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PROMISING PRACTICES

A State Policymaker's STEM Playbook

JENNIFER ZINTH, EDUCATION COMMISSION OF THE STATES
AND TAMI GOETZ, UTAH STEM ACTION CENTER

Science, technology, engineering and mathematics (STEM) has captured the attention of state policymakers who are concerned about equitable access to high-quality educational experiences and preparing and inspiring students to pursue STEM careers. Yet in many states, STEM policymaking efforts have not achieved their intended return on investment because programs are missing one or more of **three essential elements**:

- **Statewide coordination or consolidation within a single statewide entity.**
- **Adequate, reliable funding from year to year.**
- **Quality assurance or program evaluation.**

This Promising Practices in Education report highlights Utah as a case study for successfully enacting and implementing legislation that assures the presence of all three of the above components. The report also identifies other elements that contributed to the passage and implementation of Utah's efforts.

> In many states, STEM policymaking efforts have not achieved their intended return on investment because programs lack one or more of **3** essential elements **STATEWIDE COORDINATION, ADEQUATE FUNDING** and **EVALUATION.**

> In 2013, Utah passed legislation that **established** the **Utah STEM Action Center**. This legislation, and subsequent implementation processes, **assure** the **presence** of these **three essential elements**.

> Additional components critical to the Utah STEM Action Center's success are **communications**, **marketing** and **positioning**; **partnerships/liaisons**; and **funding**, including the establishment of a public 501(c)(3) in May 2016 - a game-changer for the Center.

Three Essential Elements

Since the early 2000s, when the STEM acronym began to gain currency in education policymaking circles, states have passed hundreds of pieces of STEM-related legislation. While the focus of these policymaking efforts has been diverse – STEM teacher recruitment, preparation and professional development; ensuring access to high-quality standards and curricula that provide real-world applications and hands-on learning experiences; increasing STEM interest and achievement among female and underrepresented minority students, to name just a few – policymakers by and large feel they have not solved the STEM issues in their state.

This is in part because all too often, state STEM policy approaches lack one or more of three essential elements:

- **Coordination**: Statewide coordination or consolidation within a single statewide entity.
- **Resources**: Adequate, reliable funding from year to year.
- **Evaluation**: Quality assurance or evaluation of funded programs.

The Utah Story

Utah has taken policy action to ensure that all three of these elements are reflected in state-level STEM education initiatives. The section that follows identifies critical steps in developing and implementing the Utah STEM Action Center, in large part grouped under these three elements. This report also identifies other key considerations that supported or enhanced Utah's program adoption and implementation efforts.

The Need Is Identified for a STEM Program

Coordination

Talent demand was a key motivator for Utah to look at a K-16, even K to gray, approach to STEM education. This need for talent existed across the state and across industry sectors. To address this demand, the state would need to align education efforts with industry talent needs. Equally motivating was the fact that, while numerous STEM initiatives were being deployed across the state, these were going unnoticed because programs were not leveraging efforts and resources effectively. The state recognized that improved coordination could serve as a solution.

Coordination + Resources

Conversations around talent development with industry representatives ultimately led some state leaders to determine that state-level coordination for a state STEM initiative was needed, along with a substantial leveraging of resources, across K-12, postsecondary and business/industry.

Evaluation

Some STEM programs in Utah had been in place for 10-15 years. While data showed a sustained level of participation, very little available data demonstrated impact. Policymakers questioned whether some of these programs were a good investment.

The Idea Incubates

Coordination

Goetz, in her role as the Governor's State Science Advisor, along with Diana Suddreth, STEM Coordinator for the Utah State Office of Education, brought a small group of individuals together to spend a year exploring best practices in state STEM initiatives. This nucleus included representatives from the Utah State Office of Education, the Utah System of Higher Education, the governor's office, legislators and industry.

Resources

The group realized that the proposed STEM effort justified greater support from industry partners. Legislative funding would be needed to sustain this effort.

Other Key Considerations

Framing the initiative, and finding the right supporter. Lessons learned from successful university-level engineering initiatives pointed to three needs for the burgeoning STEM effort:

- Industry-led.
- Every successful campaign needs a passionate evangelist. This STEM evangelist needs to come from within industry, and needs to know how to navigate the legislative process and garner legislative support. The industry champion must understand, and be motivated by, a need for talent - and understand that a solid STEM education foundation leads to more talent.
- Speak the language of accountability and outcomes.

Industry partners, working through a strong and supportive technology trade organization, the Utah Technology Council, united on a campaign to collaborate with legislators to champion the creation of a state STEM initiative. Industry backing, along with a substantial leveraging of resources across K-12, postsecondary and business/industry, was the tipping point for real action.

Differentiating from existing initiatives. The group saw the need to clearly differentiate the work of the Utah STEM Action Center from that of the Utah State Office of Education. The Utah STEM Action Center would drive research and development (R+D). Conducting intensive third party evaluation of programs and ongoing program oversight and monitoring, including professional development and supplemental education programs, is outside the mission of the state office of education. The Utah STEM Action Center would work in synergy with, but separate from, the state office of education. This is viewed by both parties as a truly equitable partnership.

R&D?

Utah districts were already purchasing supplemental math learning tools. However, districts do not have the time or capacity to research whether the products they are considering will achieve the desired outcomes. As a result, districts may decide to purchase supplemental math products based on cost or other factors beyond the quality of the product or its alignment with the specific challenges within the district.

Enter the Utah STEM Action Center. The Center can test a wide variety of products, targeting a wide variety of students, including English learners who may struggle with reading. Based on this research, the Utah STEM Action Center can provide a menu of options districts can choose from, based on local challenges. For example, a district serving a large immigrant population can choose products tailored to their needs. If a district decides a product is not meeting their needs, they can trade it in to the Utah STEM Action Center for a more suitable product, and not continue to use a product they may have purchased due to limiting factors such as affordability.

Embarking on the Legislative Process

Once a state decides to move forward with the creation and funding of a statewide STEM coordinating entity, policymakers should consider the challenges Utah leaders faced.

Location

Where would the Utah STEM Action Center be housed? The notion of establishing it within a single postsecondary institution was set aside, as the vision of the Utah STEM Action Center as an agnostic agency working with all governmental entities and agencies in the state would be compromised if the Center were perceived as being owned by a single institution.

The same argument was used against locating the Utah STEM Action Center within a single school district. What is more, housing such an entity went beyond the mission of a local education agency.

Further concerns dissuaded decision-makers from placing the initiative within the state office of education. Beyond conducting R+D on existing efforts, the Utah STEM Action Center would serve as an innovative space. According to Clayton Christianson's disruptive innovation model, if the new entity did not focus its efforts on innovation, the innovation component would cease to exist and the entity would be subsumed into the agency within which it was housed. Nevertheless, while not situated in the state office of education, the Utah STEM Action Center and state office of education would work in close partnership in the planning, implementation and evaluation of all K-12 programs.

The final decision was to place the Center in the Governor's Office of Economic Development. This co-location represented a neutral placement that would allow the Center to serve all education partners. The alignment of the Center's education and talent development efforts with economic development was seen as beneficial.

Funding

An endeavor that coordinates various STEM activities including R+D and evaluation activities, among K-12, higher education and workforce/industry, can only fulfill its mission with substantial financial support for grants and staff. Since 2013, the Utah STEM Action Center has received a combination of one-time and on-going funding via three appropriations spanning four fiscal years, totaling $23.5 million in one-time and $23.6 million in ongoing funding. The ongoing funding supports both operational functions ($1.5 million annually, and following the 2016 session, $3 million to support a math program) and programs. The Center received these appropriations from the general fund and not the education fund.

What Is the Utah STEM Action Center?

Statutes pertaining to the Utah STEM Action Center are in the section of Utah Code governing the Governor's Office of Economic Development.

Per U.C.A. § 63N-12-203, the Center is governed by the Utah STEM Action Center Board, which includes various representatives of K-12, higher education, government and business.

Broadly speaking, statute directs the Utah STEM Action Center and its board, under the leadership of a director appointed by the board, to fulfill a variety of functions. Many of the functions of the Utah STEM Action Center, its board and executive director relate to these critical elements of coordination, evaluation and resources.

The section that follows identifies statutory duties and powers assigned to the Utah STEM Action Center board, executive director and the Utah STEM Action Center, as well as other key considerations a state should be mindful of in developing the duties and powers of a similar statewide entity.

Coordination

The Utah STEM Action Center board is directed by statute to:

- Establish a STEM Action Center to:
  - ✓ Coordinate STEM activities among various K-12 and higher education stakeholders at the state and local level.
  - ✓ Align K-12 and higher education STEM activities.
  - ✓ **Create and coordinate best practices among K-12 and higher education.**
- Strategically engage industry and business entities to cooperate with the board to support high-quality professional development and provide other assistance to educators and students.[1]

As funding allows, the Utah STEM Action Center board is additionally directed to:

- Work cooperatively with the state board of education to further STEM education.
- Work cooperatively with stakeholders to support and promote activities that align STEM education and training activities with the employment needs of Utah business and industry.[2]

Evaluation

As funding allows, the director of the Utah STEM Action Center must:

- Ensure that the Utah STEM Action Center acts as a research and development center for STEM education through a request for proposals process described in 63N-12-206.

STEM Action Center Board Members

- Six private sector members who represent business, appointed by the governor.
- The state superintendent of instruction*.
- Member of the state board of education, chosen by the board chair.
- The commissioner of higher education*.
- The executive director of the governor's office of economic development*.
- The executive director of the department of workforce services*.
- The Utah College of Applied Technology commissioner of technical education*.
- One member appointed by the governor.
- One member with a degree in engineering and experience working in a government military installation, appointed by the governor.

*indicates where designee may take the place of an official

- Review and acquire STEM education related materials and products for
  - ✓ High-quality professional development.
  - ✓ Assessment, data collection, analysis and reporting.
  - ✓ Public school instruction.
- Identify at least 10 best practice innovations used in Utah that have resulted in a measurable improvement in STEM student performance or outcomes.
- Identify best practices being used outside Utah and, as appropriate, develop and implement selected practices through a pilot program.
- Identify kindergarten-sixth grade and seventh-12th grade learning tools identified as best practices.
- Collect data on Utah best practices, including from K-12, higher education, the Utah Education and Telehealth Network and other STEM-related entities.
- Keep track of how the best practices data are being used, and how many individuals are using the data, including the demographics of the users, if available.
- Support best methods of high quality K-12 STEM professional development, including methods that reduce cost and increase effectiveness, to help educators learn how to most effectively implement best practice learning tools in the classroom.[3]

Importantly, statute also directs the Utah STEM Action Center director, as funding permits, to work with an independent evaluator to track and compare performance of students participating in a Utah STEM Action Center program to all other similarly situated Utah students in terms of:

- High school graduation rates.
- The number of students taking a remedial math course at a state institution of higher education.
- The number of Utah public high school graduates who begin a postsecondary education program.
- The number of students, compared to all similarly situated students, who are performing at grade level in STEM classes.[4]

The Utah STEM Action Center board is directed by statute to work to meet the following expectations:

- That at least 50 educators are implementing best practice learning tools in classrooms.
- Performance change in student achievement in each classroom participating in a Utah STEM Action Center project.[5] In practice, this has taken the form of assessing student achievement via metrics, where appropriate, specific to each project. For example, with the math tools project, proficiency

gains on end-of-year test scores are analyzed. For the STEM certification program, completion and acquisition of an identified credential is considered as student achievement. For the applied science project, student pre- and post-surveys, and teacher observations are used.

As funding allows, the board must also work cooperatively with the state board of education to ensure best practices are implemented as relates to the STEM education-related instructional technology program described in 63N-12-206 and distribution of STEM education instructional technology to schools as described in 63N-12-207.[6]

Resources

The Utah STEM Action Center board is directed by statute to strategically engage industry and business entities to cooperate with the board in providing private funding and support to the Utah STEM Action Center.[7]

Statute authorizes the board to establish a foundation to assist in:

- The development and implementation of the programs authorized by statute to promote STEM education.
- Implementation of other STEM education objectives described in statute.[8]

As funding allows, the board must also engage private entities to provide financial support or employee time for STEM activities in schools, in addition to what is currently provided by private entities.[9]

Other key considerations

The Utah STEM Action Center is also directed by statute to perform various functions related to engaging students, educators, private sector representatives and others in a number of activities.

Additional Components Critical to the Center's Positive Impact

Goetz of the Utah STEM Action Center identifies these interrelated elements that, while not necessarily established in legislation, have also been critical to the Center's positive impact.

Communications, Marketing and Positioning

Utah STEM Action Center as megaphone and center of convergence

The Utah STEM Action Center functions as a megaphone - a statewide mode of communication for stakeholders and communities to learn about STEM activities in Utah. Inversely, the Utah STEM Action Center is also outward-looking, an entity to which individuals can take a STEM issue or idea, because something will come of it.

In other words, "action" is integral to the Utah STEM Action Center's name. The Center is not just a repository or clearinghouse of information, but active in the sense of communicating STEM events, and connecting individuals with resources.

What is it you do ... do?

Quoting Madeline Kahn's line from the film *Young Frankenstein*, a state developing its own STEM action center needs to determine at the outset what kind of programs it will be operating. STEM action center-supported programs must be impactful; they must make a difference for students, educators, industry and parents. Students learn to do STEM, think with STEM and solve with STEM. Programs ensure that educators have the ability to make STEM come to life in the classroom.

Programs are a part of the function of the center. But is that all? Will it be convening? Facilitating dialogue? Writing and receiving grants? Seeking legislative funding to establish programs that require reporting, monitoring or contracting? How will the targets of its programs be identified? The first few projects of the Utah STEM Action Center came about from a combined interest of legislators and education partners. However, more recent projects are a result of considerable industry input.

The key role of industry, the importance of workforce alignment

It is critical that the Utah STEM Action Center develop and clearly articulate its workforce alignment component. Industry partners are not only essential to securing financial support, but also to guiding workforce alignment strategy. The Utah STEM Action Center should ideally serve as a nerve center, helping to support economic development efforts, helping Utah companies grow other Utah companies.

As Tami Goetz phrases it, "There is life after credentials." In other words, the Utah STEM Action Center must be intentional about extending its focus beyond STEM education and serve a role after credential attainment, specifically workforce development or talent alignment/talent development. Industry must play a pivotal role in aligning STEM education efforts with the broader goals of workforce/talent development.

Marketing and branding

While coordination with business and industry is important, marketing and branding are also essential in creating a brand for STEM in Utah. Initially, the Utah STEM Action Center used the governor's marketing and communications staff for this work. However, the Utah STEM Action Center staff soon realized it needed its own marketing staff member, with the experience to savvily target different messages to a diverse set of STEM stakeholders with very different agendas – K-12 educators, legislators and CEOs, among others.

Legislative communication strategy

Early on in the process of implementing a center modeled after the Utah STEM Action Center, it is important for states to develop a legislative communication strategy. This is an iterative process that considers which legislators a STEM center should coordinate with on specific committees, which legislators may be skeptical on a certain issue the STEM center is in favor of, etc.

Partnerships and liaisons

Partnerships are essential to the Utah STEM Action Center's coordination with other state agencies. To ensure the Utah STEM Action Center's strategic plan develops or builds upon work of other agencies – and, alternatively, does not create gaps or duplicate efforts – the Utah Action Center utilizes liaisons who work part-time for the

Utah STEM Action Center and part-time for another state agency. The Center currently employs three liaisons, one each with the Utah Department of Workforce Services, Governor's Office of Economic Development and Utah State Office of Education. These positions, funded by the Utah STEM Action Center, as well as the state agency they liaise with, also share responsibility for the portion of the STEM Action Center strategic plan they are responsible for that year. Liaisons bring more depth to the Utah STEM Action Center's work, but for half the cost and allow the Center to ensure that its work aligns with workforce needs.

Funding

Diverse funding portfolio

There is value in portfolio diversification. An initiative such as the Utah STEM Action Center cannot exist without substantive and reliable legislative funding, and private donations also provide critical funds. Yet, the establishment of a public 501(c)(3) in May 2016 has also been a game-changer for the Utah STEM Action Center, particularly in how the entity is viewed by corporate donors.

Endnotes

1. U.C.A. § 63N-12-204(1)(a), (d)
2. U.C.A. § 63N-12-205(1)(c)(i), (e)
3. U.C.A. § 63N-12-205(2)(b), (c), (g)-(k), (n)
4. U.C.A. § 63N-12-205(4)(a)
5. U.C.A. § 63N-12-204(1)(f)(i), (ii)
6. U.C.A. § 63N-12-205(1)(c)(ii)
7. U.C.A. § 63N-12-204(1)(d)
8. U.C.A. § 63N-12-204(3)
9. U.C.A. § 63N-12-205(1)(d)

AUTHORS

Jennifer Zinth is Director of the High School Institute and STEM Center at Education Commission of the States. She loves, loves, loves public speaking and sharing policy research and analysis with audiences. Contact Jennifer at **jzinth@ecs.org** *or* **303.299.3689**.

Tami Goetz is Executive Director, Utah STEM Action Center. She enjoys skiing, trail running and hanging out with her husband, two stepdaughters, two dogs, four cats and four chickens. Contact Tami at **801.674.2405** *or* **tgoetz@utah.gov.**

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