Inspire the Next Generation of STEM Leaders

STEM Expo Manual

A HOW-TO GUIDE FOR PLANNING YOUR OWN HANDS-ON, INTERACTIVE, EDUCATIONAL STEM EVENT

Produced by the Southeastern Massachusetts/Cape & Islands STEM Network

The Southeastern Massachusetts/Cape & Islands STEM Network is funded through the Department of Higher Education's STEM Pipeline Fund. The Fund seeks to improve teacher preparation in science, technology, engineering and mathematics (STEM) subjects and to increase student interest in, preparation for, and success in STEM Careers. The CONNECT Partnership serves as administrator of this regional STEM network.

Acknowledgements

On May 24, 2012, 500 students in grades 5, 6. 7 and 8, more than 100 STEM professionals and approximately 200 teachers and representatives from business, government and community organizations attended the 2012 Southeastern Massachusetts STEM Expo. Evaluations from participants noted that it was a meaningful educational experience for students while providing classroom resources and opportunities to meet potential STEM partners to other attendees.

Many people and organizations are responsible for the success of the STEM Expo. We would like to thank the collaborators representing more than 60 organizations for providing STEM activities and resources as well as the volunteers who welcomed and engaged attendees. Along with the in-kind contributions, we are grateful to those who donated door prizes and to Lockheed Martin Sippican, Inc. for being the STEM Expo refreshment sponsor.

RELATED LINK
Door Prize Donors & Sponsors

We also want to thank Bridgewater State University for providing the space, equipment and staff to ensure that the STEM Expo ran smoothly and accommodated the needs of presenters and attendees.

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The SE MA STEM Network

The SE MA STEM Network is one of seven Regional PreK-16 STEM Networks, supported by the Department of Higher Education's STEM Pipeline Fund. The networks bring together K-12, public and independent higher education, businesses, and regional and community organizations around science, technology, engineering and mathematics (STEM) education to address the Massachusetts STEM Goals developed by the Governor's STEM Advisory Council.

MA STEM Quantitative Goals:

- **Increase K-12 student interest in STEM Majors**
- **Increase STEM achievement of Pre-K-12 students**
- **Increase % of students who demonstrate readiness for college-level study in STEM fields**
- **Increase number of students who graduate from a post-secondary institution with a degree in a STEM field**
- **Increase STEM classes led by effective educators (PreK-16)**
- **Align STEM education programs with workforce needs**

MA STEM Qualitative Goals

- **Community Engagement:** Communities will foster increased student interest in STEM through programming, spreading awareness, and enlisting parents, educators, employers, student leaders and STEM professionals as advocates. PreK-16 students will be encouraged to engage in experiential and applied learning opportunities outside of the classroom.
- **Academic Coherence:** STEM standards, curriculum frameworks, instruction and assessments will focus on deep content knowledge, mathematical and scientific inquiry and problem solving/design and align vertically across grade levels and horizontally across subject strands to ensure coherent subject progressions among schools, across districts and through college.
- **Educator Development:** Massachusetts educators at every level will possess deep subject matter knowledge that spans grade levels; be skilled in the pedagogy of inquiry and problem solving; integrate STEM into coherent classroom instruction; make effective use of technology; and integrate data analysis and assessments as a way of guiding practice.
- **STEM employers and STEM professionals:** will serve as mentors, internship/co-op supervisors, leaders of community-based after-school and expanded learning time programs and partner with schools to offer new programming and expand existing programming and serve as collaborative partners in high quality professional development and pre-service programs.

The SE MA STEM Network is administered by the CONNECT Partnership, a consortium of five public higher education institutions in Southeastern Massachusetts: Bridgewater State University, Bristol Community College, Cape Cod Community College, Massasoit Community College and the University of Massachusetts Dartmouth. For more information visit the CONNECT website.

SE MA STEM NETWORK Programs

The SE MA STEM Network works collaboratively with early childhood and preK-16 educators, business and industry partners, community organizations and institutions of higher education. Information about STEM careers, STEM initiatives and upcoming events is communicated through the *Petri Dish* newsletter, Regional STEM Directory and the STEM Career Exploration website. Since 2011, the network has convened meetings to bring stakeholders together to develop programs and events to support the MA STEM goals. Programs and events include the *Corporate Partners Program*, *2011 Business and Educators Bridging the STEM Gap Meeting*, *2012 STEM Expo*, *2012 & 2013 regional STEM meetings,* and the *2013 STEM Resource Fair*. For additional information about the SE MA STEM Network visit the website.

STEM EXPO MANUAL

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Why a STEM Expo Manual?

As a result of attending the STEM Expo on May 24, 2012, several school districts expressed interest in replicating the STEM Expo or adding elements of the STEM Expo to existing programs. In an effort to support them, the SE MA STEM Network has created the STEM Expo Manual. The Manual includes a description of the development and implementation process as well as materials that can be adapted to meet the goals of others planning a STEM Expo.

INSPIRE THE NEXT GENERATION OF STEM LEADERS
Host an Exciting, Meaningful STEM Event

Do you want to host a science, technology, engineering, or math (STEM) event in your community but don't know where to start? The STEM Expo Manual provides tools and resources to develop and implement an event to increase student interest in STEM fields.

ENVISION YOUR FUTURE
2012 STEM Expo

The primary purpose of organizing "Envision Your Future" was to provide students with experiences that would allow them to see the opportunities ahead for those with skills in STEM.

GOALS:

- **Increase student interest in STEM**
- **Introduce STEM Majors and Related Careers**
- **Involve the Community –** early childhood educators, K-12 educators, post-secondary educators, business, government officials, informal educational institutions, parents and others

KEY ELEMENTS:

The STEM Expo provided engaging STEM activities to increase student interest in STEM and provided resources to support school and community STEM initiatives that prepare students for STEM studies and the workplace. Over 800 attendees represented more than 30 school districts from Canton to Provincetown were represented, including 500 students in grades 5-8 and their teachers from 17 school districts and School District Community Teams from 18 school districts.. Over 150 presenters from 60+ businesses, educational and community organizations and governmental entities provided activities linked to STEM careers.

Student and Community Involvement

The STEM Expo brought together students in grades 5-8 and adults representing business, government, the community and education. Adults were able to see the value of inquiry-based and hands-on learning as students engaged in STEM activities linked to a broad array of STEM careers.

Student/Teacher Groups: *(30 students per school district accompanied by 3 adults*) Students in grades 5-8 engaged in exciting STEM activities with STEM professionals that linked what they were learning in the classroom to STEM career pathways. Classroom teachers gathered STEM career information and resources to use in their classroom.

Community STEM Education Teams:

Formal/Informal Education: School administrators, guidance professionals, school committee members, STEM and Non-STEM teachers and other representatives from communities such as: early childhood educators, local business leaders, after-school program providers, informal educational institutions and local and state government representatives.

The purpose of creating the teams was to bring individuals representing different entities in the community together to learn about the importance of STEM and, depending on their role in the community, foster their interest in supporting STEM efforts in the home, community and schools.

RELATED LINKS
Information for Student/Teacher Groups
Information for School District Community Teams

Activities presented by STEM professionals linked to careers in STEM Majors
Focusing on Goal 1 of the MA STEM goals, to increase K-12 student interest in STEM majors, the STEM Expo activities were organized by STEM major. Students engaged in hands-on activities that involved inquiry and project-based learning led by STEM professionals in a range of disciplines. Signage designated the STEM major area where attendees participated in STEM activities and met STEM professionals who provided information about STEM majors and related careers:

- Agriculture & Natural Resources
- Architecture
- Biological & Biomedical Sciences
- Computer & Information Science
- Engineering& Engineering Technology/Technicians
- Health Professions & Clinical Sciences
- Mathematics & Statistics
- Physical Sciences
- Other STEM Majors – precision production, military technology, mechanic/repair technician.

RELATED LINKS
List of Workshops, Activities & Demonstrations
List of Collaborators

CATALYST FOR EXPANDING STEM LEARNING OPPORTUNITIES

The 2012 STEM Expo was a catalyst for increasing student interest in STEM and inspiring stakeholders to work together to expand STEM learning opportunities.

Impact of STEM Expo

- Many representatives from education, families, business, government, and community organizations who attended met after the Expo to develop community STEM plans that include a continuum of STEM learning to reinforce and expand STEM skills.
- Students shared STEM Expo experience with classmates and school committee members via PowerPoint, websites, posters and by duplicating STEM activities in their schools.
- School districts, businesses and community organizations have and plan to replicate elements of the STEM Expo. Examples include: North Attleboro Middle School 2013 STEM Career Expo, Plainville's 2013 K-6 Mini STEM Expos, and the 2014 Tri-Town STEM Career Expo at Wheaton College organized by the Foxboro, Mansfield and Norton Public Schools.

Evaluation: *97% of Stakeholders -- Expo Met or Exceeded Expectations*

According to the 2012 STEM Expo evaluation sent to all collaborators, 97% stated that the STEM Expo met or exceeded their expectations. Over 90% said they made a useful connection and 80% of the boys and 70% of the girls felt that as a result of attending the STEM Expo they were interested in learning more about STEM.

HOW DO YOU RECRUIT COLLABORATORS?

Successful collaboration is based on a mutual benefit. Each collaborator needs to understand how involvement supports their personal and professional goals and be given the opportunity to participate in the development of the event.
While making all decisions yourself may be more efficient, if you want to strengthen relationships and lay the foundation for future work together, then collaboration is a key factor.

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STEM Stakeholders/Collaborators included:
2012 STEM Expo collaborators included members of Student/Teacher Groups (students in grade 5-8), STEM Education Teams, Expo Planning Committee and presenters, and were drawn from:

> **Formal/Informal Education:** Representatives from informal educational institutions such as a library, zoo, museum, after school program and higher education, early childhood, and school districts including: school committee, administration, guidance, school committee, preK-12 STEM and non-STEM teachers such as art, English, social studies, physical education.
> **Community:** representatives of the media, parents, youth groups, senior citizens.
> **Business/Industry:** representatives of businesses, chamber of commerce, school-to-career.
> **Government:** town manager, mayor, state and federal representatives.

How do you Identify Potential Collaborators?

Start with former collaborators and colleagues

Plan to meet first with people with whom you have worked successfully in the past. Listen to any objections or concerns they have about the event. More than likely they will sign on as collaborators and you can add them to the "Collaborators to Date" on the development agenda. This will be important information to review with representatives of organizations you have not worked with in the past.

Get Referrals – colleagues, friends, family

Describe the characteristics you are looking for in a collaborator and ask for referrals. Regardless of whether you think the referral is a match, follow up and get back to the person who made the referral with an update.

Attend events and meetings to connect

Along with referrals, a source of new collaborators are events and meetings attended by STEM stakeholders. When attending a meeting, always have information with you that you can give to potential collaborators and follow up with those that are interested.

Don't hesitate to reach out to strangers!

As with all things, an internet search may result in organizations and contacts you didn't already know—don't hesitate to reach out to non-profits, government agencies, educational institutions, and companies in your area that share your interest in promoting STEM.

How do you Reach Out to, Recruit, and Involve New Collaborators?

Recruiting the right collaborators often requires more than just an invitation. It is best to meet the potential collaborator first and assess whether the person understands the purpose of the event and is able to participate. The list of "Collaborators to Date" will illustrate to the person the type of organizations involved and will most likely increase their interest in participating if they see an organization listed with a similar mission or one that is well known for high standards.

- **Preparing for Meeting with Potential Collaborators**
  - Draft sample activities
  - Create a development agenda with a development calendar
  - Develop a one pager that includes goals, audience, elements, collaborators to date, and "How You Can Help"
  - Create a list of ways the organization could collaborate before meeting/phone call
  - Follow up with a summary of meeting via email

People you want to collaborate will want to know the details about the event even though you are in the development phase. They will want to gather enough information that assures them that the event will be well organized and meet the goals of the organization they represent. Having an agenda that includes a development calendar sends a message that you are organized and reinforces that you are seeking input before final decisions are made.

RELATED LINKS

Development Agenda

Sample Program Overview for 2014 Tri-Town STEM Expo

For people you have worked with before, emailing the development agenda and following up with a phone call may be enough. For people you've not worked with previously, plan on a face to face meeting. Prior to the meeting, review the organization's website to understand its mission and goals. Many people who would like to be involved may not be able to see how they can be involved. Think about specific ways the organization would benefit from participation and could be involved in case the questions arise during the meeting.

Following up with Potential Collaborators

After the meeting, send a follow up email or handwritten note. (While it is standard practice today to send emails, sending a handwritten note to a person you met for the first time would be a refreshing reminder of the value you place on the time they took to meet with you.) If the person decided not to collaborate, thank them for their time and note that you look forward to working with them in the future. If they agree to be a collaborator, along with thanking them for referrals and/or ideas, send a draft description of what you understand their role to be and ask that they update the description and sent it back to you to ensure you understand their role in the event.

- **Involving Collaborators in Planning Meetings**
- **ONE OF THE BEST WAYS TO GET BUY-IN FROM COLLABORATORS IS TO INVOLVE THEM IN THE PLANNING OF THE EVENT. THIS ENSURES THAT THE EVENT WILL MEET THE NEEDS AND GOALS OF ALL INVOLVED AND REPRESENTS A WIDE RANGE OF COMMUNITY INTERESTS.**

SOME OF THE DECISIONS THAT CAN BE MADE DURING PLANNING MEETINGS INCLUDE:

- Finalize event goals, materials, marketing plan
- Develop event evaluation
- Confirm logistics

The 2012 STEM Expo planning meetings were held monthly with the meeting dates set six months in advance. Collaborators could attend or call in. All collaborators were emailed the agenda which included a summary of what would be the focus of each meeting. This allowed collaborators to decide which meeting would be of most interest to them. This process also kept collaborators who did not attend the meetings informed about the development of the STEM Expo and gave them the opportunity to share their thoughts about marketing, activities, event evaluation and logistics.

RELATED LINKS

STEM Expo Planning Calendar & Agenda
Sample Planning Meeting Agenda
Sample STEM Expo Development Schedule

USING PUBLIC RELATIONS TO GAIN EXPOSURE

Using public relations (PR) correctly can dramatically raise the impact of your event. PR involves spreading the word to the general public to gain exposure for a cause. For the STEM Expo, PR included promoting the event and presenting information to encourage individuals and organizations to become collaborators. The purpose was to raise awareness about the importance of STEM and to encourage people to attend the 2012 STEM Expo.

- **Content**
  To ensure the success of your PR effort, the content must be clear, concise, and appeal to your entire audience. Our content included the goals of the STEM Expo determined by the MA STEM Plan, STEM Education Team members, and collaborators. The consistent messages, list of credible collaborators, and description of engaging activities and useful resources showed that STEM Expo would be a meaningful event that would be worthwhile for students, teachers, and STEM Education Team members to attend.

- **Format**
  It is important that format has considerable visual appeal and enhances the impact of the key message. The format must flow logically to help the reader easily navigate the narrative. Including relevant and creative tag lines can also help hold the readers intention. To attract readers to your informational materials include appropriate photographs and visually appealing colors.

- **Distribution**
  Your audience must have access to your materials, which makes distribution a very important aspect of a successful PR effort. Use distribution channels that ensure that your audience will be exposed to your information. Try to incorporate the internet into the distribution of your information to reach a larger audience. Materials for the STEM Expo were distributed via the SE MA STEM Network website, the *Petri Dish*, newspaper articles and at meetings with potential collaborators. Collaborators then forwarded information to their networks and posted it on their websites.

RELATED LINKS
Sample PR and Informational Materials:
Expo Overview
List of Workshops, Activities & Demonstrations
Petri Dish (sample article)
Press Release (pre-event)
Press Release (day of event)

PREPARING STUDENTS FOR THE STEM EXPO

To increase the impact of the STEM Expo it was important to ensure students were prepared to attend the event. Students are likely to learn more from the event if they are familiar with STEM material and are prepared to ask questions. Teachers were sent information that they could use to familiarize students attending the STEM Expo with the range of activities and workshops available and the questions they could ask STEM professionals. Information included a SE MA STEM Network Career Exploration Website Activity, a list of STEM majors and a sample STEM Career Exploration Student Workbook. All students received the complete workbook upon arriving at the STEM Expo and used it to document their experience and how it related to STEM majors and STEM careers.

RELATED LINKS

Preparing Students for the STEM Expo:
STEM Career Exploration Student Workbook (Sample)
STEM Majors
STEM Career Exploration Website Activity

Information for Student/Teacher Groups:
General Information
Directions and Parking
Workshop Selection Forms
Photo/Video Permission Forms

PROGRAMS & APPLICATION PROCESS

PROGRAM FOR STUDENT/TEACHER GROUPS

There were over sixty-five workshops, activities, demonstrations and displays available to students at the STEM Expo. They were grouped by STEM major in order to reinforce the link between STEM Majors and STEM careers in: Agriculture & Natural Resources, Architecture, Biological & Biomedical Sciences, Computer & Information Science, Engineering & Engineering Technology/Technicians, Health Professions & Clinical Sciences, Mathematics & Statistics, Physical Sciences, and Other STEM Majors (precision production, military technology, mechanic/repair technician).

RELATED LINKS

List of Workshops, Activities & Demonstrations

Activity Areas

Activities, demonstration and displays were grouped by STEM major and were located in two open areas. Students could engage in those activities that were of most interest to them.

Workshops

There were fourteen workshops that required registration. In their introduction, presenters noted the relationship of the workshop to STEM Majors and STEM careers.

RELATED LINK

Workshop Selection Form

PROGRAM FOR COMMUNITY STEM EDUCATION TEAMS

The purpose of creating Community STEM Education Teams was to bring individuals representing different entities in the community together to learn about the importance of STEM and, depending on their role in the community, foster their interest in supporting STEM efforts in the home, community and schools.

RELATED LINK

General Information for Community STEM Education Teams

APPLICATIONS

Unfortunately, if the event is very successful there may not be enough available space to accommodate every individual who wants to attend. To address this problem, create an application process to avoid overcrowding the event.

Student/Teacher Groups:

Know how many students and teachers can attend your event. At the STEM Expo, each Student/Teacher Groups included thirty students and was accompanied by three teachers. A total of 17 school group applications were accepted, four schools were placed on a waiting list but were unable to attend.

Student Selection: A successful event has a students from different backgrounds who have varying interest levels. While the selection of students was left to the schools, they were encouraged to be inclusive and not only select those students already interested in STEM. Schools found selecting the students who would attend was not an easy task. The process was varied. Some schools randomly selected students from regular and special education classes. Others created essay contests answering why students wanted to attend and how they would convey what they learned to their peers. In several schools,

over 150 students expressed interest. In fact, one school had over 200 students voluntarily submit essays for the 30 openings available.

Requirements: To greater the impact of the event, make sure that attendees are willing to share the information they acquired at the STEM Expo. This increases the impact of the event and helps other gain interest in STEM topics. Applications required that the applicant indicate whether students and teachers would share information after the STEM Expo and whether teachers would be willing to share STEM Education Plans at SE MA STEM Network Education Regional meetings.

RELATED LINK
Student/Teacher Group Application

Community STEM Education Teams
Like the Student/Teacher Groups, community representatives who attend the event should have diverse background and interest levels. Community representatives wanting to attend the STEM Expo were asked to form STEM Education Teams with representatives from at least two of the following STEM Stakeholder groups: Formal/Informal Education, Community, Business/Industry, and Government. The only application requirements was to ensure that attendees were willing to share the information with friends, family, and colleagues.

RELATED LINK
Community STEM Education Team Application

EVALUATION

After the event, know what was successful and what needs to be improved. A successful evaluation form can answer all of those questions and provide all the information needed to make your next event a bigger success.

Suitable survey questions include the following:

- Did the event met or exceeded expectations?
- Did the event increase your knowledge and interest in STEM topics?
- Did the event provide resources to support in-school and out-of-school instruction?
- Did the event create opportunities for positive dialogue about STEM?
- Did the event create opportunities to support STEM initiatives?

Student Evaluation

Evaluations often take time to complete. Make sure that each Student/Teacher Group is given student evaluations which can be completed at school and mailed to the event coordinators at a later date. Because evaluations are vital to future success, it is important to get as much feedback as possible. Create incentives for those who complete and return the evaluations by offering an opportunity to win door prizes.

RELATED LINK

Student Evaluation

STEM Expo Impact Survey

Utilize email and the internet to provide community attendees with surveys. Send a survey to all teachers, community representatives, and collaborators. Response rates with these individuals are much greater when evaluations are sent via email rather than requiring individuals to mail back their responses.

RELATED LINKS

STEM Expo Impact Survey

LOGISTICS

Collaborators & Presenters

It is also important to ensure that collaborators and presenters are aware of their responsibilities and student's expectations. Send information on the schedule and parking as well as a sample of the Career Exploration Student Workbook that students would be completing during the STEM Expo.

RELATED LINKS

Information for Collaborators & Presenters:
General Information/Schedule
Directions & Parking
Career Exploration Workbook Sample Questions
Photo/Video Permission Form

Ambassadors & Volunteers

Events such as the STEM Expo are not possible without the assistance of volunteers. Volunteers need to understand their role and be given adequate time to review logistics. For the STEM Expo, volunteers were invited to planning meetings and asked to meet the day before the STEM Expo to see the location of the exhibit area and workshops and to review the attendee schedule and materials.

RELATED LINKS

Information for Ambassadors and Volunteers:
General Information
Directions & Parking
Roles
Photo/Video Permission Form

Registration Process – Schedules – Maps – Signage

Successful event management is in the details. Well before the event, plan the location and process for attendee and exhibitor registration. Ensure that all attendees are provided with schedules of important events. Maps and signage are key to effective traffic flow.

RELATED LINKS

Registration Information for Student/Teacher Groups & School District Community Teams