Chan Zuckerberg Initiative

Science and Math Institute

Founded in

2009

Number of Schools, Location(s)

One in Tacoma, WA

Number of Students

525

Number of Teachers / Teacher Retention

32 teachers

88% retention (teachers who have left have transferred to one of the other two innovation schools in the district)

Per-Pupil Funding[1]

$7,616

Sector

District

Grades Served

9th through 12th

Student Demographics

12% Hispanic
61% White
10% Black
12% Asian
4% two or more races

10% students with disabilities
32% low income

Teacher Demographics

76% White
8% Hispanic
8% Black
8% Asian

[1] Per Pupil figure does not include various expenses accounted for at the District Level.

Anchoring to Established Cognitive Developmental & Educational Theories

Piaget's Theory of Cognitive Development — Constructivism[1]

Researcher: Jean Piaget

Theory's Key Tenets: Children learn as an artifact of factors both internal and external to the child. Children learn best by doing and through engaging in their environment and with the adults and peers around them.

Sociocultural Theory[2,3]

Researcher: Lev Vygotsky

Theory's Key Tenets: Children learn through hands-on experiences. Everyone in the child's environment and the overall culture and society are responsible for developing higher order cognitive functions. Learning is inherently a social act. Adults facilitate children's knowledge development through scaffolding and the Zone of Proximal Development — the space between a child's prior background knowledge and what they can do on their own, and the new knowledge, understandings, or skills that they need support mastering.

Ecological Systems Theory[4]

Researcher: Urie Bronfenbrenner

Theory's Key Tenets: Children learn through both internal and external factors by engaging in several environmental or ecological systems:

- Microsystem *(e.g. family, caregivers, school)*
- Mesosystem *(refers to relationships between those within the child's microsystem, such as parent-school partnerships)*
- Exosystem *(refers to larger social systems that impact the child's development, such as community-based resources or parent workplace environments that may cause stress on parents that lead to stress for children)*
- Macrosystem *(refers to cultural values, customs and laws)*
- Chronosystem *(refers to dimensions of time and the interplay between time and a child's external life changes and circumstances as well as the child's internal development and identity)*

[1] Jean Piaget, "Piaget's Theory," in: Bärbel Inhelder, Harold H. Chipman, and Charles Zwingmann, eds., *Piaget and His School* (New York: Springer-Verlag Berlin Heidelberg, Springer Study Edition, 1976).
[2] Lev Vygotsky, "The Development of Higher Psychological Functions," *Russian Social Science Review* 18, no. 3 (1977): 38.
[3] James P. Lantolf and Aneta Pavlenko, "Sociocultural Theory and Second Language Acquisition," *Annual Review of Applied Linguistics* 15 (1995): 108–124. doi:10.1017/S0267190500002646.
[4] Urie Bronfenbrenner, "Ecological Systems Theory," in Ross Vasta, ed., *Six Theories of Child Development: Revised Formulations and Current Issues* (London, England: Jessica Kingsley Publishers, 1992), 187–249.

Introduction

In 2000, Jon Ketler was teaching ceramics at a large, comprehensive district high school in Tacoma, Washington. When Ketler learned about a grant from the Bill & Melinda Gates Foundation in support of innovative school models, he took the opportunity to dream: What sort of school would he design?

Ketler looked to the city around him for inspiration. Tacoma is home to the second-largest school district in Washington, drawing students from a range of racial/ethnic and socio-economic backgrounds. The landscape is breathtaking, with access to forests, mountains, and the ocean. The city's history as a manufacturing center and busy port is a point of pride for many, but economic hard times were having an effect. There is a vibrant arts scene, with a strong community of artists leading the charge. Tacoma has a number of civic institutions, from museums to zoos to parks to historical sites. The city of 200,000 was large enough to offer a variety of opportunities for people wanting to make a life in the area, but it was also small enough to rally around changes that would benefit the population as a whole.

Indeed, Tacoma had many strengths to leverage. Ketler brought his own talents and assets to the school design process: his history as an accomplished artist, a commitment to inclusion of students with special needs, and deep relationships with a broad network of Tacoma educators and community leaders.

With these assets in hand, Ketler and a team pulled from his network crystallized an idea for high schools that would take advantage of Tacoma's many resources. The schools would be part of an innovation zone within Tacoma Public Schools. They would engage students from across Tacoma and with a variety

of interests and abilities, and they would focus on real-world experiences using Tacoma as the classroom. The vision for the schools would be bold: "All students can participate in high-quality educational experiences that develop their passions so they become lifelong learners, thinkers, creators, and activists."

Upon earning the grant from the Bill & Melinda Gates Foundation, Ketler and team set out to turn the vision into a reality. The team first opened the Tacoma School of the Arts (SOTA) with 150 tenth-grade students. After several years, Science and Math Institute (SAMI) and Industrial Design Engineering and Arts (IDEA) followed to round out the educational experiences provided to students.

In many ways, SOTA, SAMI, and IDEA are quite different from one another. Each has a unique location and partnerships, and each has developed programming in specialized areas. SAMI, located at Point Defiance Zoo & Aquarium, focuses on math and natural and physical sciences. SOTA, located downtown among museums and theaters, centers around performing and visual arts. IDEA, in the heart of South Tacoma with machine and maker shops, concentrates on engineering and design.

These differences aside, the schools share many similarities that tie to the vision. Each school draws students from across Tacoma via a regional lottery-based enrollment system that prioritizes representation of Tacoma's diversity (enrolling students from each of Tacoma's ten middle schools). Each school embraces place-based, experiential, and project-based learning that leverages Tacoma's resources and exposes students to post-graduation opportunities. Each adopts a full-inclusion model, thus fully embedding students with disabilities within general education classes to engender the mission of community as every student has strengths and challenges regardless of special education designation. Each heavily invests in community-building via a focus on school culture and multi-age mentor groups (these family groups have a caring adult and older students teaching the younger students about post-high school planning). Each anchors the experience of students in shared core values of community, empathy, thinking, and balance.

Today, SOTA, SAMI, and IDEA are important elements of Tacoma Public Schools' broader approach to offering innovative educational experiences. The three schools are district-led and serve nearly one-quarter of Tacoma Public Schools' high schoolers. The schools work in partnership with the nonprofit, Elements of Education, which has a mission to "partner with community resources to change public education, emphasizing creativity and utilizing a fully inclusive model that educates the whole student through our values." As such, Elements of Education supports the schools as labs in which innovative programs can be incubated for the benefit of the larger district. This lab approach has already led to the expansion of several programs. For example, students at the district's comprehensive high schools now have access to the internship program incubated by Elements, Next Move, as well as the Bridge Program, a pre-internship class where all students are expected to support a classroom and teacher, setting goals as they will in their community internship.

The schools are also vital members of the broader Tacoma community. Reflecting Ketler's focus on partnerships, SAMI and its sister schools have deep connections with a comprehensive set of Tacoma organizations, including the zoo, Metro Parks Tacoma, the Tacoma Urban League, the Tacoma Arts Museum, the Museum of Glass, LeMay – America's Car Museum, and the University of Washington Tacoma. These partners have a shared set of priorities: to ensure that the next generation of Tacoma residents can meaningfully contribute to the community and take advantage of community resources. As one community partner said, "Community is the answer, not the schoolhouse." The partnerships have been critical in everything from establishing SAMI's location within Metro Parks' property, to opening the Tacoma Arts Museum up for interactive SOTA classes. A leader at the museum reflected on the mutually beneficial relationship: "It's great for students to be in these spaces, and it's great for us to get more people in." A student echoed this sentiment: "Sometimes art museums can be exclusive and elitist. Now, a bunch of students are in here every day in this museum. It's our space too."[5]

Given the breadth and depth of innovative programs across SOTA, SAMI, and IDEA as well as the different ways these programs look across each campus, this case study focuses most intensively on one school: Science and Math Institute (SAMI). By focusing primarily on SAMI, the case provides a more holistic, cohesive, and up-close picture of the model as it plays out in a school. Though all schools outperform the district and state in graduation rates, SAMI was selected among the three schools for this focus because of its relatively stronger academic outcomes. Where appropriate, examples from SOTA and IDEA are provided to illustrate how the programs are tailored to different contexts.

[5] Paula E. Chan et al., "Beyond Involvement: Promoting Student Ownership of Learning in Classrooms," *Intervention in School and Clinic* 50, no. 2 (2014): 105–113.

Defining and Measuring Success

Definition of student success. SAMI leaders promote a broad definition of student success. As one leader said, "Success is that our students walk out prepared to be viable community members who are prepared for work or college. That doesn't look the same for every student. We've been paying attention to soft skills and executive functioning skills as we become a global marketplace. More than just 'Can you write, read, and do math?' and more about 'How do you collaborate, work on the team, work with others that do not look like you or have the same values as you?' Those are skills we believe in deeply and want to measure." Another added, "It's not about do we get x percent in college, did we graduate x percent of students. It's about questions like, 'Are kids enjoying their lives? Are they part of something meaningful? Are they cared for and nurtured, and ready to launch?'"

Current and desired ways of measuring success across domains. While SAMI does not currently have tools to measure these outcomes, leaders point to other powerful indicators of success: exit survey data about whether seniors are happy and felt that they belonged; the number of alumni engaged in the Tacoma area arts or environmentalism scene or hired on as SAMI teachers; the number of students and alumni who take jobs with companies they intern with during their SAMI experience.

Academic success. SAMI and its sister schools SOTA and IDEA can also point to more traditional measures of success:

- The schools have had some of the district's highest graduation rates over the past 17 years, ranging from 92.5% to 100%
- 100% of juniors and seniors take college-level courses for college credit
- 87.1% of students go on to higher education
- 40% of students are accepted into highly selective four-year universities and colleges
- 100% of students in special education graduate with a standard diploma
- SAT scores average 1480

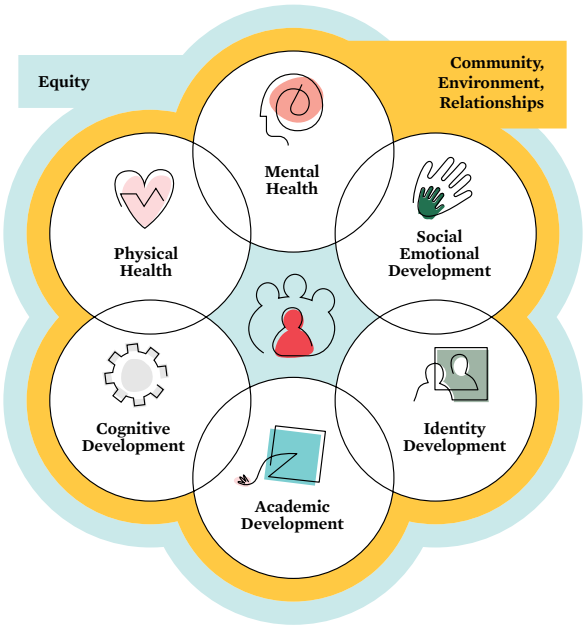
How Science and Math Institute Facilitates Comprehensive Student Development

SAMI demonstrates integration across multiple domains of Comprehensive Student Development (CSD). In the sections that follow, we explain what SAMI's model looks like. We also clarify how the model fuels CSD.

The following aspects of SAMI's model are critical to its success in facilitating student development:

1. Place-based education leveraging community resources
2. Student voice and choice
3. Focus on mentorship
4. Real-world internships

Comprehensive Child Development



1. Place-based education leveraging community resources

Cognitive	Physical	**Academic**
Mental	**Social Emotional**	**Identity**

■ Primary Domain ■ Secondary Domain

Science and Math Institute's location in a real-world setting brings learning to life. As students encounter and apply their learning in engaging, realistic contexts, they accelerate academic, social-emotional, and identity development.

Science and Math Institute (SAMI) is located in Point Defiance Park and within Point Defiance Zoo & Aquarium, all operated by Metro Parks Tacoma. The site showcases the beauty of Tacoma's natural landscape of lush forest and the shoreline of Commencement Bay. Among the nearly 500,000 annual patrons of the park are SAMI high school students who spend all four years of high school alongside zoo staff, visitors, and thousands of species, ranging from the giant Pacific octopus to the Sumatran tiger. Classrooms are seamlessly integrated throughout the park, located in the newly constructed Education Learning Center, portable trailers, and even along nature trails. SAMI Co-Directors Liz Minks and Joni Hall reflected on the power of this environment: "It's about getting away from institutional buildings that impact behaviors. In the same way that prisons impact prison behaviors, schools are similar. We wanted to tear that all down, using every opportunity to be in actual settings and not just rely on theory."

This place-based, hands-on education enables a primary focus on integrated **academic development**, social-emotional development, and identity development. Students deepen academic development via rigorous and engaging courses. Courses with real-world applications foster **social-emotional** skills like curiosity and relevance of school. Connection to the resources and assets in Tacoma, like the parks and museum, can also develop a sense of belonging and social awareness. **Identity development** is fueled as well by this place-based approach to education. As students explore personal interests, they build personal identity. As they see the direct impact of their work, they build a sense of purpose.[6] Students also develop a broader sense of identity as they learn to see themselves as belonging to and responsible for the Tacoma community. Thus, the unique location of this school informs both what students learn and how they learn it, as demonstrated by vignettes below:

- Students in the mariculture class learn about marine biology, ecology, and chemistry. Frequent walks to Commencement Bay bring lessons to life and provide a natural laboratory for learning. Students in another class, outdoor ed, navigate forest trails to practice plant identification. At the arts-focused SOTA, students take classes like museum studies or business of art, through which they access the exhibits and experts at the Tacoma Art Museum or the Museum of Glass.

- In a unit on adaptation in biology class, students selected an animal in the park to study. Students spread throughout the zoo to find their animals, draw them, and identify the features that enable the animals to adapt to their environments. Some students ended up in the Asian Forest Sanctuary studying clouded leopards, another group headed toward the Arctic Tundra area to examine puffins, while yet another group entered the Pacific Sea Aquarium to study a giant spider crab.

- Juniors and seniors in an English class used the park to engage in the international Project Green Challenge, through which students tackled an environmentally themed challenge each day for a month. During a challenge on "zero waste," a group of students examined the use of plastics at the zoo and pitched an effort to replace

[6] Heather Malin, Indrawati Liauw, and William Damon, "Purpose and Character Development in Early Adolescence," *Journal of Youth and Adolescence* 46, no. 6 (2017): 1200-1215.

plastic straws at zoo concessions. The students didn't just use the idea to compete in Project Green Challenge; they advocated for the changes to be implemented.

- In a recent class on environmentalism, a group of students created a way to promote eco-friendly messaging with zoo visitors. Students designed a water stencil project and painted environmentally friendly messages along sidewalks in the zoo with a special substance that is only visible in the rain.

- The human development class leads an early learning program housed inside SAMI, through which students from Tacoma Head Start programs (and their teachers) attend a weeklong zoo camp facilitated by SAMI students. A SAMI leader described the program: "Half of the class is focused on child development, and students leave with certifications to walk into a para job or a role at a community preschool. The second half is with 15-20 pre-schoolers. This has really showcased the strengths of some of our kids who would be undervalued other places; they've found a spot where they can shine. One was offered an internship and another was offered a job at one of the visiting early childhood centers."

- Students in Spanish class apply their learning in the zoo by serving as docents during their junior and senior years. Students actively advise on and participate in the zoo's educational programming for Spanish-speaking visitors.

- Students can learn from sites throughout Tacoma. Via what is known as a "whole-child access pass," students receive transit passes so that they can explore Tacoma (and get to school) and access reduced prices for area museums and attractions. One student said, smiling, "We can get $200 tickets for $5. I'm going to see this famous jazz artist and I got front-row seats."

One student described the impact of these real-world learning opportunities: "We take field trips to the car museum, we come downtown and visit SOTA, we go all over the place. We branch out so much. If we didn't have that, it'd just be normal high school, isolated. Without community impact, you won't have anything. We're part of something bigger than one building, bigger than our school, and we use everything to our advantage."

Teachers, too, appreciate the unique location and approach to teaching. One said, "I love the relationship with the zoo. It was my passion for organisms that brought me to teaching. Now we're surrounded by them." Another added, "I love the connection to the outdoors and connection to nature." Teachers report that the approach has challenged them to get creative in making learning relevant. One said, "There's lots of freedom here to approach language from a more hands-on perspective. There are so many limitations in a four-wall classroom. With my Spanish class, I can go to the aquarium and have students do cross-curriculum learning. I can have them experience what I'm teaching in a real-world environment. People don't truly learn language in controlled environments. You learn in non-controlled environments, like when you're traveling or living abroad. Because of this approach, we're bringing learning to real-life scenarios."

2. Student voice and choice

Student voice and choice are common themes at SAMI. Choice is exercised as students choose a school, courses of interest, and a "major." Voice (or agency) is developed as students shape significant aspects of the school experience. Both promote student development across multiple domains.

Cognitive	Physical	**Academic**
Mental	**Social Emotional**	**Identity**

■ Primary Domain ■ Secondary Domain

Students make choices about their own education at multiple junctures. Student choice is promoted as students select from among Tacoma Public Schools' portfolio of high school options, as they select a major course of study, and as they choose from among SAMI's broad diversity of course offerings.

This continuous emphasis on student choice demonstrates a primary focus on academic, social-emotional, cognitive, and identity development. **Social-emotional skills** like agency and self-direction are developed as students are invited to make decisions about their education. The decision-making supports **cognitive development** of executive functions like planning and problem-solving. Students experience **identity development** by developing a sense of purpose as they explore their senses of self and goals for the future. As a result of their choices, students actively engage in rigorous **academic development** that gives them deeper, more accelerated exposure in their areas of interest. The snapshots below provide greater detail of student choice in the SAMI experience:

- Students choose from among SAMI, SOTA, IDEA, or one of Tacoma's comprehensive high schools. So that students can make informed choices, Elements of Education started the XPlore program. Via this program, Tacoma elementary and middle school students take interactive summer courses on topics like marine studies, computer science, engineering in the makerspace, and visual arts on the SAMI, SOTA, and IDEA campuses.

- Students also have significant choice in selecting classes; science offerings alone range from aquaculture, to anatomy and physiology, to forest ecology.

- Students select a "major" that enables them to delve deeply into an area of interest. For example, majors at SAMI include physical sciences, life sciences, and astronomy; majors at SOTA range from audio recording to graphic design. Students are not constrained, however, by the place-based approach to learning; they may choose to enroll in courses at other campuses. As one student reflected, "I wanted to come to SOTA since second grade. I've been doing music and theater forever. I'm now a sound-writing and audio major. SOTA has offered me some of the best experiences I've ever had. I get to take challenging classes here taught by real artists, and then I also get to go to SAMI every Tuesday and Thursday to take AP Calc and AP Bio there."

- Choice is further exercised during monthlong "mini terms" and "micro terms" at the end of each semester. Each term offers students the chance to engage in an intensive study via a unique course. SOTA, for instance, recently offered "Garbage," an in-depth look at the intersection of art, social justice, climate change, and pollution. IDEA hosted the robotics-focused "Powered Up Robotics." SAMI ran "SAMI Podcast Season One: Judgement Day," in which students created podcasts about various U.S. Supreme Court cases.

- Students are trusted to make good choices and demonstrate maturity, responsibility, and agency due to the location of schools in shared or public spaces. Given how classrooms are spread out, students have 15-minute passing periods to navigate the forest trails (at SAMI) or the UW Tacoma campus (at SOTA).

- Students directly tie this series of choices to valuable lessons on what life path they do — or do not — choose to pursue. Several students spoke of the particular value of learning what they do not want. One said, "I came in the school thinking I'll major in science, but I'll leave thinking about international relations." Another added, "I get to try something that's an interest and may or may not relate to my future."

Cognitive	**Physical**	**Academic**
Mental	**Social Emotional**	**Identity**

■ Primary Domain ■ Secondary Domain

Students' choices enable them to design their own SAMI experiences. However, students also exercise their voice and agency in ways that have impact on the broader school community. SAMI students are known for tackling big projects with big impact, often reflecting their passions and interests. Students frequently propose new courses to match an interest, and help improve the physical environment of the school by building new structures or decorating the halls. They also create and lead cultural traditions that bring the school together. In each of these instances, students are empowered to lead in their school community.

Importantly, student agency is mirrored by an environment that supports teacher agency. As one teacher said, "There's a great deal of autonomy and flexibility. Leaders respect us as professionals and respect us to do our job. We get to take risks. People support you trying new things." This approach

toward adults provides an important model for how teachers are expected to treat students.

Emphasis on student voice and agency demonstrates integrated focus on academic development, identity development, and social-emotional development. Students take charge of their own **academic development** by frequently proposing new classes. Students demonstrate **identity development** as they perceive a need in their community, align that need to something they are passionate about, and take the initiative to address that need. This process also accelerates **social-emotional development** as students practice the agency, self-efficacy mindset, self-direction, and relationship skills needed to complete a complex project successfully. For examples of what this looks like in practice, see the vignettes below:

- The recent elective Comparative Cultures was started based on a student's suggestion. Upon reflecting on current events, a student wanted a safe and intellectual place to learn about other cultures. Following a semester of collaboration with her English teacher, this student brought a proposal to school leaders, who celebrated the initiative. The result is a class in which students study cultural norms and ethics from around the world.

- Another class, Inclusive Leadership, empowers students to develop lessons that are later facilitated by student leaders in mentor groups, thus reaching the entire student body. Lessons have featured approaches to building relational capacity as well as exercises to gather data on micro-aggressions in class and use restorative practices to repair harm. Inclusive Leadership students have also led professional development at staff meetings to support educators in examining implicit bias and setting classroom equitable and inclusive classroom norms.

- Each Friday, students participate in a two-hour block called Adventures and Application (A&A). The A&A courses for a given semester are designed entirely by teachers and students, based on their passions and experiences. In one class, students built and installed Arduino and Raspberry Pi sensors in the portable classrooms to monitor temperature, humidity, and rainfall over a period of time. In another class, students learned methods of video recording to create their own YouTube series. In a third class, students combined dance and anatomy. While preparing for a public dance performance, students studied the muscles and bones that enabled the complex movements. In another project, students teamed up to design and build a shed for the school's co-directors. Students identified the need for such a space, planned for the project, secured the raw materials from the hardware store, and constructed a heated office space.

- One teacher shared the importance of student voice in her classroom: "Any type of premade or preset curriculum would take away from the efficacy. Students sign up for our class because of the core idea, but we still get student input on the curriculum and what to do. We might start the class with a KWL chart — what do you know, want to know, what have you learned. We really want it to be interactive. That's part of what's made it successful." Another added, "It's an ongoing learning environment, not a top-down situation at all. It's not a boxed curriculum. We're constantly assessing where kids are and moving kids forward from that place. It's a dynamic place, and it never feels like passive learning."

- Every year, students start off the year with a three-day visit to a nearby camp. A recent micro-term class suggested by students was "Camp 101," in which students planned activities for the next camp session. One student said, "I became leader of the camp dance. I had to teach everyone the moves and get everyone involved. One teacher was shocked that I was in charge, because I was just a sophomore." Another added, "I planned the first night's activities. We showcased people's talents. People who don't know us think we're a bunch of nerds, but it's cool to see other people's talents and hard work. One girl recited pi for two minutes. We also did competitions like one where you had to see who could solve a riddle first. We even got the teachers to commit to a lip sync battle."

- Students at SOTA recently developed "SOTA Gear." Instead of having typical, factory-printed T-shirts with a SOTA logo affixed, students wanted to reflect the school's artistic nature and their unique sense of style and fashion. A group traveled to local Goodwill stores to find clothing that reflected their fashion sense, screen-printed logos, received permission for students to wear the new apparel, and sold the newly designed clothing alongside more traditional merchandise.

Teachers said these sorts of projects help students strengthen their leadership skills. One teacher noted, "Our students have the confidence. They feel like they can do anything. I see

a level of ownership that I did not experience in other schools." Students shared similar sentiments: "It's been powerful. I've been able to make change. It's cool to see what I can do, how I can do it, and to see actual impact."

3. Focus on mentorship

While mentorship happens in myriad informal ways at SAMI, two formal structures exist to give all students access to mentors: Mentor Peer Groups (MPGs) and the Bridge program. Each of these structures supports SAMI's focus on academic, social-emotional, identity, and cognitive development.

Cognitive	Physical	**Academic**
Mental	**Social Emotional**	**Identity**

■ Primary Domain ■ Secondary Domain

Mentor Peer Groups (MPGs) are multigrade cohorts that meet each Friday. Students stay in the same MPG all four years of high school, thus building strong relationships with their mentor and each other.

Mentor Peer Groups are designed to represent the diversity of Tacoma. As one leader shared, "We intentionally look at who's coming from where, and we intentionally spread kids across MPGs. Relationship skills are crucial in the workplace, so we make sure they get them here."

Students specifically report the benefit of four years of bonding with one teacher, whose job is to see a student as a whole human; teachers in MPGs frequently become mentors and advocates for the students in their groups. Teachers called the groups a positive experience, as they deeply value the relationships built with students as well as having the time and space to form those relationships. As one teacher described: "I spent five years at a comprehensive high school teaching science. I got really burnt out and quit that job. Then I was hired here. It's been a dream. I fell in love with teaching and kids again. I like science, but I like kids first, so I like MPGs the best. MPG is the connection to the 'why' of teaching for me, and it gives continuity." Teachers are supported to grow as mentors. As one teacher said, "It's important to accept that not everyone is a natural mentor. But there's good support for the staff: They give background on MPGs, help on how to run a group, facilitate table talks to hear what works for other people. We can do some problem-solving. They don't leave teachers high and dry along the way."

While the schedules across schools differ (e.g., MPGs at IDEA meet daily for 20 minutes in addition to the two-hour Friday block; groups at SOTA meet weekly for four hours on Friday), the central focus on knowing each child via these groups is consistent across schools. The cross-grade structure, the amount of time spent in the groups, the intentional focus on relationship-building, and the student-led MPG sessions differentiate these structures from homerooms or advisory structures at many other schools.

The intentionality in the design of MPGs makes them places where social-emotional development and identity development can flourish. MPGs support student **social-emotional development**. MPGs form strong communities through shared traditions (e.g., an annual three-day-long camp experience) and significant shared time (e.g., two-hour weekly sessions); this supports students' sense of belonging at the school. Within MPGs, students form deep relationships with teachers over the course of four years. They also practice relationship skills and social awareness with students from a variety of grades and backgrounds. Demonstrating **identity development**, students shape their MPG's own norms, traditions and cultures, and use of time. MPGs also support development in secondary areas of focus: academic and cognitive development. Students experience **academic development** via the supports MPGs provide, such as the additional study sessions mentioned above. They also practice **cognitive development** skills related to executive functioning as they plan and execute activities for their group or engage in goal-setting and problem-solving with their mentors in student-led conferences. The snapshots below illustrate the depth and intentionality of MPGs:

- MPGs engage in community-building, most notably during an annual August camping trip, through which the MPG welcomes new members and builds relationships. Students noted the special moments that camp enables, from sharing a cabin with their MPG peers to gathering around a bonfire as a school on the last night of the experience. As one leader noted, "Camp is all about building culture. It's to make kids feel comfortable and safe."

- MPGs engage in school-wide traditions together, such as an annual potluck. In a large SOTA science workshop housed in a former warehouse in downtown Tacoma, a student boasted that the entire workshop is cleared out and large feasting tables are set up so that the whole school can join together for the meal. MPGs each find their own corners of the room in which to gather, and each MPG plans its special contributions to the meal. "It's totally like Hogwarts," she said.

- The multigrade makeup of MPGs creates opportunities for students to build leadership. One student described it as "a cycle … you become the mentor and become a role model. It's a great way to give back to the community." Older students bring younger students into the community; for example, seniors participate in "adopt a freshman" each year at camp. Older students also assume leadership of the MPG throughout the year. One student added, "The little opportunities for leadership helped me grow confidence to try bigger things." Younger students value the mentorship of older students. As one noted, "Older students help me grow." Another shared, "There was this senior in my class. He was the man. He showed me what things are like."

- MPG activities are student-driven and student-planned, thus creating additional opportunities for student leadership. As one teacher shared, "I've tried the 'here's our lesson' thing and they revolt." One student described the activities her mentor group has planned: "We paint to Bob Ross videos, make waffles, and go on field trips like to the international district in Seattle." Still other MPG sessions might include students sharing their "happies and crappies" (i.e., their personal and school-related highs and lows), doing community service around Tacoma, or studying for upcoming exams. As one student reflected, "I serve as an MPG liaison. No one knew what to do with our mentor group, so I sought the ideas and passions of people around me. This past year, I had people fill out Google forms about their passions to use for MPG time."

- Mentors serve as supports, advocates, and advisers for students. One said, "It's hard for students to fall through the cracks here. We are very intentional about looking for who needs support. Because we have a home base in mentor group, there's someone that is doing that for every single student. If something comes up, you're never alone." Another added, "I had a mentor student who always did great. I thought she was fine, but when she turned 18, she moved out and got an apartment by herself. She stopped showing up to first period, started failing classes and such. The thing that worked was that I had a relationship with her because she was in my mentor group. I went to her apartment and knocked on her door. I got her phone number and called her. Once she knew I was going to knock on the door, she came to class. She graduated, went to college on the East Coast, and is now doing great. She's doing a lot of social justice work. She didn't respond to carrots and sticks, she needed a nurturing warm demander."

- Mentors also play a unique role in helping students shape their high school and postsecondary plans. Students annually work with mentors to set personal and professional SMART goals across four areas: articulating a clear post-high school plan connected to passions and dreams, reflection and articulation of on-track graduation status, reflection on mastery of standards in all classes, and understanding of regular attendance. These goals are revisited frequently and are the central focus of biannual student-led conferences, which include the student, parents, and mentor. As one teacher said, "It's a space to have those conversations about a student's skills, strengths, and areas students might be curious about."

- Students value the strong sense of community that MPGs instill. As one student said, "It's like a break from school, but it's not — it contributes so much to school. Connections are so important. Every mentor group has a different feel and community. Without mentor group, I would be failing my classes. I go to one person for help on physics and one for help in math. It's a huge support system." Another added, "It's a group of people to keep you accountable, help you with stuff you're struggling with. It's a really important thing — you feel included. We get so close. Community here is the foundation." Another student said, "The community here has helped me find confidence. I'm not just a number here, I have a name and a personality here."

- The mentor groups also energize teachers. As one shared, "I've taught humanities for 20 years. I knew I had a deep passion for my content area. Now that I'm here, I'm seeing myself as mentor first, teacher second. Every Friday, I'm with 23 students. We're in it together for service, exploring post-high options, looking at family, emotions. It's very powerful." Another added, "I don't think I'd work anywhere else. I love the relationship with kids via mentor group. That doesn't exist at other schools, the amount of time we get with kids."

Cognitive	Physical	**Academic**
Mental	**Social Emotional**	**Identity**

■ Primary Domain ■ Secondary Domain

Mentorship is also formalized in the classroom via the Bridge program. Tenth- through 12th-graders are eligible to take an elective class in which they serve as "Bridges," or teacher assistants, in content classes. Aligned to the school's commitment to full inclusion of students with disabilities, Bridges are frequently assigned to students with special needs; this provides those students with additional supports and connections critical to their success. As one leader noted, "We are full inclusion, and we put Bridges in very purposeful partnerships; for example, one student needed a scribe. It gets internalized that 'we are of one and take care of each other.' The students help each other instill confidence." Bridge spots are coveted, and the expectations are high. As one teacher said, "Bridges come in and help students with their work — it's not just passing out papers."

The Bridge mentorship structure enables academic, social-emotional, and identity development. Bridges and the students they support receive **academic development** in the form of additional support for and/or exposure to academic content. **Social-emotional development** is supported as students gain social awareness and relationship skills by relying on the support of their Bridge. In turn, the Bridge builds social awareness and relationship skills by providing support to the teacher and students. The role that Bridges play in supporting students with special needs can help students increase their sense of belonging, such as with a student whose participation in a general education classroom was enabled by the support of a Bridge acting as a scribe. Bridges may experience **identity development** in developing a sense of purpose as they see the benefit that their work has on the students they serve. Details on the Bridge program illustrate development in these areas:

- The Bridge program gives all students extra supports. This was demonstrated in a ninth-grade science classroom, in which a Bridge circled the room to help students organize themselves before an upcoming lab. Meanwhile, the instructor in the classroom did the same. Through their combined efforts, more students received support.

- Bridges lead special programs such as the Sneak Peeks for Tacoma middle schoolers. Newly accepted students attend a series of meetups at SAMI to get to know the space and community. Programming during Sneak Peeks is mostly student-led. As one student noted, "It's cool to see people one grade above you with that leadership."

- The Bridge program provides older students opportunities to practice leadership and reinforce skills. As one Bridge reflected, "I Bridged for my Algebra 3-4 class sophomore year. That was good to get a firmer base in Algebra and to help kids. I worked one-on-one with kids. I learned more and understood it more, and I helped kids understand it."

- Students reflected on the powerful impact of this program. One noted, "It's a way students can take action. Lots of kids here are good leaders."

4. Real World Internships

Cognitive	Physical	**Academic**
Mental	**Social Emotional**	**Identity**

■ Primary Domain ■ Secondary Domain

SAMI and its sister schools help students apply their learning and explore future career paths via robust internship opportunities. These experiences accelerate academic, social-emotional, and identity development, particularly in preparation for postsecondary life.

The Next Move Internship Program run by Elements of Education works with local community organizations to design meaningful internship experiences for high school students. Students participate in the internships during the school day, accumulating 90 hours of internship experience and school credit. From this program, students get a preview of a potential career path, a chance to work alongside professionals, and skills and experience in a field of interest. Students intern for one of 200 Tacoma-area partner organizations. These partnerships facilitate SAMI and its sister schools' vision for high-quality educational experiences; as one leader said, "The internships are deeper than field trips. Students work in the community, see problems, question what they need to do, and plant the seed for changes."

Tacoma leaders and businesses benefit from the internships, too. The businesses rely on the hard work and creativity of young people, some of whom decide to make long-term careers out of their internships. Adults form ties with young people in the community, with whom they can share their professional interests. By seeing young people effectively managing their internships, adults learn to trust and respect them. This creates a virtuous cycle, through which the internship experience both demonstrates the benefits of and enables the continuation of a place-based, hands-on learning model.

Rather than simply placing students into an internship, the three-semester-long Next Move program prepares students for the experience and then supports them in their early forays

into the working world. As a leader of Next Move said, "We want students to be competitive in the workforce. The scaffolded assignments lead them there. It's about finding that spark and passion for every kid. If the student has no idea what they want to do, that's completely okay, but we will support them in trying something to explore skills, strengths, and areas of curiosity."

The Next Move internship program fosters academic, social-emotional, cognitive, and identity development. Students accelerate **academic development** as they apply lessons from the classroom in real-life settings. The structured and scaffolded supports for interns enable **cognitive development** in the form of executive function. For example, the Intro to Internship class helps students plan for an internship and set and track meaningful goals throughout the experience. Students are also supported in **social-emotional development** as they are prompted to approach the internship experience with the curiosity and growth mindset. Internship experiences also facilitate **identity development**, as students have the opportunity to explore their interests and connect with a sense of purpose. The vignettes below demonstrate how the internships support development across domains:

- Before students enter an internship, they complete an Intro to Internship course. In the course, students prepare a résumé, write a cover letter, practice interviewing, and learn norms of professional communication. A Next Move workbook guides students through practical lessons in each topic. Each student also has a coach that prepares him or her for interviews and placement.

- Just before starting an internship, students set professional and site-specific SMART goals for their internship experiences. During the internship, students are expected to frequently check in with their site supervisors for feedback on their goals. One student interned at the World Affairs Council of Tacoma, a volunteer-driven nonprofit that promotes public understanding of world affairs. She set a goal to propose a new idea each week; within the first weeks of her internship, she had already facilitated a new partnership between the council and another nonprofit that eventually resulted in the organizations co-hosting an event.

- Students are matched with internships that align to their interests, and they engage in meaningful work. One student recently interned at the Readiness Acceleration and Innovation Network (RAIN), a nonprofit biotech incubator, reporting to the head of research. She assisted with implementation of lab protocols including DNA analysis and culturing of bacteria. She reflected, "I want to go into a scientific field, and I'm doing a college-level lab internship where I get hands-on experiences. In school, I used to think doing lab work was not that fun, and it was hard to understand why I was doing them. At my internship, there's a purpose for the labs, I know what's going on, and lab is interesting, fun, and even relaxing!"

- Upon completion of an internship, students may continue working at a prior placement site or explore a new industry. Occasionally, internships lead to long-term job placements. For example, a student who started as an intern at Recreational Equipment Inc. (REI) several years ago is now a manager there who leads a team. That manager has since hosted several Next Move interns.

- Students speak of their internship experiences with pride. One said, "My supervisor thought I was a junior or senior in college. She was impressed with my interpersonal skills. She was impressed that I don't spend time on my phone but that I can carry myself face-to-face and in professional emails." Another added, "My grandmother was an immigrant. My mom defied the odds to get an education and to be a single parent who still managed to purchase a house in her twenties. My mom sees me follow in her ambitious footsteps. She sees me get serious about a career and life earlier than she was, and she's so proud and grateful for this opportunity."

Conclusions

Core elements of the Science and Math Institute (SAMI) model — place-based education leveraging community resources, emphasis on student voice and choice, focus on mentorship, and real-world internships — enable Comprehensive Student Development. Across its model, SAMI demonstrates particular strengths in systematically attending to integrated social-emotional, identity, and academic development (though other domains are emphasized via discrete components of the model). Surely, some specifics of the model are unique to SAMI's adolescent student population, Tacoma-based location, and status as an innovative district school; however, themes elevated in this case study about what development in these areas looks and feels like and details about how this development occurs are designed to be broadly applicable.

What enables this success?

The section that follows summarizes aspects of the SAMI school model that enable its success in Comprehensive Student Development. This section is intended to demonstrate the intentionality and comprehensiveness of the school's approach.

The "What": Mission, Vision, and Definition of Student Success

Mission/Vision

- SAMI's mission and vision emphasize the development of students' "unique needs and passion" and attention to the "whole student."

The "How": Curriculum and Educational Approach

Community engagement

- Place-based co-location of schools brings learning to life through real-life applications and enables students to deeply engage with their local organizations. For example, at SAMI, which is located within Point Defiance Zoo & Aquarium, students in Spanish class apply learning by serving as docents in the zoo.
- Community partnerships both increase students' exposure to their local resources and enable students to play an active role in their community. SAMI partners with Tacoma Head Start early childhood programs, where SAMI students facilitate a weeklong camp experience for preschool students at the zoo.
- Real-world internships enable students to deeply engage with their surroundings. This empowers students to brainstorm and implement initiatives to better their community. For example, Next Move Internship Program exposes students to local businesses and organizations ranging from a biotech incubator to Recreational Equipment Inc. (REI). This gives students access to professionals in the Tacoma community, and it helps Tacoma organizations build the next generation of professional leaders.

Instructional methods

- Student-led, hands-on, place-based learning takes advantage of local resources while exposing students to opportunities and careers aligned with their interests. For example, SAMI students designed water stencils and partnered with the zoo to paint them along pedestrian trails to share environmentally friendly practices with visitors.

Curriculum and materials

- Student-initiated and passion-driven courses allow students to dive deep into their interests and apply learning. During mini-term, micro-term, and Adventures and Application (A&A), students opt into interdisciplinary teacher-created courses ranging from beekeeping to robotics.
- Specialized curricula and pathways enable students to deeply engage in an area of interest. Schools offer majors like physical sciences and songwriting & audio that provide students with deep exposure to content areas.

Student Culture

- Schools prioritize student autonomy. This creates a culture where students are empowered to initiate ideas and take risks in their own learning.
- Investment in mentorship time builds strong community among students. Mentor Peer Groups (MPGs) enjoy an annual camping trip, shared traditions, and significant weekly time spent together.

Interventions

- Full inclusion (i.e., serving all students in a regular classroom full-time regardless of disability) provides equitable opportunities for all students. With targeted in-class supports, students with disabilities succeed in rigorous general education settings.
- Student mentors serve as teacher assistants via an elective course known as the Bridge program. This provides both leadership opportunities for the mentor and academic in-class supports for other students.

The "How": Operational Systems

Use of time

- SAMI's block schedule of 90-minute classes enables students to deeply engage in content. Fifteen-minute passing periods allow students to demonstrate responsibility as they navigate shared spaces (like the zoo) while also having time to re-energize (e.g., via a walk in nature).
- Significant time dedicated to mentor group every Friday provides consistency necessary to build a community of trust between students and mentor.

Use of physical space

- SAMI classrooms are not merely within indoor school buildings, but they are also nature trails at the park or exhibits in the zoo. This engages students, enables them to move, and helps them apply their learning in real settings.

The "Who": Talent

Leadership

- The visionary leadership of Jon Ketler initiated the concept behind SAMI, and the strong support of Tacoma Public Schools has enabled the long-term sustainability of the program.
- Partnership, collaboration, and sharing of best practices support students throughout the broader district and city. While the Next Move Internship program originated at SAMI, SOTA, and IDEA, the program is now available throughout Tacoma Public Schools.
- SAMI, SOTA, and IDEA are each led by two co-directors, enabling strong partnership and collaborative leadership.
- Leaders from across Tacoma have contributed to the school's success. For example, the head of the Metro Parks Department has provided crucial support needed for SAMI to be housed on park property.

Staff

- SAMI, SOTA, and IDEA have creatively leveraged education system policies to bring nontraditional teachers and leaders into schools. For example, SAMI has attracted industry hires via Type 2 teacher certificates and has hired adjunct, part-time faculty.
- Staff are encouraged to bring their passions into the classrooms. This engages students in deeper learning and motivates teachers to be creative

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