AMERICAN MODELING TEACHERS ASSOCIATION

STRATEGIC PLAN 2016-2018

The American Modeling Teachers Association (AMTA) enhances student learning in STEM through professional development and research in the Modeling Method of Instruction; classroom-tested curriculum resources optimized for Modeling Instruction classrooms; and collaboration and community among Modeling teachers.

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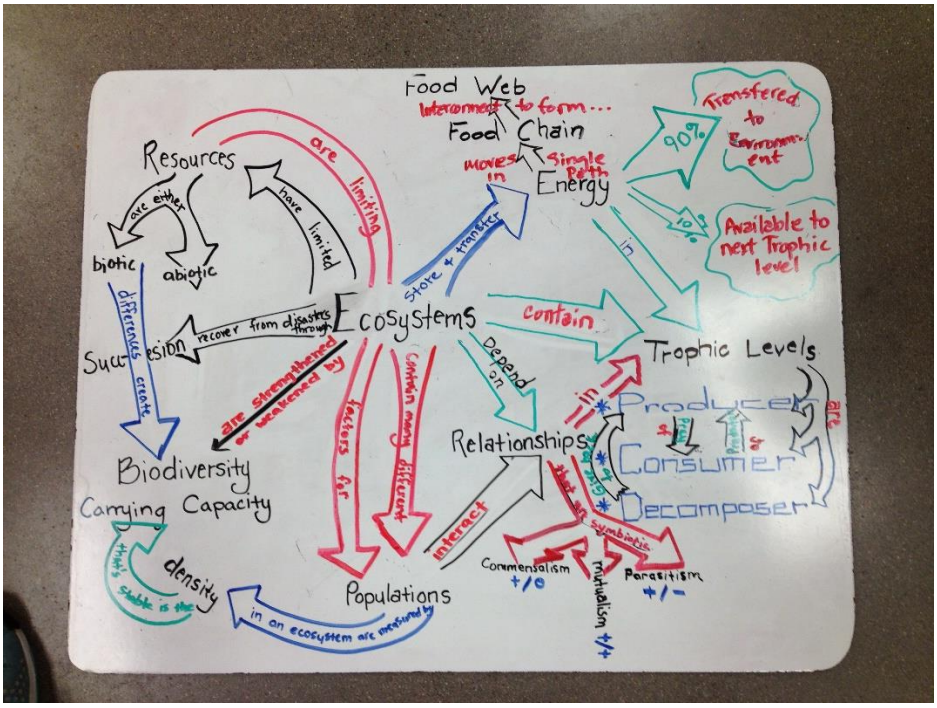
Mission and Values

Mission

The American Modeling Teachers Association (AMTA) enhances student learning in STEM through professional development and research in the Modeling Method of Instruction; collaboration and community among Modeling teachers: and classroom-tested curriculum resources optimized for Modeling Instruction classrooms.

Values

- AMTA is a grassroots organization, by teachers, for teachers, about teaching
- AMTA promotes reflective teaching practice
- AMTA supports teachers to enable reflective learning in their students
- AMTA continuously evolves its Modeling Instruction based on learning from actual classroom use



Crisis in US Science Education

Students in the United States lag their counterparts in the rest of the developed world in science achievement. According to tests administered to 15-year-olds by the Organization of Economic Cooperation and Development, US students performed slightly below the 65-country average in science, and students in 22 countries exceed US student achievement. As our economy becomes more and more reliant on technology, a home-grown workforce with the STEM skills needed to engineer our future is in short supply.

Teachers are on the front lines of addressing this crisis. A 2011 study conducted by Microsoft, for example, found that 57 percent of STEM college students were inspired to study STEM subjects because of a teacher or class, and 1 in five STEM college students said they decided to pursue a STEM career in middle school or earlier. AMTA retools teachers with a pedagogy that is proven to excite students and improve their understanding of basic physics and chemistry concepts by as much as 1-2 standard deviations over students taught in traditional ways. Teachers who adopt Modeling Instruction typically continue to use it in their classrooms for the remainder of their careers. Thus, Modeling Instruction is a vital tool in the national arsenal in the fight to improve STEM education for all students.

Modeling Instruction

Modeling Instruction is a pedagogy that uses student-driven authentic laboratory investigations to help students construct, refine and apply the fundamental conceptual models that form the content core of the sciences, represent these models in multiple ways, and share their understanding with their fellow students to promote deep understanding. In professional development workshops, teachers perform experiments in "student mode" using Modeling Instruction curriculum resources just as their students would, then discuss how they might work in classrooms in "teacher mode" conversations. Modeling is one of the eight key science and engineering practices in Next Generation Science Standards and one of the 8 Mathematical Practices singled out by Common Core State Standards.

Vision

Who

While it remains focused on teachers and their students, in five years, AMTA envisions partnering with a wide range of partners to strengthen its ability to deliver its mission. AMTA will have nurtured 3-5 additional local organizations devoted to disseminating Modeling Instruction, on the STEMteachersXYZ model (current local affiliates are STEMteachersNYC, STEMteachersPHX, STEMteachersDFW, STEMteachersSoFL), and have at least one international affiliate. AMTA and these local teacher alliances will have partnerships with school districts; administrators; curriculum coordinators; technology, engineering and math specialists; and individual school science departments. Modeling Instruction will be adapted for use by home schooling community and in informal science learning programs. AMTA will partner with, researchers, Principal Investigators and science teacher education institutions. It will have strong relationships with 5-10 funders who recognize and appreciate the value of Modeling Instruction. AMTA will be a well-recognized player among professional organizations related to STEM teaching and learning at the local, regional, state and national levels. It will be actively working with state Departments of Education, legislators and policy leaders to promote good STEM educational policy.

What

Recognizing that Modeling Instruction is at the heart of the AMTA mission, in five years, AMTA and its partners will have a clear understanding of what Modeling Instruction is (and is not), and will have appropriate quality control mechanisms in place to ensure that it consistently delivers high quality Modeling Workshops worldwide. AMTA will ensure that there is a pool of fully trained, certified workshop leaders in all subject areas adequate to meet the demand for Modeling Workshops nationwide. Comprehensive, classroom-tested, standards aligned, robust science curriculum resources for Modeling Instruction will be available as a benefit of AMTA membership. Computational thinking will be explicitly integrated into the Modeling Cycle. There will be Modeling Instruction science curriculum will be in development or available at every grade level, from pre-K-20.

The STEMteachersXYZ affiliate organizations will be true partners in providing professional development and local professional science teaching communities, and will be recognized as the local face of AMTA for workshops and outreach.

In addition to face-to-face professional development, AMTA will offer distance-learning workshops. A library of video-taped workshop resources will be available on-line, to use for multiple purposes.

AMTA will make significant progress toward the integration of all STEM subjects in a Modeling Instruction-based standards-aligned learning progression from K-12 for use by all its constituencies.

AMTA will expand its current programs to include consulting services for program evaluation, remediation and outreach (a source of new revenue). It will lead an active program of research on Modeling Instruction theory and practice. It will host an annual conference at which research will be a significant strand. It will have speakers and writers bureaus. It will be a clearinghouse for information on accredited Modeling Instruction-based degree programs and college credit for workshops around the country. It will serve pre-service teachers through its university and professional association partners.

In five years, AMTA will be a respected voice in the educational policy debate and will influence the formation of educational policy. One critical focus area it will address, both in its own structure and in the larger community, is diversity.

AMTA will have the ability to support all the science teacher communities who ask it for help.

Where

In five years, AMTA envisions expanding the number of locations where Modeling Instruction has a strong local presence (currently New York City, Raleigh, Phoenix, Chicago, Miami-Dade, Dallas-Fort Worth, St. Louis, Philadelphia, New Orleans, Columbus, middle Tennessee, Sacramento) to include regional, state-wide, national and international locations. It will have a presence at professional meetings, retreats, professional development workshops, in publications and on social media. It will operate virtually and face-to-face. It will expand its presence at both the grassroots and institutional level. Its members will teach using Modeling Instruction at the elementary, middle school, high school and college levels. Modeling Instruction curriculum will be used in biology, chemistry, physics, middle school and elementary science classrooms in public, charter and private schools.

Goals, Strategies and Tactics for 2016-2018

Goal: AMTA will expand the availability of Modeling Instruction Workshops

Modeling Instruction uses data-focused student-driven authentic laboratory investigations to help students construct, refine and apply the fundamental conceptual models that form the content core of the scientific disciplines. Next Generation Science Standards are poised to become the standard by which student success is measured, and modeling is one of the 8 key science and engineering practices of NGSS. Long before NGSS was devised, Modeling Instruction was a powerful tool for improving science education across the country, and its relevance is growing.

- **Strengthen Regional Hubs** - Over the past several years, AMTA has been successful in nurturing new, local affiliate organizations that have expanded the footprint of Modeling Instruction, while continuing to support long-standing high education centers of workshop activity. AMTA will work actively with existing affiliates (STEMteachersNYC, STEMteachersPHX, STEMteachersDFW and STEMteachersSoFL) and seek to nurture others, to support the provision of face-to-face Modeling Workshops for teachers in these regions. AMTA will help identify and recruit Modeling Workshop leaders, provide fiscal management services for Modeling Workshop host organizations when necessary, market all Modeling Workshops through AMTA's website, LISTSERVs, mailing lists and other resources, and provide host organizations with advice as needed.

- **Lead Workshop Leadership Development Training** – Fundamental to the ability to expand the footprint of Modeling Instruction is the availability of capable Modeling Workshop leaders. AMTA will continue to organize and participate in leadership development workshops for Modeling Instruction-trained teachers who have demonstrated competency in Modeling Instruction and an interest in workshop leadership. Currently workshop leader shortages exist in the areas of Biology, Middle School and distance learning. Over the next three years we will train at least 12 new middle school, 12 new biology and 12 new distance learning workshop leaders. The goal is that, by the end of this strategic planning period, workshop leadership talent will no longer be a limiting factor in the expansion of Modeling Instruction nationally.

- **Make Modeling Instruction Workshops Available in More Locations Nationally** – Modeling Instruction Workshops are currently available in 20 cities in states about a dozen states. In communities without their own local affiliate, AMTA will seek partnerships with organizations that can organize and host Modeling Workshops. Sponsors could be universities, school districts, funded research programs at IHEs and National Labs, other non-profits, foundations, national professional organizations, or others. In each locale, AMTA will identify local Modelers--teacher leaders--who can help connect their peers to the larger Modeling teacher community and to one another. These local leaders will link teachers to the core of the grassroots teacher community that is central to Modeling Instruction.

Make Modeling Instruction Workshops Available On-Line – Technology offers a powerful means to expand the Modeling Instruction community of trained teachers. AMTA will develop the capacity to provide Modeling Workshops in an online, synchronous learning environment. It will optimize its ability to provide for the real-time teacher interaction that is at the heart of all Modeling Workshops. By mid-2019 AMTA will have offered at least 10 distance learning workshops in physics, chemistry and or middle school.

Goal: AMTA will develop new workshops that expand the Modeling Teacher community by both grade level and subject matter

Modeling Instruction was originally developed for teaching physics. In 2005, in response to teacher demand Chemistry Modeling Workshops were developed and offered. In 2009 Modeling Biology Workshops were developed by a small group of teachers and in 2013, with the support of grant funding, AMTA undertook the development of Middle School Modeling Workshops. There remains a major opportunity to engage teachers and their students in their elementary and middle school years, and to expand the explicit use of engineering practices in all Modeling Instruction classrooms.

One goal of expansion across grade level and subject area is the ability to introduce crosscutting concepts such as systems, energy and the structure of matter at all grade levels and in various contexts to promote deep understanding and connections across all the scientific disciplines.

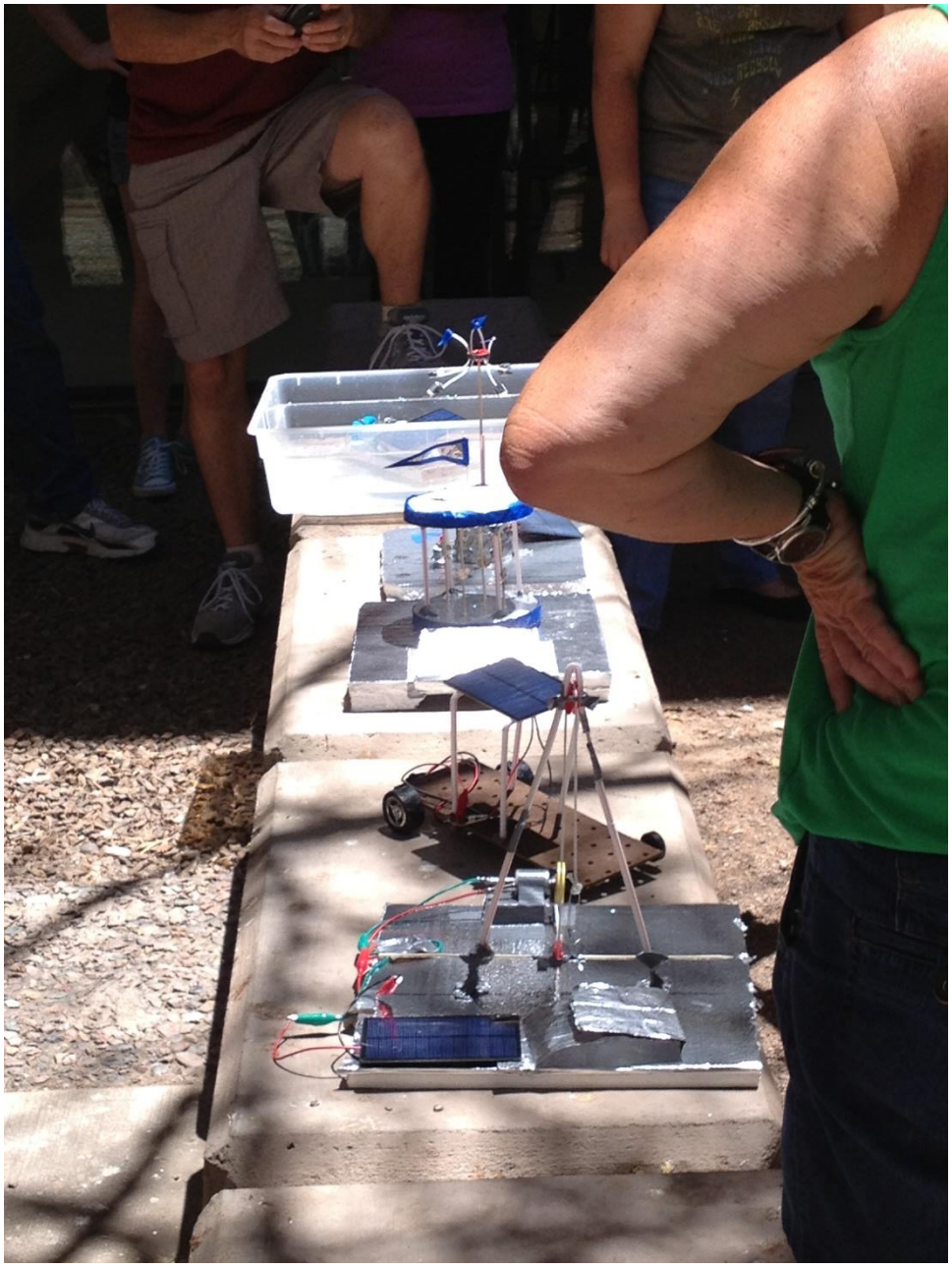
- **Fully develop Biology Modeling** – Modeling Instruction has its roots in physics and has expanded successfully into chemistry. There is a cadre of trained leaders, a tested set of curriculum and laboratory resources, and an accepted standard to test content knowledge in these subjects. Over the next three years, AMTA and its members will complete the development and refinement of Modeling Biology Workshops and curriculum resources for both the "biology first" and "biology last" instructional sequence, test resources in 3-week workshop settings and train a cadre of Biology Modeling Workshop leaders. By mid-2019, Biology Modeling Workshops Biology will be offered regularly to teachers in 8-10 locations across the country.

- **Refine and Scale-up the Dissemination of Middle School Modeling** –Middle school science teachers are perhaps the most underserved audience for science professional development, and because every student must take middle school science, middle school represents the best chance to address issues of social justice and inequality of educational opportunity in our schools. Middle School Modeling Workshops were first offered in the 2013. Over the next three years, AMTA will train at least 12 new Middle School Modeling Workshop leaders and work intensively with its local partners and others to offer these workshops in 10 locations around the country.

- **Enrich Physics First with Computational Thinking** – In early 2016, President Obama announced his Computer Science for All initiative to empower a new generation of American students with the computer science skills they will need to thrive in a digital economy. In response, AMTA will work with partner organizations to infuse computational thinking and model-building into its workshops and curriculum resources that support Physics First classrooms at the middle/high school level. By the end of the strategic planning period, a tested set of resources and a cadre of teachers trained to use them will be active in demonstration classrooms, and professional development workshops focused on this approach will be available.

- **Develop Astronomy Modeling** – Astronomy is typically introduced in elementary or middle school. AMTA will build on existing approaches to develop a Modeling Workshop in astronomy suitable for middle and high school teachers. By the end of the strategic planning period, a workshop with a well-developed set of resources that elucidate the basic models of astronomy will be in the testing phase.

Develop Physical Science Elementary School Modeling Workshop – Elementary school teachers are in an ideal position to inspire an interest in and enthusiasm for science learning in their students, but they are poorly equipped and have scant preparation in the sciences—especially in the physical sciences. AMTA will work with AAPT and other affiliates to create a Modeling Workshop in the physical sciences and companion curriculum resources that focus on the needs of K-5 teachers that helps them develop deeper content knowledge and more confidence in their ability to do substantive hands-on science with their students.



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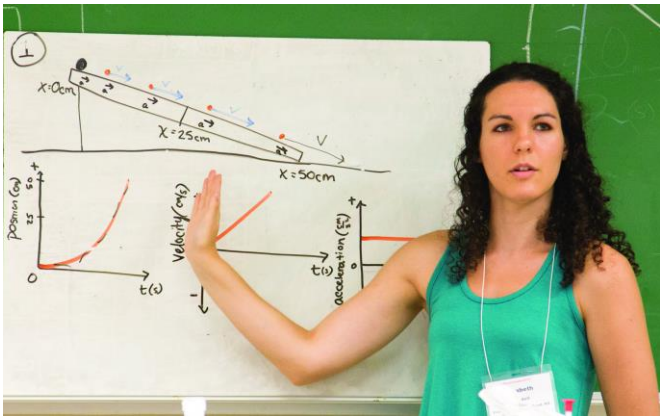
Goal: AMTA will develop standards for high-quality Modeling Instruction workshops and evaluate workshops against them

As Modeling Instruction has evolved and the Modeling Workshop leader community has grown, the Modeling Workshop experience has become somewhat variable depending upon when a where a workshop leader has their first exposure to Modeling. There is a risk of losing the distinctive practices and theoretical perspective that define the approach and are key to its success with students. As the Modeling Teacher community has grown, it has become more important to have a shared standard set of criteria for what constitutes a Modeling Workshop, and to provide ways for Workshop leaders to stay current with best Modeling practices.

- **Update skills of existing leaders** – Modeling Instruction leadership development has long been the purview of AMTA. As the array of disciplinary workshops has increased and new data collection and analysis technology, and practices such as computational thinking are incorporated into workshops, AMTA will continually update experienced leaders on the tools and practices they must master and incorporate into their workshop leadership.

- **Support the advancement of workshop leaders' expertise** – To help workshop leaders ensure that their workshops consistently deliver high quality professional development tor their teacher-participants, and to help Workshop leaders engage in reflective practice, AMTA will provide a variety of supports. Among the possibilities are: the development of a workshop leader's handbook, regular workshop leader virtual town hall meetings, a rubric for assessing the key elements of a Modeling Workshop; webinars on the latest Modeling research, tools to help workshop leaders enhance participants' understanding and management of whiteboard-mediated discourse; ideas for construction or procurement of simple experimental apparatus; tips on effective leadership; and videos illustrating all of the above.

- **Collect Data and Observe Workshops** – AMTA has traditionally played a coordinating role for the Modeling teacher community. It develops and curates workshop curriculum resources and coordinates a network of Modeling Workshop leaders, leaving the actual delivery of workshops to local affiliates who hire these leaders. As it seeks to develop and promulgate standards, the AMTA executive board and staff will collect data on Modeling Workshops nationwide and observe a representative sample of Modeling Workshops and classrooms where Modeling Instruction is in use with students to gather examples of excellence and to monitor quality.



Goal: AMTA will expand its services to develop new revenue streams

AMTA has historically depended upon membership fees and use fees for workshop curriculum materials to fund its budget. These sources of revenue are no longer adequate to support its current level of activity, much less the activities envisioned in this strategic plan.

- **Program/Project Evaluation** – While AMTA's focus in the past has been on preparing teachers to implement Modeling Instruction in their classrooms and supporting them throughout their careers, there exists within the membership and staff the expertise to contribute to the strengthening of science teaching in other ways. One is program evaluation. During the strategic plan period, AMTA will develop a network of partners in the academic arena for whom it will provide evaluation services for grant-funded educational activity. Evaluation looks at the impact of specific programs on teacher competence, confidence and/or student learning. By the end of the strategic planning period, AMTA will be under contract to evaluate at least four grant-funded projects.

- **Research** – While Modeling Instruction is in widespread use across the country, it is continually evolving. There is a perennial need for up-to-date research documenting its effectiveness as it is a method of instruction. AMTA will lead a research program, in partnership with one or more academic institutions, to examine Modeling Instruction as a conceptual framework for teaching and learning in order to understand how it works, to quantify its impact and to disseminate results to the national community of science educators.

- **Consulting** – Another area AMTA plans to explore is hiring out its expertise to school districts, universities, policy forums and other entities involved in the knotty problem of improving science education in the U.S. Given Modeling Instruction's decades-long track record of success, AMTA has much to offer in helping to shape professional development programs, grant-funded projects, and educational policy.

- **Speakers and Writers Bureau** – With 2,500 members, AMTA has an outstanding network of experienced, passionate teachers and teacher-leaders who are devoted to honing their craft and improving science learning among their students. As of 2015, 50 modelers have been honored with the prestigious Presidential Award for Excellence in Mathematics and Science Teaching. Many modelers are not only passionate, but articulate. AMTA will mobilize this resource to form a speakers and writers bureau that can provide first-hand "stories from the front" and informed commentary to forums and outlets where such voices are often lacking.

Goal: AMTA will remain financially viable

AMTA grew out of the commitment of Modeling Teachers themselves, who wanted a means to support the passionately-committed community of physics and chemistry teachers that was created through the sixteen years of National Science Foundation funding that created and developed Modeling Instruction. Unlike most other educational reform efforts, Modeling Instruction is still alive, well and growing 11 years after NSF funding expired. AMTA is the coordinating entity of a vibrant community of 2,500 teachers and 4 local affiliate organizations. It is now time for it to develop the financial underpinnings that will sustain it for the long term.

- **Strengthen access to funding resources** – Grant funding for AMTA's activities has historically been opportunistic and episodic. In the strategic planning period, AMTA will make a concerted effort to build relationships that can lead to predictable sustained funding. It has already had some success in this endeavor in its partnership with STEMteachersNYC, and will continue to partner with local Modeling Instruction affiliate organizations to access funding in their communities. It will partner with national organizations with whom it shares members, such as the American Association of Physics Teachers, the American Physical Society and the American Chemical Society, to craft projects that further the field and are attractive to funders. It will actively offer its services to universities who need a means of outreach for federal and state grant proposals. And it will aggressively pursue the funding possibilities presented by consortiums such as 100Kin10, of which it is a member. By the end of the strategic planning period, AMTA expects to be a partner in at least five grant-funded initiatives and to have secured grant funding for at least two projects of its own.
- **Build recognition** – While AMTA has an impressive track record among teachers, especially physics teachers in the U.S., 10% of whom are Modelers, it has succeeded in achieving national recognition as a provider of high quality professional development only in the physical sciences. In the strategic planning period, AMTA will devote time and resources to expanding its recognition as an effective actor in the STEM education universe by cultivating relationships with key leaders, speaking out on relevant issues, improving its web and social media presence, and publishing in influential arenas.

- **Influence the policy debate** – All too often, teachers are absent from policy discussions at the local, state and national levels that affect their daily lives. With initiatives like the Next Generation Science Standards and Computer Science for All, that policy discussion is increasingly focused on STEM education. AMTA has the experience and expertise to make a contribution to this debate informed by decades of successful classroom experience in a variety of settings around the country. During the strategic planning period, it will actively seek opportunities to participate in the debate and help shape STEM education policy to reflect the real-world experience of its members.

Contact Information

COLLEEN MEGOWAN-ROMANOWICZ PHD EXECUTIVE OFFICER	JEFFREY HENGESBACH ASSOCIATE EXECUTIVE OFFICER	WENDY HEHEMANN NATIONAL WORKSHOP COORDINATOR
		
Tel (480) 704-4605 amtaexec@modelinginstruction.org	**Tel** (480) 704-4605 jeff@modelinginstruction.org	**Tel** (480) 854-4764 wendy@modelinginstruction.org

Company Information

American Modeling Teachers Association
5808 13th Ave
Tel 480-704-4605
http://modelinginstruction.org

AMTA
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