	86025	85353	86033
85140	85338	86005	85641

Middle School 12.5 positions from zip codes:

85364	86336	86025	85353	85353
85345	86086	85025	85641	85337
85353				

Elementary School 2 positions available from zip codes:
85086

TOTAL SCIENCE POSITIONS CURRENTLY AVAILABLE 29.5

CTE TOTAL 9 from zip codes:
86336 86403 8633786336

OTHER TOTAL 15 positions from zip codes:
86033 86042 86025
3 High School English teachers
2 Guidance Counselors
1 School Psychologist
1 **Earth Science** teacher
2 Elementary
6 Not Specified

3. *How many positions, if any, have been eliminated because of the current funding cuts?*

Science

High School 1 position from the following zip code:
85122

Middle School 1 position from the following zip code:
86323

Elementary School 5 positions from the following zip code:
85326

TOTAL SCIENCE POSITIONS ELIMINATED 7

Math

High School 2 positions from the following zip codes:
85122 86336

Middle School 4 positions from the following zip codes:
85630 86323 85353

Elementary School 5 positions from the following zip code:
85282

TOTAL MATH POSITIONS ELIMINATED 11

CTE/OTHER TOTAL 19.4 eliminated from the following zip codes:
86003 86337 85122 86403 86337
85310 85338 86336
6.4 CTE teachers
1 Highs School Social Studies
3 Literacy Coaches
9 Elementary

ATTACHMENT 13

TEACH FOR AMERICA AND SCIENCE FOUNDATION ARIZONA
STEM TEACHERS IN RURAL COMMUNITIES

As Arizona works to become more competitive in the new high-tech economy, our state's public education system must be able to produce a qualified and innovative workforce. Yet this poses a major challenge to an education system that is not equipped currently to prepare students with the skills and knowledge they need to succeed in today's marketplace. Science, technology, engineering and mathematic (STEM) knowledge is fundamental to individual and economic success, and Arizona must do what it can to better prepare students with rigorous and relevant STEM-based education delivered by highly effective teachers.

The Arizona Education Reform Plan articulates the fundamental need to increase teacher effectiveness, improve student achievement in math and science, and embed STEM throughout our education system. Recent conversations around the state have reaffirmed these priorities as well as the overall need for more STEM teachers. A recent survey by SFAz in July 2011 found that of the Arizona school districts responding 82% were from rural communities, and of those 90% needed math, science and/or career and technical education teachers. These rural districts indicated 70 current openings for STEM teachers in K-12.[1]

In Arizona's Education Reform Plan, the Governor set forth a goal of 85% of Arizona's students scoring proficient on the NAEP 8th Grade Math exam by 2021; however of the Arizona 8th grade students tested, only 29% reached proficiency on the 2009 NAEP Math exam. These numbers are mirrored in our State AIMS Assessment as well. In the same year, 29% of Arizona 8th graders tested proficient in Math, while only 22% tested proficient in Science.[2] This means nearly 2/3 of Arizona students on prepared for success for today's job market.

Given the urgency of closing the academic achievement gap and raising expectations for all students in Arizona, we must target our resources and efforts more strategically and efficiently to dramatically improve teacher effectiveness and student achievement, particularly in STEM fields that are critical to our state's economy. Through leveraging of existing resources and a strategic focus on deploying and developing effective STEM teachers and leaders, Arizona can provide all children with additional opportunity for success -- in careers and in life -- while bolstering job opportunity and competitiveness of our communities and our state.

Teach For America (TFA) is already one of the most significant providers of STEM teachers in Arizona. Science Foundation Arizona (SFAz) has established itself as a leader in developing STEM education programs and, through the Arizona STEM Network, is building capacity in schools and districts to more fully integrate STEM learning and improve student outcomes. A partnership between SFAz and TFA would meet the state's needs and priorities while also maximizing existing resources.

Program

SFAz and TFA propose a partnership that will encompass three interconnected projects: strategically train and deploy TFA corps members to teach STEM subjects in rural Arizona; adapt TFA's teacher training model to support a new alternative certification program for encore STEM professionals interested in teaching; and translate this learning into a new STEM model for professional development programs that will be delivered through the Regional Centers. These projects will integrate TFA's Teaching as Leadership model with SFAz's STEM content to address the state's most pressing academic challenges and meet the expectations for a 21st century workforce to support strong local economies.

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[1] The total response rate for the survey was 17 percent.

[2] The results are even lower in rural communities in Arizona. The average AIMS Math "meets or exceeds the standards" score for Arizona 8th grade students from rural communities is 57%, showing a slight increase at the 10th grade level to 61%. The average Science percentage of "meet or exceeds the standards" for rural communities in the same test year for students in 8th and 10th grades is 48% and 26% respectively.

Over the next five years, SFAz and TFA will work with the Governor's Office, State Board of Education, Arizona Department of Education, County Superintendents and Regional Alliances and Centers to train and deploy TFA corps members specialized in STEM to rural schools[3]. In addition, SFAz will work to repurpose TFA's corps training model to enhanced STEM content as well as develop a new alternative certification program for STEM professionals who wish to enter the teaching profession. Together, STEM teachers will be recruited, trained, certified and placed in rural communities that demonstrate:

- Need based on student academic performance in math and science,
- Need to hire high quality STEM teachers,
- District, school and teacher support, coordination and integration of STEM, and
- Community support for increased focus on STEM education.

TFA will take the lead in recruiting and training 40 Corps members to rural communities demonstrating the above with SFAz supporting in the development of STEM enhanced curriculum. SFAz will take the lead developing the newly created certification program, building from TFA corps training model, working in conjunction with Arizona workforce and economic development leaders to identify and recruit STEM professionals to participate, and coordinating with rural schools to place newly certified teachers. The result will be a transformational model for STEM teacher certification – the first of its kind in the country.

In the first year, the model will be piloted with an initial cohort of 10 that will be evaluated for impact and improvement potential. A full cohort of 20 STEM professionals will begin in Fall 2013, along with a new TFA corps of 40 teachers.[4] Over 5 years, this effort will result in the placement of over 200 new and highly effective STEM teachers in schools throughout rural Arizona.

SFAz and TFA will also collaborate to develop a STEM-based professional development model for existing Arizona teachers that incorporates much of what TFA has learned in teacher development. Armed with the knowledge experience gained from the development of the first two parts of this program, we will work with the Arizona Regional Education Centers to identify local needs. A small team of designers who are familiar both with STEM-based teaching and TFA's approach would adapt models from both organizations to design new, integrated programs. These programs would include a variety of modules to meet teachers' needs, increase leadership potential as well as STEM content knowledge and pedagogical content knowledge, develop lesson plans based on curricula and standards to better deliver STEM instruction, and build skills to engage students in STEM.

The design team will also develop programs for whole schools and districts to help teachers and leaders integrate STEM into their schools in a meaningful way. These programs will equip schools and district leaders with the skills to provide the necessary and ongoing support for their teachers to maximize their classroom effectiveness. Once these programs are developed, SFAz's team of designers and trainers will collaborate with the Regional Centers to implement these trainings. Developed programs could also be shared with other teacher preparation programs in the universities and adapted to meet undergraduate needs.

Alignment with Arizona Education Reform Plan

This proposed partnership embodies the spirit and the concrete recommendations of the Arizona Education Reform Plan and the Race To The Top application. The funding to support this project will be "multipurpose funding"[5]; the program will also help the Regional Centers fulfill their mission and

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[3] Teach For America has specific criteria for launching a new site, including the following: a community alignment with our mission to close the achievement gap, a commitment from the local district and charter schools to placing a critical mass of corps members across the full range of grade levels, and the ability to fully fund the site in a sustainable, on going manner. TFA will work with SFAz, the Governor's Office, and the ADE to identify interested communities and determine the best fit. In order to launch TFA's rural corps expansion, there must be a path to on-going, sustainable funding.

[4] Use of technology for program delivery will be explored, potentially reducing the costs and enable expansion to more participants. SFAz will own the development of the alternative certification program, but will hire TFA alumni to help design the training and support components.

[5] Arizona Education Reform Plan

potential: "Centers will be expected to institutionalize and sustain a focus on STEM education, thus establishing a statewide network for STEM implementation."[6] Additionally, both the SFAz and TFA leverage significant private investment, which will increase the overall amount of resources flowing into the state's education system. With the state's investment in this project, a partner foundation has offered $2M investment in TFA to support its ongoing impact on under-resourced students in Arizona and its ability to undertake partnerships such as this proposal. The partnership between SFAz and TFA will catalyze Arizona's success in preparing its students for a high-tech workforce and providing all children with the high quality and high expectations for education they deserve.

[6] Race To The Top application, Section A-47

Arizona Department of Education's Technical Timeline/Implementation Plan

The rollout of the 2010 Arizona ELA and Mathematics Standards is being conducted in a strategic way in which careful thought is being given to capacity building at the local education level. ADE is being responsive to various needs of LEAs and charters to execute their scaffolded implementation plans, change instruction at both the content and practice levels, and communicate and collaborate within their existing system to ensure that students are prepared for PARCC assessments.

PHASE I - Building Awareness: June 2010-July 2011 (and ongoing)	
June 28, 2010 ***(ADOPTION)***	State Board of Education adopts K-12 Common Core State Standards in Mathematics and English Language Arts.
Summer 2010	Arizona Department of Education (ADE) staff and committees of stakeholders in English Language Arts and Mathematics review public feedback, finalize recommendations for state-specific additions to Common Core, and assist in creating Arizona-specific supporting documents such as crosswalks/alignments between current standards and Common Core standards, grade-level documents that include explanations and examples, and summaries of changes documents highlighting critical changes at each grade level. Stakeholders also provide input into the design of instructional support materials and professional development sessions, focused on unwrapping and understanding the new standards.
August 23, 2010	State Board of Education adopts Arizona State-Specific Additions to Common Core Standards in English Language Arts and Mathematics.
January 2011	2010 Arizona Mathematics Standards grade-level documents with accompanying crosswalks and summaries of changes are released.
March 2011	ADE content experts, K-12 teachers, and higher education professors provide initial feedback on Draft PARCC Content Frameworks.
May 2011	2010 Arizona English Language Arts Standards grade-level documents with accompanying alignment documents and summaries of changes are released.
June 2010 – July 2011	National PARCC Implementation and Transition Meetings attended by: • K-12 Content Experts/Educators • ADE Leadership • Higher Education Leadership and Content Experts • State Board of Education Representatives • District Leadership Representatives • County Education Service Agency Representatives

<table>
<tr><td>November 2010 – July 2011</td><td>Building awareness and knowledge of the 2010 Arizona Mathematics and English Language Arts Standards is the focus for professional development sessions and technical assistance provided by ADE. (Phase I)
<table>
<tr><th>English Language Arts and Mathematics</th></tr>
<tr><td>2010 Arizona ELA Standards - online course modules created</td></tr>
<tr><td>Training of Trainer sessions to prepare ELA and Mathematics trainers to present at 1 and 2-day conferences</td></tr>
<tr><td>Phase 1 ELA and Mathematics Training of Trainer sessions to prepare trainers to present at counties, LEAs and charters</td></tr>
<tr><td>Phase 1 ELA and Mathematics Standards Rollout Conferences (1 and 2 day)</td></tr>
<tr><td>Informational technical assistance presentations at conferences, meetings, and LEA requests</td></tr>
<tr><td>2010 Standards Webinars</td></tr>
<tr><td>1-Day Phase I Administrator ELA and Mathematics Content Training</td></tr>
</table></td></tr>
<tr><td>Summer 2011</td><td>AIMS analysis of reading levels and genres of all passages in item bank. New passages are approved for field testing with focus on expository text emphasizing science content. Readability for new passages is increased to better align with Common Core expectations.

Teacher committees convene to write items for Spring 2012 field testing at a DOK (Depth of Knowledge) level of 2 and 3. Committees are encouraged to write selected response items at the concept level of the current Arizona ELA and mathematics standards in order to reach higher DOK levels. Science items are also written to higher DOK levels.</td></tr>
<tr><td colspan="2">PHASE II – Knowledge and Incorporation: August 2011-July 2013 (and ongoing)</td></tr>
<tr><td>Fall 2011</td><td>Committee starts working on transition plan for High School Competency Exam

ADE begins to look at shifts in standards to determine where the focus might be changed on the current assessment blueprint within a concept or strand without changing the blueprint or going through a new standard setting.</td></tr>
<tr><td>August 2011</td><td>PARCC Content Frameworks – 3 week public review period to include targeted stakeholder input.</td></tr>
<tr><td>November 2011</td><td>PARCC Content Frameworks are released for Grades 3-11 ELA and Mathematics.</td></tr>
<tr><td>August 2011 – July 2012</td><td>Full implementation of 2010 Arizona Mathematics and English Language Arts Standards at kindergarten begins.

Continued technical assistance and professional development focuses on understanding intent and content of the standards. ADE builds capacity by developing trainer cadres of content experts (initial step of Phase II). The Trainer Cadres take responsibility for delivery of ongoing statewide Phase I professional development. Phase II professional development targets the in-depth study of content, rigor, text complexity, literacy integration, and mathematical practices.
<table>
<tr><th colspan="2">Content-Specific Professional Development to Support Implementation Efforts</th></tr>
<tr><th>English Language Arts</th><th>Mathematics</th></tr>
<tr><td>• Multisensory Grammar
• The Key Comprehension Routine
• The Key</td><td>• K-2 Academy (focuses on Counting and Cardinality and Operations and Algebraic Thinking)
• K-2 Problem Solving
• Intel Mathematics for K-8 Teachers</td></tr>
</table></td></tr>
</table>

Vocabulary Routine: Content Vocabulary Instruction • The Answer Key to Open Response • Teaching Writing as a Subject – Foundations K-8 • PARA Reading • Summary Reading/Writing and Retell • Fiction Writing • Personal Narrative Writing • Struggling Adolescent Readers • Developing Metacognitive Skills • Persuasive Writing • Expository/Explanatory Writing about Content and Research • Expository Writing – Different Products	(builds the connections among arithmetic, geometry, and algebra through a problem-solving lens) • Improving Mathematics Instruction by Focusing on Instructional Shifts that Raise Student Achievement (K-8) • Constructing Fraction Sense (Gr. 3-5) • Proportional Relationships (Gr. 6-8) • Making Connections within the Geometry Standards (High School)
ELA and Mathematics Training of Trainer sessions to prepare certified trainers to present Phase I trainings at counties, LEAs and charters	
Customized technical assistance presentations at conferences, meetings, and LEA requests	
SEC (Surveys of Enacted Curriculum) Standards Analysis	
Content-Specific Professional Development to Support Implementation Efforts	
Identify and Publicize Exemplar Local Implementation Plans	
Content Frameworks Professional Development	
Development of Sample Curriculum Maps	
Response to Intervention for Administrators and K-3 Leadership	
Phase II Administrator Professional Development Kick-Starting the Implementation	
Development of Website Resources, Online Professional Development and Webinars	

Districts and schools begin to scaffold implementation of new standards. Emphasis on the Standards for Mathematical Practice is recommended as part of the scaffolding in mathematics. Collaboration among ELA and History/Social Studies, Science and Technical Subject teachers is essential in transitioning to the Literacy Standards. Additional local implementation decisions should be informed by district/school data and context, with special attention paid to crosswalk/alignment and other supporting documents.

Spring pilot testing of item types begins in AZ and all governing states belonging to the Partnership Assessment of College and Career Readiness Consortium (PARCC). This consortium is developing a multi-state common assessment of the 2010 Arizona Mathematics and English Language Arts Standards.

ADE launches Common Core website with specific support for stakeholder groups (Teachers, Administrators, Families/Community, and Students) which includes: links to national Common Core resources, Arizona support documents for ELA and mathematics, scaffolded implementation models, videos, bilingual links for parents, PowerPoint presentations, PARCC (Partnership for Assessment of Readiness for College and Careers) assessment information, necessary shifts in instruction, math progressions, and SEC

	standards analysis. PARCC assessment prototyping and development begins.
September 2011	ELA application for trainer cadre developed and released.
October 2011 – ongoing	ADE monitors LEA participation in Phase I Standards professional development to determine the geographical reach of statewide technical assistance. To build statewide capacity, ADE delivers targeted communication notifying LEAs of future professional development opportunities.
October 2011	Survey all past attendees of 2010 ELA Standards and Administrator trainings to determine: • The number of trainings that have been conducted • How many individuals have attended trainings • How current classroom practice has been impacted • Whether or not their LEA/charter has a rigorous scaffolded implementation plan to prepare students for PARCC assessments in 2014-2015 • Areas of needed ADE support
November 2011	Convene cross-section implementation team with ADE leadership to coordinate work, messaging, core instruction, etc.
December 2011	Common Core overview training for cross-section ADE implementation team to include Program Specialists and Directors working closely with LEAs and charters.
August 2012 – July 2013	Full implementation of 2010 Arizona Mathematics and English Language Arts Standards begins at grade 1 and continues at kindergarten. Furthermore, strategic scaffolded implementation continues at remaining grade levels. Phase I and Phase II professional development and technical assistance continues to support LEAs and charters. Phase III trainings are developed as needed in response to the needs of LEAs and charters. Field Testing of new items for the PARCC Consortium Assessment System begins.
Winter 2012	Committee meets to discuss methodology of raising AIMS rigor to new standard. ADE Assessment Section requests development of new reading passages for Spring 2013 field testing with a focus on higher text complexity and more expository text.
Spring 2012	Field testing of AIMS embedded items developed at higher DOK levels and associated with passages with increased text complexity. Alignment analysis of current AIMS item bank to the 2010 Arizona Mathematics and ELA Standards to determine gaps.
Summer 2012	Teacher committees convene to write items aligned to 2010 Arizona Standards (Common Core) at DOK levels of 2 and 3. Text complexity is raised for new passages. Teacher committees select current operational items from the AIMS item bank for the Spring 2013 AIMS assessment. Test difficulty increased slightly to align to 2010 AZ Standards (Common Core). Items will continue to be selected to determine student performance on previous standard.

	PARCC Item and Task Prototypes are released.
Fall 2012	PARCC Model Instructional Units are released for use by teachers and local/state curriculum directors.
PHASE III – Full Implementation: August 2013-July 2015	
August 2013-July 2015	Professional Development will be provided in response to the needs of LEAs and Charters. • Content-specific instructional strategies • Support in connecting instruction and PARCC assessment expectations • Grade-level specific content support
August 2013 – July 2014	Field Testing of new items for the PARCC Consortium Assessment System continues.
Spring 2013	ADE - field testing of embedded AIMS items developed at higher DOK levels and associated with passages with increased text complexity. Development begins for PARCC (voluntary) K-2 formative tools.
Spring - Summer 2013	PARCC professional development modules will be made available to help educators directly responsible for administrating the new PARCC assessments.
Summer 2013	ADE - write performance based items based on PARCC modeled or released items for field testing – embedded in AIMS. Test difficulty increased slightly to align to 2010 AZ Standards (Common Core). Items will continue to be selected to determine student performance on previous standard
Fall 2013 - Fall 2014	PARCC K-2 Assessment system is available. PARCC Diagnostic Tool for ELA and Mathematics is available.
Winter 2013	Possible AIMS field testing of response to reading items and more extensive mathematics performance levels. The PARCC "Partnership Resource Center" is available. This is an online warehouse of all the tools PARCC is developing, including the Model Content Frameworks, sample tasks and assessment items, and the model instructional units.
Winter - Spring 2014	PARCC college readiness tools made available for use by teachers, school leaders, and higher education.
2013-2014	**Full Implementation of 2010 Mathematics and English Language Arts Standards is required at all grade levels.** Second year of Field Testing for PARCC Consortium continues.
Spring 2014	Field testing of PARCC and embedded items on AIMS. PARCC diagnostic assessments will be available as a resource for teachers.
2014-2015	PARCC Summative Assessment begins on the 2010 Arizona Mathematics and English Language Arts Standards

Annual Report of

The Data Governance Commission

December 1, 2011

Submitted to the Governor, President of the Senate, and Speaker of the House of Representatives

John Huppenthal,
Superintendent of Public Instruction

J. Elliott Hibbs,
Chairman

2011 Annual Report

The Data Governance Commission

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J. Elliott Hibbs
Deputy Superintendent
Arizona Department of Education

Vice-Chairman
Michele Norin
Chief Information Officer
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Maricopa Community Colleges

Rick Krug
Founder
Team Dream World

Aaron Hale
Co-Founder
Legacy Traditional Academy

Vacant

The Data Governance Commission (DGC) is a statutorily created commission established to: identify, examine and evaluate the needs of public educational institutions, provide recommendations on proposals for technology spending in the education arena; analyze and recommend policies for various aspects of data management; and, establish guidelines for future technology implementation. In accordance with statutory guidelines, the Commission is a 13 member body who represent various aspects of expertise in the areas of administration, information technology and business. Initially appointed members serve by lot two, three or four years; subsequent appointees serve terms of four years.

The DGC was created by Laws 2010, Ch. 334, § 1 to act as a guide in approving technology spending and to act as a resource on a number of other issues ranging from privacy and security to resolution of data conflicts. The DGC is established within the Arizona Department of Education (ADE) which works on behalf of the DGC to support its statutory mandate and to further its goal of responsible technological innovation in the educational community.

John Huppenthal
Superintendent of Public Instruction

Chris Kotterman
Deputy Director

Aiden Fleming
Legislative Liaison

Pamela Smith
Program Director

Lisa Blyler
Business Liaison

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Introduction

In 1999 former State Superintendent, Lisa Graham Keegan established the Student Accountability Information System (SAIS) which was created to fundamentally advance the school finance system and create a student database to improve required state and federal reporting and accountability. Since SAIS's development 12 years ago, the need for improved and updated technology has become more apparent. According to Mark Masterson, ADE Chief Information Officer, the SAIS system was down for repairs 26 weeks in 2010, costing the department and Arizona schools substantial losses in time and money.

Pursuant to A.R.S. § 15-249, ADE, in cooperation with the DGC, is required to develop the Arizona Education Learning and Accountability System (AELAS) to compile, collect and maintain data for students attending Arizona public schools and public postsecondary institutions.

To support ADE's efforts, The Educational Learning and Accountability Fund was established to provide funding for a statewide educational technology system. The Arizona State Legislature supported the fund with $5.0M from basic state aid and imposed a $6 fee for full-time students attending public post-secondary institutions in Arizona (bringing total funds to $6.2M).

The DGC held its first meeting on August 19, 2011, to provide recommendations and guidance on new state and federal data system requirements to the ADE. In developing the DGC's annual report, special consideration has been given to current data fixes underway, longitudinal goals and future challenges. The following is a summation of findings, recommendations, approvals and actions taken by the Commission through November, 2011.

Membership, Authority & Charges

The Data Governance Commission was created by Laws 2010, Ch. 334, § 1, which added Arizona Revised Statutes §15-249.01, establishing the Commission, outlining its membership and charging it with certain responsibilities. According to statute, the commission consists of 13 members. Of the members, seven are appointed by virtue of the position that they hold within Arizona's educational institutions, and the remainder are appointed by the Governor, President of the Senate, and Speaker of the House of Representatives. The membership is as follows:

- The chief technology managers, or the managers' designees, of each of the universities under the jurisdiction of the Arizona Board of Regents.
- The chief technology manager, or the manager's designee, of a community college district located in a county with a population of 800,000 persons or more who has expertise in technology and who is appointed by the Governor.

- The chief technology manager, or the manager's designee, of a community college district located in a county with a population of less than 800,000 persons who has expertise in technology and who is appointed by the governor.
- The chief executive officer of the Arizona Early Childhood Development and Health Board or the chief executive officer's designee.
- An officer or employee of a school district located in a county with a population of 800,000 persons or more who has expertise in technology and who is appointed by the Governor.
- An officer or employee of a school district located in a county with a population of less than 800,000 persons who has expertise in technology and who is appointed by the governor.
- An officer or employee of a charter school located in a county with a population of 800,000 persons or more who has expertise in technology and who is appointed by the President of the Senate.
- An officer or employee of a charter school located in a county with a population of less than 800,000 persons who has expertise in technology and who is appointed by the Speaker of the House of Representatives.
- Two representatives of the business community, one of whom is appointed by the President of the Senate and one of whom is appointed by the speaker of the House of Representatives.
- The Superintendent of Public Instruction or the Superintendent's designee.

Statute charges the commission to "identify, examine and evaluate the needs of public institutions who provide instruction to pupils in preschool, kindergarten, grades one through twelve and postsecondary programs in Arizona," and directs it to:

1. Establish guidelines related to the following:
    (a) Managed data access
    (b) Technology
    (c) Privacy and security
    (d) Adequacy of training
    (e) Adequacy of data model implementation
    (f) Prioritization of funding opportunities
    (g) Resolution of data conflicts
2. Provide recommendations on technology spending.
3. Provide analyses and recommendations of the following:
    (a) The control of data confidentiality and data security for stored data and data in transmission
    (b) Access privileges and access management
    (c) Data audit management, including data quality metrics, sanctions and incentives for data quality improvement
    (d) Data standards for stored data and data in transmission, including rules for definition, format, source, provenance, element level and contextual integrity
    (e) Documentation standards for data elements and systems components
    (f) Data archival and retrieval management systems, including change control and change tracking
    (g) Publication of standard and ad hoc reports for state and local level use on student achievement

(h) Publication of implementation timelines and progress

4. Submit an annual report on or before December 1 regarding the Commission's activities to the Governor, the Speaker of the House of Representatives and the President of the Senate. The Data Governance Commission shall provide copies of this report to the Secretary of State.

Situational Analysis

The issues that Arizona faces with capturing and maintaining accurate student data are numerous and well-documented, both in various state reports and the media. In creating the Data Governance Commission, along with its appropriation to ADE to begin work on updating the state's educational data system, the Legislature demonstrated an intent that Arizona's various educational institutions collaborate in order to produce a product that will serve the public at all levels of the state's educational system. This is a monumental task which is still in its very early stages. The first task of the Commission is to wrap its arms around the scope of the issues at hand.

When Superintendent John Huppenthal took office in January 2011, he placed a renewed emphasis on customer service. A large part of ADE's services to school districts and charter schools lies in school finance and data processing, currently the Student Accountability Information System (SAIS). In prior years, SAIS had become more of a burden to both the department and its educational partners than a service. Therefore, ADE set out on a two-pronged strategy. First, it would stabilize SAIS so that it became a useable tool for school districts, and second, it would simultaneously build the Arizona Education Learning Accountability System (AELAS), the larger data system envisioned by the Legislature.

The Data Governance Commission is tasked with overseeing the development of AELAS, ensuring that it will meet the needs of Arizona's educational stakeholders and provide a stable, useful, and reliable platform to improve Arizona's education system from preschool through college.

SWOT ANALYSIS **on delivering a successful State-Wide integrated total student management tool. Giving Teachers, Parents, Districts a complete 360 view of a student**

S — Strengths

- Executive leadership (Governor, Legislative) supports the effort to replace SAIS
- Executive IT leadership has experience in delivering multi-phased multi-million dollar projects
- Aligns with Superintendent's view on how education should be transformed
- Alliances with MCESA , NAU, and ASU
- Current Data System (SAIS) is being stabilized to bridge the gap for a short-term (3 years)
- Current SLDS provides 50 measures and thousands of demensions….The front-end will be modernized to ensure ease of use

W — Weaknesses

- Stakeholders/consituents alliances/partnerships due to poor past performance is a potential hurdle to get needed support/trust/cooperation
- Available grant /budget dollars undefined and not yet approved.
- Lack of standard Data Governance - difficult to transform disparate data sets (Data Gov. Commission to address)
- Data collections requirements/definitions are dynamic
- Necessary resources to deliver effort will be sourced from vendors/resource to create infrastructure /platform design required to support future data system

O — Opportunities

- Will help state, districts, schools, teachers make data-driven decisions to improve student learning/facilitate achievement/close achievement gaps to better prepare for competitive global marketplace
- Rebuild, strengthen education community and all stakeholder relationships (Business, Higher Ed)
- Successful implementation can translate into strategic public relations event
- Innovation/technology development will make ADE/State of Arizona leader in educational tech community-at-large
- Reduce overall IT spending in the future through consolidation efforts

T — Threats

- Multiple project approval stages thus causing potential bottlenecks or roadblocks
- Cost of system more than currently allocated/budgeted
- Loss of alliances and partners if project not delivered in 3 years.
- Certain stakeholder groups may become hostile: District/School IT staff and/or SMS/SIS vendors
- Competitors' new products and innovation
- Loss of future funding / grants if system not updated

Current Efforts

The Data Governance Commission and the Department of Education have undertaken several efforts to immediately address critical weaknesses in the current data system as well as lay the foundation for future success. Following is a brief summary of each.

Statutory Requirement Mapping

In conjunction with the SAIS stabilization and school finance projects, ADE's Information Technology division is also deconstructing and documenting SAIS. This project endeavors to map each of SAIS' business rules ultimately to a specific state or federal requirement in cooperation with the department's government relations division. This will help the department to estimate the cost of making legislatively-mandated changes in the future and also to identify duplicative or outdated processes. To date, ADE has identified nearly 300 rules that apply to determining Average Daily Membership alone.

SAIS Stabilization

The SAIS stabilization effort involves configuring the current SAIS system so that it is available for districts to use. Since January, the department has reversed the time that SAIS is up versus the time that it is down. For the first time in nearly a decade, the SAIS system is available more than it is unavailable, and it can run student integrity in a reasonable amount of time (reduced from weeks to hours). The department has kept the Commission apprised of this effort as it moves forward. Currently, SAIS is being upgraded to modern software that is supported by the marketplace. **Total Authorization: $997,726**

Application Life Cycle Management (ALM) Phase I Analysis

As part of the education data systems modernization, ADE's Information Technology division will develop the set of processes that will be used in the delivery of the new IT services. An initial analysis of the environment has been completed, and the ADE SAIS Integration Team is going through pilot test phase of new process to formalize build and deployment of development projects as well as source management. **Total Authorization: $109,725**

Great Plains (Enterprise Resource Planning Module)

One of the primary functions of ADE's data system is to provide information to the department's school finance division, which calculates and distributes funding for schools. However, many current processes are not automated, prone to error and are not as transparent as they need to be. Replacing ADE's finance system with a centralized, more automated product will help to improve efficiency, increase reliability and make the school finance system more transparent. This module, Microsoft Great Plains, will also make it easier for the department to adapt to changing statutory requirements. **Total Authorization: $745,020**

Identity Management

The Arizona Office the Auditor General (OAG) has previously identified some significant faults with information security at the Department of Education. The current administration takes this very seriously, and has asked for approval from the Data Governance Commission to begin implementation of an identity management solution. This solution, Microsoft Forefront Identity Management (FIM),

once implemented, will create greater security for student-level information and provide the opportunity in the future to provide access to specific data for many stakeholders, such as teachers, parents, and perhaps even students themselves. **Total Authorization: $800,000**

AELAS Business Case

Prior to embarking on a massive project at great taxpayer expense, ADE IT proposed that it construct a business case to prove the AELAS concept. The business case will examine the proposed system architecture, and analyze whether or not the AELAS model that is being proposed will ultimately save schools, the department, the state, and taxpayers time and money. A third-party vendor will be contracted to build the business case. **Total Authorization: $826,720**

Arizona Statewide Longitudinal Data System (AZ-SLDS)

In addition to ongoing state and federal requirements, Arizona also made several assurances to the federal government in exchange for accepting federal State Fiscal Stabilization Fund (SFSF) monies, also known as "stimulus" dollars. One of these assurances was that the state would pursue the development of a longitudinal data system that could track student and teacher performance over time. In order to accomplish this, the state must have the ability to "map" which students are in which courses, and what teacher is teaching them. The state used federal monies to establish a successful pilot program in the Osborn School District; however, rolling out such a system more broadly requires additional dollars. As AELAS is intended to be a system that is all inclusive including SLD services, the Data Governance Commission was asked to lend support to this project, though not to fund the full rollout of the student/course/teacher connection to each school across the state. **Total Authorization: $199,500**

Per the Governor's Office request, interim statistic data reports were created and posted onto ADE website (October 22, 2011) while a new dashboard to visualize five specific use cases (user computer screens designed to access aggregate district/school reporting) is developed and implemented by January 2012. These dashboards will visualize specific data currently in the data warehouse in a user-friendly format. **Total Authorization: $72,600**

Help Desk Ticketing System

As part of laying the foundation for a next-generation IT system, ADE IT needs to upgrade its incident management software package. The preferred product, Sunview Software ChangeGear, will allow ADE to support the current system, as well as future additions made to bring AELAS fully online. **Total Authorization: $98,830**

Summary of 2011DGC Budget Recommendations

Item	Amount
SAIS Stabilization	$997,726
ALM Phase I	$109,725
ADE School Finance Module	$472,920
Identity Management	$800,000
AELAS Business Case	$826,720
AZ-SLDS (Course Mapping)	$199,500
AZ-SLDS (Dashboards & Use Cases)	$72,600
Help Desk Ticketing System	$98,830
Total Recommendations	**$3,578,021**
Total Spend to date	

*Note, funding recommended is provided via the education learning and accountability fund. The total amount in the fund is subject to Legislative appropriation.

Future Efforts

In 2012 the Commission, along with the Department of Education, plans to move into the technical work of outlining the scope of Arizona's future education system (AELAS). The Commission recognizes that coordination among the various stakeholders is a challenge that faces all would-be builders of comprehensive systems. The Commission's goal will be to bridge the gaps between the various constituencies to bring Arizona a data system that will ably serve it current and future needs.

In January 2012, the Data Governance Commission will be provided recommended guidelines to be established for further evaluation of potential solutions, as required by the enabling legislation. The areas that will be covered are:

(a) Managed data access
(b) Technology
(c) Privacy and security
(d) Adequacy of training
(e) Adequacy of data model implementation
(f) Prioritization of funding opportunities
(g) Resolution of data conflicts

Within the next several months, the Commission plans to take up the issue of AELAS system architecture in order to adopt a broad plan for what AELAS will look like when completed. Further, the Commission will examine the issue of common education data standards, or CEDS, to determine whether that is an appropriate standard for Arizona to adopt for its education data.

As SAIS deconstruction and rule extraction continues to other areas, the department will convene a business rule validation working group, which will examine the documented rules and make

recommendations on whether or not they are necessary, proper, etc. and will eventually begin developing new rules. These recommendations will be brought before the Commission for discussion and adoption.

The members of the Data Governance Commission are committed to providing expert guidance to the Department of Education, Board of Regents, Community Colleges, First Things First and other entities dealing with education data in order to establish Arizona as a model for data governance.

Conclusion

In the four short months since the Commission's enabling legislation took effect, the Data Governance Commission has covered a large amount of ground. It is commonly stated that the future of education is in technology. This can mean many things to many people, but the goal of the Commission is to provide quality, professional oversight and advice to the keeper's of Arizona's education data. The Commission will also encourage cross-institutional collaboration in order to achieve the goal of delivering a system that is high-performing and nimble enough to fulfill Arizona's education policy goals both today and in the future.

ADE IT Modernization Effort

AELAS – Education MIS Roadmap

Arizona Department of Education

Year 1 | Year 2 | Year 3 | AELAS 2014

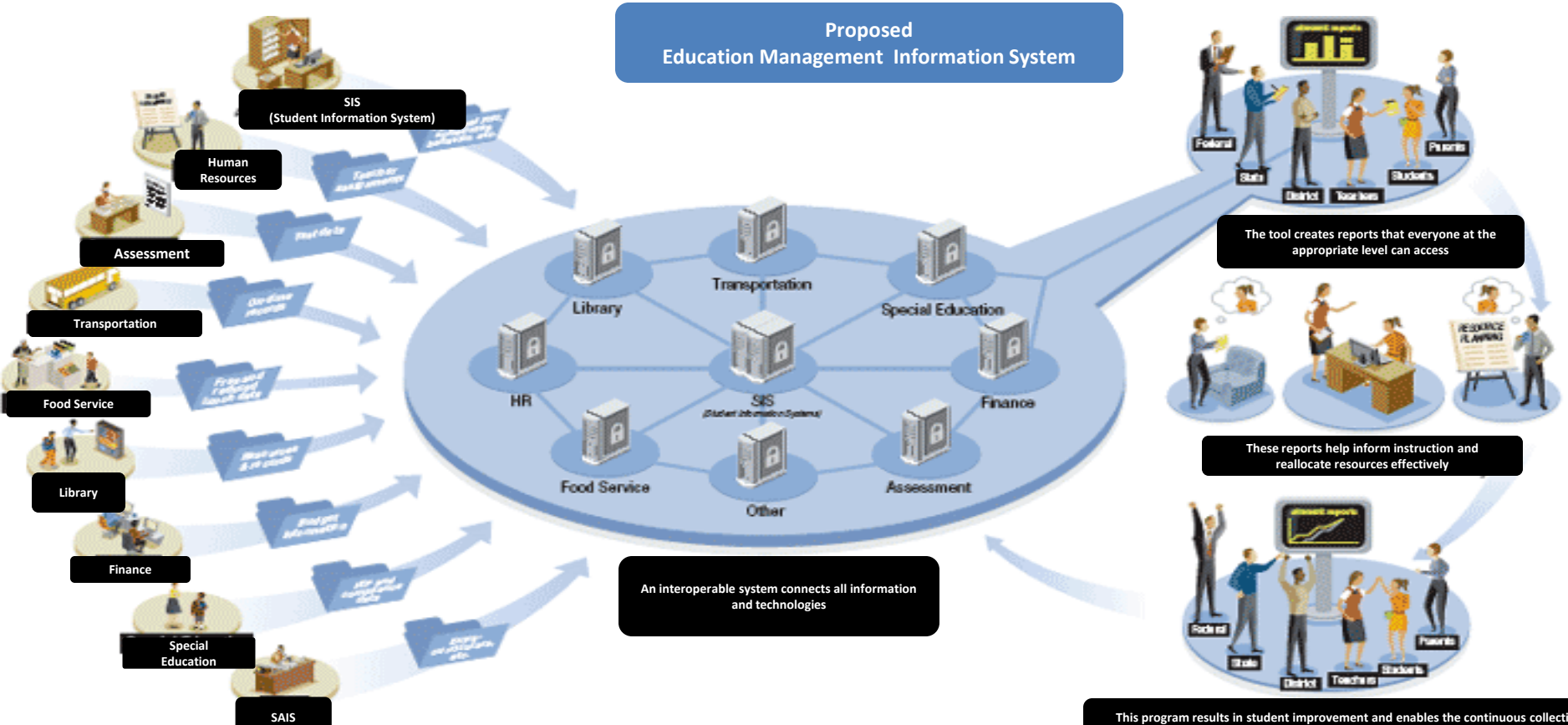
Year 1
- "Map the Mess"
- Define Services
- Develop Requirements
- Business Case
- Prepare RFP
- Statewide Student/Teacher Identifier recommendation
- Establish Data Governance Commission

Year 2
- Prepare Service RFP
- Select Vendors to Build Platform
- Support Services
- Pilot Test District Selected

Year 3
- Design
- Implementation
- Begin State Implementation
- Training Centers

Year 4
- Continue Rollout

Proposed Education Management Information System



ADE IT Modernization Effort

SAIS Roadmap - Updates

Nov 2011

Upgrade servers OS and optimize database platform to a single supported platform

Provides vendor support for State critical service

Nov 2011

Complete Integrity POC for New Architecture

Seek Approval to Build Module

Nov/Dec 2011

Provide SOA Framework to port ADE 100+ Legacy Applications

Nov 2011 – Aug 2012

Build Bus Case for AELAS
- *SIS
- *Assessment
- *Back Office
- *Other "TBD"

Dec 2011

Automate Integrity to Run 2 Times per Week to Improve Customer Service

Jan 2012

Deploy User Portal for 5 Use Cases for SLDS

(Expose AZ Data Mart)

Mar - Apr 2012

Real-Time Integrity Capability (Dependent on Legislature Review of Rules)

ADE Modernization Effort

AELAS: SAIS Stabilization Estimated Costs

SAIS Project Phases	SAIS Project Estimated Costs
SAIS Phase 0 – Assessment	$ 49,500.00
SAIS Phase 1 – Integrity	$ 237,000.00
SAIS Phase 2 – School Finance	$ 154,117.00
SAIS Phase 3 – Transaction	$ 79,703.00
SAIS Phase 4 – Aggregation	$ 79,703.00
SAIS Phase 5 – Data Push	$ 142,800.00
SAIS Phase 6 – High Priority Assessment (10 Systems)	$ 129,000.00
SAIS Assessment Completed and Report	$ 45,600.00
TOTAL	**$ 997,726.00**

ADE Modernization Effort

AELAS: SAIS Stabilization Detail

SAIS Phase	Estimated Costs	Status
SAIS Phase 0 – "Assessment" •Define Scope Phases 1 through 5	$ 49,500.00	Approved by Arizona State Board of Education Completed
SAIS Phase 1 – "Integrity" •Decompose all business rules and map all to state laws – 267 rules to date identified •Document process and business rules •Determine if business rules versus legislation properly interpreted •Build Proof of Concept (POC) for new integrity process	$ 237,000.00	Approved by Arizona State Board of Education In Process
SAIS Phase 2 – "School Finance" •Decompose ADE School Finance system •Document business rules •Perform Six Sigma •Engineer business process •Determine road map for Great Plains interface	$ 154,117.00	Approved by Arizona State Board of Education Launch Pending Recommendation by Data Governance Commission
SAIS Phase 3 –"Transaction" •Decomposed transaction processing •Document business rules •Define interface between ADE Charter Districts •Define "As Is"	$ 79,703.00	Approved by Arizona State Board of Education Launch Pending Recommendation by Data Governance Commission
SAIS Phase 4 – Aggregation •Decompose all business rules and map all to state laws •Build Proof of Concept (POC) for future aggregation process	$ 79,703.00	Approved by Arizona State Board of Education Launch Pending Recommendation by Data Governance Commission

ADE Modernization Effort

AELAS: Great Plains Estimated Costs

Great Plains Project Phases	Project Estimated Costs
Great Plains Phase 0 – "Assessment"	$ TBD (Will populate 9/29/11)
Great Plains Phase 1 - "Analysis"	$ TBD
Great Plains Phase 2 - "Design"	$ TBD
Great Plains Phase 3 - "Development"	$ TBD
Great Plains Phase 4 - "Deployment"	$ TBD
Great Plains Phase 5 – "Operations"	$ TBD
TOTAL	**TBD (Will populate 9/29/11)**

ADE Modernization Effort

AELAS: Great Plains Detail

Great Plains Phase	Estimated Costs	Status
Great Plains Phase 0 – "Assessment" •Define Scope Phases 1 through 5	**TBD**	25% Project Approved by Arizona State Board of Education Completed
Great Plains Phase 1 – "Analysis" •Project Charter •Project Plan •Functional Requirements Document (FRD) •Fit Gap Analysis Spreadsheet •Business Process Maps/Workflows •Data Migration Requirements •Infrastructure Design Document •Integration and Interface Requirements	**TBD**	No Status
Great Plains Phase 2 – "Design" •Functional Design Document (FDD) for: •Fits (Configurations) •Gaps (Customizations) •Integration and Interface Requirements •Data Migration Requirements •Technical Design Document (TDD) •Solution Design Document (SDD)	**TBD**	No Status
Great Plains Phase 3 – "Development" •Functional Design Document (FDD) for: •Fits (Configurations) •Gaps (Customizations) •Integration and Interface Requirements •Data Migration Requirements •Technical Design Document (TDD) •Solution Design Document (SDD)	**TBD**	No Status

ADE Modernization Effort

AELAS: Great Plains Detail (continued)

Great Plains Phase	Estimated Costs	Status
Great Plains Phase 4 – "Deployment" •End User Training •User Acceptance Test Results •Final Data Migration •Final System Readiness & Go-Live Checklist •Production Environment •Cutover to Production •Deployment Plan •Train-the-Trainer (TTT) Training •Production Operations Guide	**TBD**	No Status
Great Plains Phase 5 – "Operations" •Project Closure Report •Final Delivery of all Project Deliverables to the customer •Documented Lessons Learned	**TBD**	No Status

ADE IT Modernization Effort

AELAS: Identity Management System (IMS)

Arizona Department of Education

Estimated Costs (Review): Microsoft FIM

IMS Project Phases	Project Estimated Costs
IMS Phase 0 - "Analysis"	$50,000
IMS Phase 1- "Design"	$500,000
IMS Phase 2 - "Development"	$200,000
IMS Phase 3 - "Deployment"	$50,000
TOTAL	$800,000

ADE IT Modernization Effort

AELAS: Identity Management System (IMS)
Estimated Costs: Microsoft FIM

IMS Phase	Estimated Costs	Status
IMS Phase 0 – "Assessment" •Define full project scope and phases •Define high-level tasks, WBS, and project plan •Conduct project kick-off meeting & assign Work Groups •Identify ALL applications within ADE enterprise, Active, Inactive, and currently in development •Obtain PIJ approval	**$50,000**	Approved by Arizona State Board of Education Completed
IMS Phase 1 – "Pilot to Replace Common Logon" •Purchase hardware and software •Identify Pilot systems and users •Identity and implement FIM minimum set features & capabilities •Implement basic self servicing portal •Migrate internal common logon users to Active Directory •Re-purpose EduAccess users to FIM	**$500,000**	Approved by Arizona State Board of Education In Process
IMS Phase 2 – "Expanded Systems" •Expand self servicing •Expand user roles •SAML, Claims based authorization, and Federated trust •COTS, Home Grown, and other applications implementation to FIM	**$200,000**	Approved by Arizona State Board of Education Phase Pending Recommendation by Data Governance Commission
IMS Phase 3 – "Self Sustainability and Ongoing Support"	**$50,000**	Approved by Arizona State Board of Education Phase Pending Recommendation by Data Governance Commission

ADE IT Modernization Effort
AELAS Business Case

- Launch of Business Case (LearningMate)
  - Reduce the total cost of ownership for various education technology product
  - Provide the flexibility to school districts
  - Plug-and-play various education technology systems/products
  - Reduce dependency on single vendor and wants to increase the ownership of data for districts and DOE
  - Improve the quality of data and develop standardization
  - To reduce the infrastructure cost
  - Provide software as a service and Infrastructure as a service

ADE IT Modernization Effort

AZ-SLDS

- State Dashboard and 5 Use Cases (Capstone BI)
- Course Mapping: “Course Walk” (ESP)

ADE IT Modernization Effort

Summary Budget Approval Recommendations

Business Case: LearningMate	Develop comprehensive business case for middle tier projects.	**$ 826,720**
IMS: Microsoft FIM (Forefront Identity Management) Phase III & Phase IV	Provide a single sign on as well as increased system security, and greater compliance with FERPA	**$ 250,000**
ITIL Tool: ChangeGear	Help Desk Ticketing Tool	**$ 98,830**
AZ-SLDS : 5 Use Cases & Dashboards:Capstone BI	Federal / State Mandates	**$ 72,600**
AZ-SLDS :Course Mapping: ESP	Federal / State Mandates	**$ 199,500**

ADE IT Modernization Effort

Executive Budget Summary

Budget Approvals:	**$2,020,646.00**
Additional Budget Authority Asking:	**$1,719,750.00**
Total Proposed Budget Approval	**$3,740,396.00**
Spend to Date:	**$ 703,321.78**

Overarching Goal

COLLEGE & CAREER READY STUDENTS

Areas of Emphasis

STEM Education ● Rural Outreach ● Native American Needs

Standards and Assessments Section B	Data Systems Section C	Great Teachers & Leaders Section D	Low Achieving Schools Section E
B1 CSSS	**C1** SLDS	**D1** High-quality pathways	**E1 Intervention**
B2 High-quality assessments	**C2 Access and use state data**	**D2** Improve effectiveness	**E2** Turnaround
B3 Supporting the transition	**C3** Improve Instruction	**D3** Equitable distribution	
		D4 Preparation programs	
		D5 Effective support	

Implementation Mechanisms
Section A

Arizona's eLearning Platform IDEAL ● Arizona's LEA Tracker

Five Regional Education Centers ● State of Arizona Counties Communications Network

INTERAGENCY SERVICES AGREEMENT
BETWEEN
THE GOVERNOR'S OFFICE OF EDUCATION INNOVATION
AND
ARIZONA DEPARTMENT OF EDUCATION
AGREEMENT # II-ISA-12-2366-01

This INTERAGENCY SERVICES AGREEMENT (the "AGREEMENT") is entered into by and between the Governor's Office of Education Innovation ("GOEI"), located at 1700 West Washington, Suite 300, Phoenix, Arizona 85007, and the Arizona Department of Education ("ADE"), located at 1535 West Jefferson, Phoenix, Arizona 85007 pursuant to Arizona Revised Statutes § 35-148. The Catalog of Federal Domestic Assistance (CFDA) Number is **84.395A**, Race to the Top Round III, administered by the U.S. Department of Education.

I. PURPOSE OF THE AGREEMENT

ADE is tasked with the oversight and distribution of Race to the Top Round III funds made available from Public Law 112-10 (the Department of Defense and Full-Year Continuing Appropriations Act, 2011 (Fiscal Year (FY) 2011 Appropriations Act)).

ADE agrees to provide funding to GOEI in exchange for GOEI providing project performance management responsibilities, as stated herein, to support the Race to the Top Phase 3. In this capacity, ADE agrees to provide up to $1,500,000 to GOEI.

II. GENERAL PROVISIONS

The parties mutually agree as follows:

A. Scope of Work

I. Services to be provided by GOEI:

1- Coordinate performance management and performance metrics.
2- Align Arizona Ready Education Council Report Card to Race to the Top.
3- Work with ADE to develop and deploy statewide communication related to goals and strategies for Race to the Top Phase 3.
4- Work with ADE to ensure vertical and horizontal alignment for Regional Centers, new standards, and STEM initiatives.
5- Work with ADE on Regional Center coordination and development.
6- GOEI shall provide ADE the following information for ADE's approval within five business days of ADE's request:
    a. All information, data and supporting documentation requested by ADE or, if not requested by ADE, determined relevant by GOEI to assist ADE in reconciling award amounts and dollars requested by GOEI for this project. GOEI shall provide the requested information, data and supporting documentation in the manner requested by ADE or ADE may withhold payments to GOEI.
7- GOEI shall provide ADE quarterly programmatic and financial reports in the form provided by ADE no later than the 6th day after the end of the quarter, or as requested by ADE.
8- GOEI shall comply with all applicable requirements, including but not limited to:

a. Maintaining accounting of monies separately;
b. Providing contact information updates to ADE;
c. Single Audit;
d. Procurement;
e. 1512, FFATA, or other Reporting – jobs calculations, information/data is due to ADE by the 6th day of the month after the end of the quarter or as requested by ADE, and any other related information requested by ADE;
f. Fraud, waste and abuse prevention programs.

9- GOEI shall make relevant GOEI personnel, including staff assigned, hired and/or contracted for this project, available to ADE for contact and meetings with Federal or State oversight agencies, when requested by ADE. Additionally, GOEI shall make relevant GOEI personnel available to contact and meet with ADE when requested by ADE. GOEI shall provide to ADE contact names, addresses, telephone numbers, e-mail addresses, and any other relevant contact information available to GOEI regarding GOEI personnel considered by GOEI relevant to the activities described in this agreement.

10- GOEI shall inform ADE when GOEI is contacted by any Federal or State oversight agency regarding SFSF dollars within five business days of contact.

11- GOEI shall provide ADE, within five business days, copies of single audit or other grant monitoring reports received by GOEI or issued by GOEI regarding SFSF funds.

12- GOEI shall allow ADE to review GOEI's fraud, waste and abuse prevention programs and SFSF transactions, as requested by ADE.

13- GOEI shall provide information, data and supporting documentation regarding other grants or information which may impact the project's outcomes to ADE.

14- GOEI shall comply with the Arizona State Procurement Code which is incorporated as part of this agreement by reference herein.

II. Services to be provided by ADE:

1- Act as Fiscal Agent of Race to the Top Phase 3 Funds, if awarded.
2- Develop a Race to the Top Phase 3 governance structure that includes the State Board of Education, GOEI and ADE in performance management of the project.
3- Provide curricular tools for Arizona LEA's to implement new state standards that include STEM integration.
4- Provide "train the trainer" services to County Superintendents as Regional Support Centers.
5- Expand Arizona's education data capacity.
6- Stabilize web-based delivery of content.
7- In a partnership with the County Superintendents, ADE will provide seed funding for County Superintendent alliances into five Regional Centers.

B. <u>Method and Terms of Reimbursement</u>

Funds will be transferred to GOEI in accordance with approved disbursement schedules provided to ADE by GOEI. GOEI will be responsible for paying sub-recipients and vendors covered by this agreement, if applicable. ADE will provide to GOEI a master template for the Reimbursement Request Form (RFR). ADE will forward funds to GOEI using a Companion Transaction Transfer (Form GAO-614), prior to the disbursements, allowing appropriate lead time for the disbursements (two to three days). Since GOEI may incur expenses through the date when this AGREEMENT ends, GOEI shall request reimbursement for those expenses by the sixth day after the AGREEMENT ends. Any unspent funds associated with this agreement will be refunded to ADE at the completion of stated

contract term. Final payment for this agreement will be released upon receipt of any final reporting requirements which are yet to be determined.

C. Reporting and Compliance Requirements

Payments by ADE to GOEI shall be in strict compliance with: OMB Circular A-87, Cost Principles for State, Local and Indian Tribal Governments (2 CFR 225 A-87); shall adhere to the Federal Cash Management Improvement Act (CMIA) and comply with guidelines of the SFSF and those established under the Recovery Act through Public Law 111-5 (H.R.1) and amended by Public Law 111-8 (H.R. 1105).

In addition, the Recovery Act specifically provides that funds may not be used by any state or local government, or any private entity, for any casino or other gambling establishment, aquarium, zoo, golf course, or swimming pool. The Recovery Act funds may be used in conjunction with other funding as necessary to complete projects, but tracking and reporting of Recovery Act funds must be separate, to meet the reporting and other requirements of the Recovery Act and other applicable law.

The accounting systems of all recipients and sub-recipients must ensure that funds from any award under this Recovery Act solicitation are not commingled with funds from any other source. Misuse of grant funds may result in a range of penalties, including suspension of current and future funds, suspension or debarment from federal grants, recoupment of monies provided under a grant, and civil and/or criminal penalties.

Consistent with the special purposes and goals of the Recovery Act, and its strong emphasis on accountability and transparency, it is essential that all funds from a Recovery Act grant be tracked, accounted for, and reported on separately from all other funds. Recipients must also be prepared to track and report on the specific outcomes and benefits attributable to use of Recovery Act funds.

Funds associated with this AGREEMENT shall only be used by GOEI for the purposes set forth on Section I of this AGREEMENT. GOEI must comply with all applicable Federal and State policies, procedures, and requirements related to Recovery Act monies including, but not limited to, the following:

1) **"Buy American Act" Est. 1933**
The recipient understands that this award is subject to the provisions of section 1605 of the Recovery Act ("Buy American Act"). No award funds may be used for non-American sources of iron, steel, or manufactured goods for a project for the construction, alteration, maintenance, or repair of a public building or public work, unless the recipient provides advance written notification and upon approval of the federal grant agency, a waiver is issued allowing this activity.

2) **Davis-Bacon and Related Acts: Wage Rate Requirements**
All applicants should be aware that the Recovery Act contains a provision on wage rate requirements that concerns projects funded or assisted by Recovery Act funds that employ laborers and mechanics. See section 1606 of the Recovery Act for the full text of this requirement.

3) **ARRA Infrastructure Investment: Preference for Quick-Start Activities**
Pursuant to section 1602 of the Recovery Act, recipient of funds under this solicitation for infrastructure investment are to give preference to activities that can be started and completed expeditiously, and also are expected to use grant funds in a manner that maximizes job creation and economic benefit. For the details of this requirement, please see section 1602 of the Recovery Act.

4) **Recovery Act: Contracts**
Generally speaking, the Recovery Act places special emphasis on the use of fixed-price contracts awarded through competitive procedures.

5) **National Environmental Policy Act Requirements**
Under section 1609 of the American Recovery and Reinvestments Act of 2009 all recipients must comply with any applicable environmental impact requirements of the National Environmental Policy Act of 1970 (NEPA), as amended, (42 U.S.C. 4371 et seq.), 40 CFR parts 1500 through 1508 and any State government requirements that implement NEPA.

III. EFFECTIVE DATE, TERM, TERMINATION, RENEWAL, AMENDMENT

A. Effective Date
This AGREEMENT shall become immediately effective upon execution of the AGREEMENT by ADE and GOEI.

B. Term, Termination, Renewal

The initial term of this AGREEMENT shall begin on January 1, 2012 and terminate on December 31, 2015, unless terminated as provided herein, or extended. Either party may terminate this AGREEMENT at any time by providing thirty (30) days written notice to the other party. If this AGREEMENT is extended by mutual written consent of the parties, all terms, conditions and provisions of the original AGREEMENT shall remain in full force and effect and apply during any extension period.

C. Amendment

This AGREEMENT may be modified, altered, extended or amended only in writing signed by, or on behalf of, both parties.

IV. NOTICES

Any and all notices, requests or demands given or mGOEI upon the parties hereto, pursuant to or in connection with this AGREEMENT, unless otherwise noted, shall be delivered in person, fax, email, or sent by United States Mail, postage prepaid, to the parties at their respective addresses as set forth immediately below:

ADE	**GOEI**
Ross Begnoche	Rebecca Gau
Deputy Associate Superintendent	Director
Business & Finance	Governor's Office of Education Innovation
Arizona Department of Education	1700 West Washington Street,
1535 West Jefferson	Suite 300
Phoenix, AZ 85007	Phoenix, Arizona
Phone: (602) 364-1967	Phone: (602) 542-3483

V. ARBITRATION

This AGREEMENT is subject to arbitration to the extent required by A.R.S. § 12-1518, and any such proceeding shall be held in Maricopa County, Arizona.

VI. NON-AVAILABILITY OF FUNDS

Every payment obligation of ADE under this AGREEMENT is conditioned upon the availability of funds appropriated or allocated for payment of such obligation. If funds are not allocated and available for the continuance of this AGREEMENT, either party may terminate this AGREEMENT at the end of the period for which funds are available. No liability shall accrue to ADE or the State of Arizona in the event this provision is exercised, and ADE and the State of Arizona shall not be obligated or liable for any future payments or for any damages as a result of termination under this paragraph.

VII. CANCELLATION FOR CONFLICT OF INTEREST

This AGREEMENT is subject to cancellation pursuant to Arizona Revised Statutes § 38-511, the provisions of which are herein incorporated by reference.

VIII. AUDIT OF RECORDS

Pursuant to Arizona Revised Statutes § 41-1351, ADE shall retain all data, books, and other records relating to this AGREEMENT. GOEI is subject to all audit oversight policy and procedure established by ADE.

IX. GOVERNING LAW

This AGREEMENT is made under, and is to be construed in accordance with, the laws of the State of Arizona. In the event of litigation arising under, out of, or relating to, this AGREEMENT, ADE and GOEI hereby stipulate to the exclusive jurisdiction and venue of the Maricopa County Superior Court in Phoenix, Arizona.

X. ENTIRE AGREEMENT

This AGREEMENT contains the entire agreement and understanding of the parties hereto. There are no representations or provisions other than those contained herein, and this AGREEMENT super cedes all prior agreements between the parties, whether written or oral, pertaining to the same subject matter of this AGREEMENT.

XI. INVALIDITY OF PART OF THIS AGREEMENT

The parties agree that should any part of this AGREEMENT be held to be invalid or void, the remainder of the AGREEMENT shall remain in full force and effect and shall be binding upon the parties.

XII. COUNTERPARTS

This AGREEMENT may be executed in any number of duplicate originals, photocopies or facsimiles, all of which (once each party has executed at least one such duplicate original, photocopy, or facsimile) will constitute one and the same document.

XIII. INTERPRETATION

This AGREEMENT is not to be construed or interpreted for or against either of the parties on the grounds of sole or primary authorship or draftsmanship.

XIV. PARAGRAPH HEADINGS

The paragraph headings in this AGREEMENT are for convenience of reference only and do not define, limit, enlarge, or otherwise affect the scope, construction, or interpretation of this AGREEMENT or any of its provisions.

XXXXXXXXXXXXXXXXXX

THIS SECTION INTENTIONALLY LEFT BLANK

XXXXXXXXXXXXXXXXXXXX

XV. IN WITNESS WHEREOF, the parties agree to execute this AGREEMENT.

Governor's Office of Education Innovation
1700 W. Washington, Suite 300
Phoenix, Arizona 85007

Rebecca Gau
Director
Governor's Office of Education Innovation

Arizona Department of Education
1535 West Jefferson
Phoenix, Arizona 85007

Russ Begnoche
Deputy Associate Superintendent
Arizona Department of Education

Travis Price, C.P.A.
Compliance, Finance and Procurment Manager
Office of the Governor

GOEI SOW Budget for ISA with comments(2).xlsx

GOEI SOW

State Name					
Project Name:	Reg. Ctr. Devel. coordinate/perf mgmt (A)(2) dashboards (B)(3) and (C)(3) vertical and horizontal alignment (Priority 5)				total
	Yr 1	Yr 2	Yr 3	Yr 4	
1. Personnel	$ 120,000.00	$ 120,000.00	$ 130,000.00	$ 127,000.00	$ 497,000.00
2. Fringe Benefits	$ 43,200.00	$ 43,200.00	$ 46,800.00	$ 45,720.00	$ 178,920.00
3. Travel	$ 8,000.00	$ 8,000.00	$ 8,000.00	$ 8,000.00	$ 32,000.00
4. Equip	$ -	$ -	$ -	$ -	$ -
5. Supplies	$ 6,000.00	$ 6,000.00	$ 6,000.00	$ 6,000.00	$ 24,000.00
6. Contractual	$ 131,000.00	$ 141,000.00	$ 141,000.00	$ 127,000.00	$ 540,000.00
7. Training Stipends	$ -	$ -	$ -	$ -	$ -
8. Other	$ 20,000.00	$ 20,000.00	$ 20,000.00	$ 20,000.00	$ 80,000.00
9. Total Direct (Lines 1-8)	$ 328,200.00	$ 338,200.00	$ 351,800.00	$ 333,720.00	$ 1,351,920.00
10. Indirect Costs	$ 35,018.72	$ 35,018.72	$ 37,162.08	$ 36,880.48	$ 144,080.00
11. Funding for Involved LEAs	$ -	$ -	$ -	$ -	$ -
12. Supplemental Funding for Participating LEAs	$ -	$ -	$ -	$ -	$ -
13. Total Costs (lines 9-12)	$ 363,218.72	$ 373,218.72	$ 388,962.08	$ 370,600.48	$ 1,496,000.00