Sample Editorials

Telling the STEM Chapter of the Education Story

These materials apply the tested frame elements to external communications opportunities such as editorials, social media updates, and program descriptions. They can be adapted to local contexts (for example, adding local references or site-specific information) or restructured for different formats (for example, repurposing an editorial as a blog post or public remarks.)

Sample Editorial: School Gardens (Informal STEM Learning)

This short opinion piece – suitable for the editorial page or a blog post – makes use of several reframing strategies. The primary reframing technique is explanation and illustration of STEM skills in a concrete, accessible manner – avoiding the *Missing Process Trap* whereby communicators fail to provide the public with a more robust understanding of what STEM skills are and how they are developed in practical, applied contexts. In addition, the Explanatory Metaphor *Fluency* helps to channel attention to the need for immersion in real-life applications of subject matter and thus in turn ways in which informal and formal learning can complement and enhance one another. This tested frame element has proven to be a reliable way of getting the public out of the default thinking that in-school and out-of-school learning are fundamentally different. Finally, much of the reframing work here is subtle – decisions represented by the absence of common, but potentially problematic, communications habits. There is little here that could leave the public stuck in unproductive patterns of thinking such as *STEM = Science, Engineering is Specialized, or Math = Adding + Subtracting.*

CULTIVATING OUR FUTURE

The arrival of spring has yielded features and photographs celebrating various educational gardens in the region. The growing trend of school gardens has been touted as an important way to spark conversations about the food and fitness environment, and schools and afterschool programs often draw on the gardens to teach various life sciences lessons. But these gardens can be sites for lessons that integrate not just science, but also technology, engineering, and math – disciplines collectively known as STEM. Workforce experts have noted that these are the fields that will be in high demand in the world the next generation will inherit, so these gardens are growing tomorrow's economy as well as herbs and vegetables.

How so? In the garden, students do math: measuring rainfall or plant growth, calculating the precise portions for mixing plant food with water. They conduct scientific observations – making note of the impact of insects or fertilizer – and experimental trials, manipulating variables of water or other substances added to gardens. They evaluate technology, identify opportunities for work to be made more efficient or effective through the use of physical aids, and determine which tools are necessary for which jobs. They think and act like engineers, designing and building support structures for various plants. The garden offers these learning opportunities for

those in the earliest stages of schooling and continues to offer challenging learning for high school students exploring geometry, chemistry, or computer-assisted design. These hands-on lessons in math, science, engineering, and technology travel from the classroom to the garden space and back again, as do the scientific habits of collaboration, problem-finding, and problem-solving.

In this way, these gardens are opportunities for developing STEM fluency. Just as those who are learning a language greatly benefit from immersing themselves in contexts where they have to apply what they have learned in the classroom, learning opportunities that engage students in multiple spaces, times, and activities challenge students in ways that truly grow concepts and ways of thinking. As just one example, the After Zone program in Providence, Rhode Island provides a space for students to get their hands dirty through the Urban Naturalist program. Drawing in community based organizations like botanical gardens, this program enables students to study ecology, enriching their academic understanding of the subject by building skills through practice. We need to discover and develop more of these opportunities that engage learners' attention and motivate their learning in our schools and communities, integrating learning opportunities in libraries, community centers, museums, and afterschool programs to increase opportunities for strong growth.

Let's celebrate gardens not just for what they teach students about where food comes from, but as ideal spaces for the kind of teaching and learning that's needed for the modern era - fertile learning spaces where students can apply and grow critical STEM knowledge and skills.

[479 words]

Sample Editorial: Improve and Expand STEM Instruction

This short opinion piece – suitable for the editorial page or a blog post – makes use of several reframing strategies. Opening the communication with appeals to the tested Values F*uture Preparation* and *Fairness Across Places* establishes the issue as one with broad implications for society. In addition, the Explanatory Metaphor *Weaving Skills Ropes* helps to establish diverse skills as equally vital and mutually reinforcing – a powerful antidote to the dominant model of skills as hierarchical, linear, and sequential. Finally, much of the reframing work here is subtle – decisions represented by the absence of common, but potentially problematic, communications habits. There is little here that could reinforce limited conceptions of STEM as primarily important for attaining lucrative employment, or that children's interest in STEM is a function of either temperament or charismatic teachers.

SCALING NEW HEIGHTS – WITH STRONGER ROPES OF STEM SKILLS

One of the ways our country can be more prepared for the challenges and opportunities ahead is to improve and expand the teaching of science, technology, engineering, and math – disciplines collectively known as STEM. Leaders in business, economics, and education have started to focus on the threads that these disciplines have in common. Each involves strands of problem-solving, keen analysis of data, attention to detail, methodical trial-and-error approaches, and more. As students learn the skills that STEM fields offer—skills of problem solving, collaboration, examination and application of evidence—they weave together a strong rope of integrated skills. No one strand can do the work of the rope - these individual skills are all necessary, and each can be strengthened through multiple opportunities to learn and practice.

When these strands are strong and flexible, they can be woven into different 'skill ropes' that can be useful in other areas of learning and life. Understood in this way, it becomes clear that STEM education has important social and civic benefits, as it can improve the problem solving capacities of the next generation. Weighing and applying evidence, working through problems collaboratively – these are the skills necessary for competent decision making in all areas of policy. To be thoroughly prepared for the future—when we'll need to draw on scientific knowledge and technological expertise in order to solve complex problems in health care, food production, transportation, and urban planning, when we'll continue to plumb the mysteries of the universe, the planet, the human body, when we'll understand the complexity of modern life in new ways—we need a generation equipped with strong and flexible STEM ropes.

In addition to being grounded in the use of evidence to develop knowledge, these disciplines also share another, more dubious distinction: they tend to be taught unevenly, with opportunities to learn these skills varying widely from one place to another. For instance, students living in rural areas typically have little or no access to the advanced science courses that students in metropolitan areas take or granted, and even within a single urban school district, the availability of the kinds of STEM courses can vary widely. To build a generation with an agile, adaptable set of skills, we can start with an important step: ensuring access to high quality STEM programs to all students, regardless of where they live. This includes making sure that all schools have teachers and programs that provide critical opportunities to weave STEM skill ropes. There already exist a variety of innovative and effective ideas that can make a difference in ensuring that American children across the country all have access to high-quality STEM learning opportunities – from using student-loan forgiveness programs to attract teachers to under-served areas, to leveraging technology to make online coursework available in locations that wouldn't have it otherwise, and more.

When efforts such as these are expanded, so is our potential as a nation. STEM learning trains minds to observe, use logic, test hypotheses, be disciplined in the pursuit of reasoned solutions. In a constantly changing world, these are skills we can't afford to do without. To scale the challenges of the 21st century, America needs stronger, more flexible ropes of STEM skills.

[533 words]

Sample Editorial: Greater Equity and Inclusion in STEM Learning

This short opinion piece – suitable for the editorial page or a blog post – makes use of several reframing strategies to establish a compelling case for addressing racial and ethnic disparities in STEM opportunities and outcomes. Opening the communication with appeals to the tested Values *Future Preparation* and *Fairness Across Places* establishes the issue as one with broad implications for society, rather than as one that only matters for marginalized students. In addition, the Explanatory Metaphor *Charging Stations* helps to explain the mechanism of inequitable access to educational quality – a key reframing strategy for channeling attention away from deficit thinking that associates poor outcomes with a lack of drive or ability. Helping the public to see the role of systems in creating and maintaining inequalities is a critically important piece of reframing disparities in STEM and other educational outcomes. With attention channeled to structures, there is less chance that the public will default to explanations that rely on problematic assumptions about "cultural differences" or individual proclivities for STEM subjects.

In an ever-changing, increasingly complex world, it's more important than ever that the next generation is prepared to bring knowledge and skills to solve problems, make sense of information, and know how to gather and

evaluate evidence to make decisions. These are the kinds of skills that students develop in science, technology, engineering and math – disciplines collectively known as STEM. If we want a nation where our future leaders, neighbors, and workers are prepared to think deeply and think well, then experts agree that building students' skills and content knowledge in STEM fields is essential.

Opportunities to apply this knowledge and these skills are like charging stations where children plug in to power up to take an active role in their learning and development. Some students are in charging systems with lots of opportunities to charge up STEM learning. Everywhere they go, there are powerful charging stations like great libraries, science centers, zoos, aquariums, and engaging afterschool programs. The schools in their communities offer a wider variety of advanced courses– for example, not just biology, but microbiology, anatomy, and more - and foster the kind of thinking needed to move into the fields of engineering or technology.

But other students are in charging dead zones — places where there just aren't many high-quality learning opportunities to plug into STEM experiences. Every American child should be able to rely on their neighborhood school to serve as a powerful charging station, but currently, not all schools are equipped to provide challenging and up-to-date instruction in STEM fields. In too many communities, schools have fewer well-trained teachers, fewer advanced courses, and less access to the materials necessary for hands-on learning experiences that allow students to explore and master these subjects. For example, some rural schools only have one science teacher for the entire school. In this situation, the teacher must create a lesson for every subject and every grade, a task that takes considerably longer than a teacher only prepping for one grade. This makes it difficult for a teacher to set up hands-on lab experiences –- for instance, and if they lack the time to make sure a lab is safe, then they can't offer them.

A spotty system of charging stations adds up to students in under-resourced schools having significantly fewer opportunities to connect to learning than their more advantaged peers. This uneven approach is failing to ensure that children across the nation are developing their skills and abilities in these fields, and as a result, we run the risk of weakening our future workforce and our economy. There's already evidence that our nation has a workforce shortage in these areas. According to an analysis by Change the Equation, even in the economically sluggish years of 2009-2012, the number of STEM-focused job postings outnumbered unemployed STEM professionals by nearly two to one.

To have an agile, adaptable workforce ready for tomorrow's economy, we need to build an effective charging system across the country so that all students, no matter where they are, have high-quality opportunities to engage with STEM subjects. Innovative states and communities are finding ways to fill in the patchy system to ensure that more students have the opportunity to charge up their learning. For example, the Rural Communities STEM Initiative connected a Tennessee school district with a local community college, whose faculty and science majors are creating "lab in a box" kits that make it possible for middle schools with only one science teacher to offer hands-on learning experiences for students. In New York City, a program called Urban Advantage connects middle schoolers with local science museums, and provides low-income families with memberships so that they can access the city's informal science institutions in the course of completing a year-long science investigation required to graduate from eighth grade.

These programs and others like them are a great start, but there's much more to do to ensure that there are quality STEM programs in all parts of the country. To make this happen, we need to devote more resources to those areas that have low-quality learning opportunities. Our goal should be to create a country where all children — regardless of where they live — have a fair chance to reach their potential and contribute to society.

[705 words]

Sample Editorial: Informal Learning Opportunities Are Essential Investments

This opinion piece – suitable for the editorial page or a blog post – reinforces the message that we must take a broader approach to STEM education. The piece highlights three approaches to expanding quality STEM learning: afterschool opportunities; connecting informal science centers to formal education; and connecting schools to community resources. By establishing what's at stake with the Value *Future Preparation*, the piece channels public thinking away from understanding STEM education as a path toward individual gain and toward its collective benefits. Infusing the Explanatory Metaphor *Charging Stations* throughout gives the editorial an organizing principle, and frames the issue as one of expanding, improving, and connecting collective resources. Finally, much of the framing that goes into this piece involves choices about what isn't made explicit. For instance, there is little here that could remind the public of assumptions that make STEM reform "hard to think," such as I*nformal Learning Is Just for Fun, Engineering Is Highly Specialized, or Teachers Are the Education System.*

As we get ready for a new school year, it is a good time to remember that the learning that students access today is getting us all ready for tomorrow. With a future that is certain to bring both welcome surprises and unforeseen challenges, we need to ensure that the next generation is being prepared to adapt to unpredictable circumstances and find or create solutions to new problems. Engineering and technology will provide the way forward in many cases in the 21st century, which has drawn the attention of many leaders and educators to improving learning in subjects referred to as STEM – science, technology, engineering, and math.

There is less attention, however, to the wide range of resources we can draw on as we try to figure out better ways of developing knowledge and skills in these critical fields. Schools, of course, are essential, but they can't do the job alone – and they don't have to. Opportunities to learn work much like charging stations where young people power up to take an active role in their learning. Schools must be strong and reliable charging stations, but informal learning contexts - such as afterschool and summer programs, science centers and museums, community organizations, and clubs – are also a necessary part of a powerful learning system. These environments provide opportunities for open exploration, experimentation, and lots of hands-on practice – all of which are needed for effective STEM learning. Our nation's classroom teachers are essential partners, but we can also add the power of scientists, engineers, tech gurus, university professors, and other STEM professionals to supercharge the learning of the next generation.

There are many excellent examples of what it looks like when communities start to connect more resources to support STEM learning. Techbridge brings professionals from Silicon Valley to afterschool settings in Oakland, San Jose, and San Lorenzo, where students are likely to encounter fewer adults who work in these fields. The STEM experts guide students in practicing hands-on applications of technology. In one simulation, students are faced with a situation in which electrical power, food, and a clean water source are unavailable – challenging them to design water filters, wind-powered cranks, a message-carrying car, and safe shelter. In the process, the students use math to solve problems and gain age-appropriate practice thinking like engineers as they design solutions that fit the situation. Results from this program suggest that the students who participate end up more likely to sign up for more advanced math and science courses – putting them on the path toward becoming the kind of STEM professional we need to fill the jobs of the future.

Out-of-school opportunities can build student interest and knowledge in STEM, but we must also be more innovative about the ways that we ensure that our schools are powerful sources to connect to these subjects. Because STEM is best taught through teaching techniques like guided research and experimentation, this requires that teachers have the curriculum, materials, support and training they need to provide hands-on lessons. The

Science and Math Investigative Learning Experiences (SMILE) at Oregon State University is a great example of a program designed to do just that. SMILE opens up the resources of a large state university to public school teachers, connecting K12 educators with professors, helping to provide equipment and supplies for experiments and simulations, and allowing teachers to use the university library, which lets them access scientific research that would otherwise be difficult or expensive to get. We need to support more programs like these to link our schools into the network of community resources.

Today's students are tomorrow's leaders and decision-makers. As society faces new challenges - such as redesigning cities for greater sustainability – we need citizens and workers who are equipped with the knowledge and skills to contribute to the solutions we'll need. To get ready, we need to invest now in the many kinds of opportunities that students need to charge up their STEM learning. By connecting our school system to all of the community resources at our disposal, creating an interconnected, highly effective charging system that surrounds and powers the next generation, we can achieve megawatt results.

[689 words]