Higher Education and Secondary Schools Coming Together: Strengthening STEM Education Through Collaboration

Maine STEM Landscape Analysis: Secondary Schools

MAINE EPSCoR

Campus Compact Maine

STEM

Table of Contents

Maine STEM Landscape Analysis: Secondary Schools

Executive Summary

In 2014, Maine Campus Compact (MCC), with support from Maine Experimental Program to Stimulate Competitive Research (EPSCoR), conducted a statewide landscape analysis to assess ways to advance science, technology, engineering, and math (STEM) education and collaborative opportunities between higher education, K-12 schools, and community partners in Maine. Seventy school districts and 20 higher education institutions throughout the state received one of two surveys: one for secondary schools and the other for higher education. In total, surveys were sent to 573 secondary school (SS) and higher education (HE) educators, administrators, and staff with a 29% response rate (see Appendix Tables 1 and 2). In this report, we will detail the findings of the SS report including current STEM education practices and challenges and opportunities in STEM education. Informed by these findings, this report also introduces a comprehensive model emphasizing initiatives, known as *STEM Engaging Initiatives,* to address identified gaps in Maine STEM education.

Central findings from the SS survey revealed:

- SS respondents consider the top three challenges facing STEM education in Maine to be: insufficient funding for K-12 STEM education (96%), lack of good professional development for STEM educators, (88%), and inadequate links within the K-20 pipeline (87%).
- 90% of SS respondents believe not enough collaboration with HE higher education institutions exist.
- 90% of SS respondents believe that collaboration between K-12 and higher education would help strengthen STEM education.
- 93% of SS respondents believe that community engagement strengthens STEM efforts.
- The most effective collaborations with HE as identified by SS respondents include: (1) field trips to HE research sites, (2) professional development opportunities, and (3) one-week STEM learning modules for the classroom.

Introduction: The Need to Increase STEM Collaboration in Maine

By 2018, nationwide job openings for careers in technology and engineering are expected to increase by 50% in comparison to non-STEM jobs.[1] In Maine, one-in-seven new jobs will be STEM related.[2] Despite these trends, in 2010, Maine ranked second-lowest in New England in the number of STEM bachelor degrees granted [3] while in 2014, Maine ranked 44th nationally in college graduates employed in STEM occupations.[4]

An added consideration is that recent research has linked students' academic trajectory in STEM fields with family background, reporting that socio-economic status significantly influences a SS student's participation and achievement in STEM course work.[5,6] Secondary school students from middle- and high socio-economic status backgrounds receive higher levels of encouragement, exposure, and access to STEM experiences that may foster greater interest, confidence, and academic skills in STEM necessary to achieve a postsecondary degree.[7] On the opposite end of the spectrum, these results pose a difficult challenge for SS students in Maine, where in 2015, nearly half of all Maine students (47.6%) qualified for free and/or reduced meals in school.[8] These statistics suggest that Maine students need increased knowledge and skills in STEM to become academically competitive, to engage as citizens, to find meaningful professional work, and to build and sustain vibrant communities.

What, then, can be done to set more Maine students on a path to pursue STEM education and careers? Dr. Jay Labov, a Senior Advisor for Education and Communication for the National Academy of Sciences and former faculty member in the Biology Department at Colby College, advocates for framing STEM as an *educational ecosystem*, in which each classroom, student, institution, administrator, and teacher has a role to play, depending on and influencing one another.[9] Other STEM researchers and policymakers funded by the Noyce Foundation explain:

> "A STEM learning ecosystem encompasses… a variety of environments that together constitute a rich array of learning opportunities for young people. A learning ecosystem harnesses the unique contributions of all these different settings in symbiosis to deliver STEM learning for all children. Designed pathways enable young people to become engaged, knowledgeable and skilled in the STEM disciplines as they progress through childhood into adolescence and early adulthood."[10]

Affirming the need for more collaboration, the Maine Department of Education's (DOE) Strategic Plan for STEM (2010) states, "the Department recognizes that collaboration with governmental, non-governmental and higher education partners is essential to strengthening STEM education for Maine students."[11]

Recognizing the underutilized resource of higher education, in 2014, Maine Campus Compact launched a new STEM initiative aimed at strengthening the link between higher education and K-12 schools as well as empowering K-20 STEM collaborative opportunities. MCC, a coalition of 18 Maine campuses engaged in reinvigorating the public purpose and civic mission of higher education, is uniquely positioned to work with institutions of higher education to take a more

collaborative role and to address what the DOE has stated as critical for strengthening STEM education in Maine.

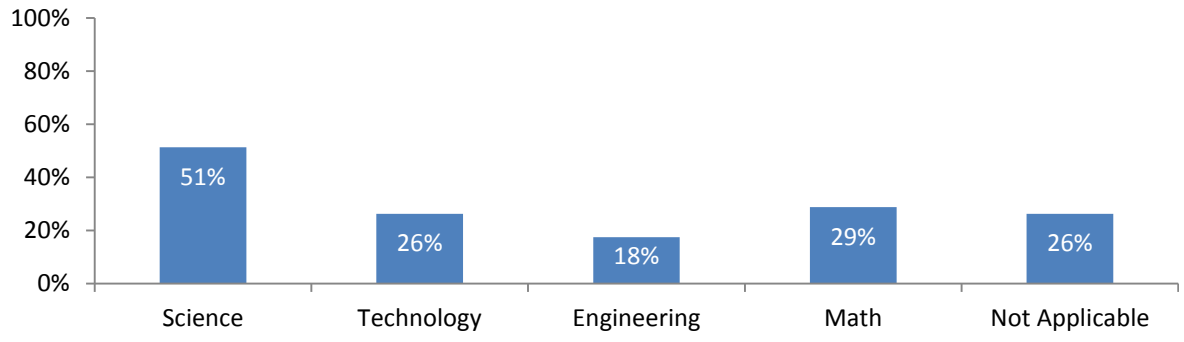
In 2014, with support from AmeriCorps VISTA and the Maine Experimental Program to Stimulate Competitive Research (Maine EPSCoR) at the University of Maine, MCC conducted two statewide surveys (one for SS educators and one for HE faculty) and a series of related focus groups. These surveys inquired about the current landscape and opportunities for strengthening the STEM pipeline through collaborative efforts. The results of the surveys have offered new, helpful insights. Additionally, they have confirmed some expectations about the challenges and pressures of the current STEM educational environment. Perhaps most importantly, although the results reported an inadequate link between higher education and secondary schools throughout the state, they have also provided the beginnings of a road map for addressing these gaps.

The aim of this report* is to showcase important findings from the SS survey about current STEM challenges and practices in Maine, and outline potential collaborative opportunities between K-12 schools and higher education. Informed by these findings, MCC aims to mobilize educators and faculty to take a more active role in initiating and participating in STEM initiatives to bridge these identified gaps with Maine K-20 STEM education.

Study Sample

The SS survey sample consisted of educators and administrators from towns and/or school districts within five-to-ten miles surrounding twenty colleges and universities in Maine. Superintendents, principals, and department chairs for high schools and middle schools from 70 towns were identified across the state (See Appendix Tables 1 and 2). The SS survey was sent to a total of 303 secondary school educators/administrators, with a 29% response rate. Sixty-one percent (61%) of those who responded were classroom educators teaching in STEM fields (Figure 1). Seventy percent (70%) of respondents were involved with grades 9 through 12.

Figure 1. STEM subjects taught by SS respondents



* MCC has a comparable HE report and Executive Summary available.

Study Findings

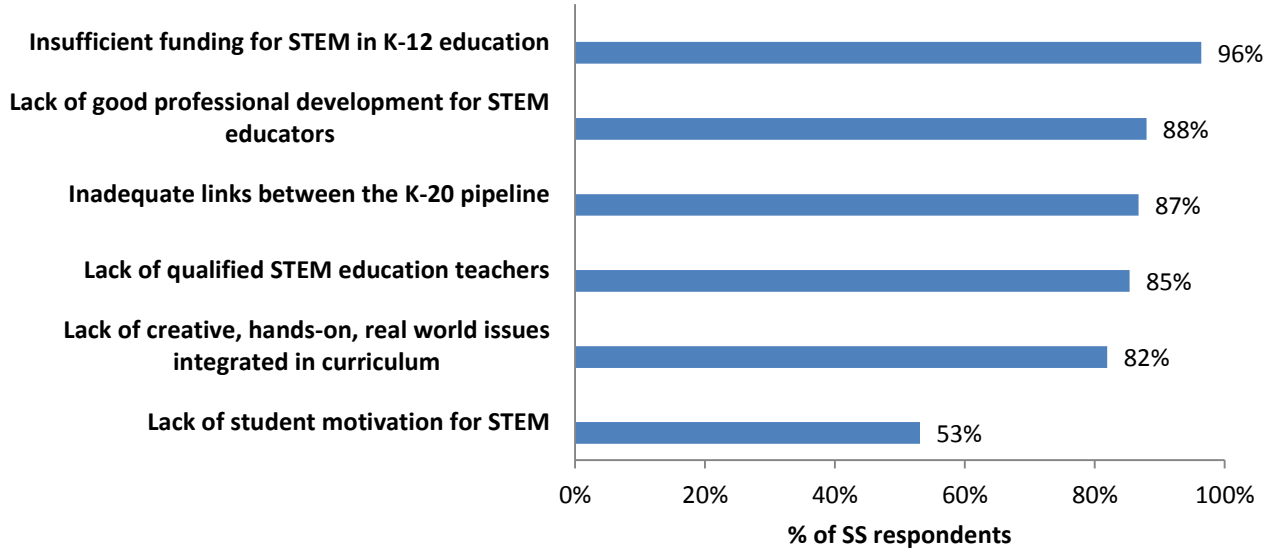
The findings from the SS survey have afforded new insights from SS perspectives about the current state of STEM programming in Maine, including specific challenges and opportunities. The findings have also provided a foundation for effective collaborative initiatives that will help address STEM educational gaps.

Challenges to STEM Education in Maine

Maine students will be entering a highly competitive global workforce that demands a 21st century skill set including critical thinking, problem solving, communication, and teamwork. Schools at all levels are seeking strategies to engage students in real life educational experiences and enable them to hone these critical skills while mastering essential academic content. Although students will require increased knowledge and skills in STEM fields, some sources report that Maine students show a decrease in STEM skill level from middle school through high school.[12] These challenges within the STEM pipeline have brought about renewed efforts to improve the quality and effectiveness of STEM education in Maine.

SS respondents reported that the top three challenges facing STEM in Maine are: (1) insufficient funding for STEM in K-12 education (96%), (2) lack of quality professional development for STEM educators (88%), and (3) inadequate links within the K-20 pipeline (87%) (Figure 2). Knowing these challenges from the perspective of middle and high school educators allows for a better understanding of how to improve and strengthen STEM programs.

Figure 2. Key challenges facing STEM education in Maine as identified by SS respondents



SS respondents were also asked how this list of possible challenges facing STEM education impacted their own school or district. The top three challenges were similar: 90% reported a lack of funding, while 83% stated a lack of quality professional development. Seventy-eight percent (78%) of SS respondents expressed concern about inadequate links within the K-20 pipeline, believing that other school priorities seem to outweigh the need to develop STEM opportunities.

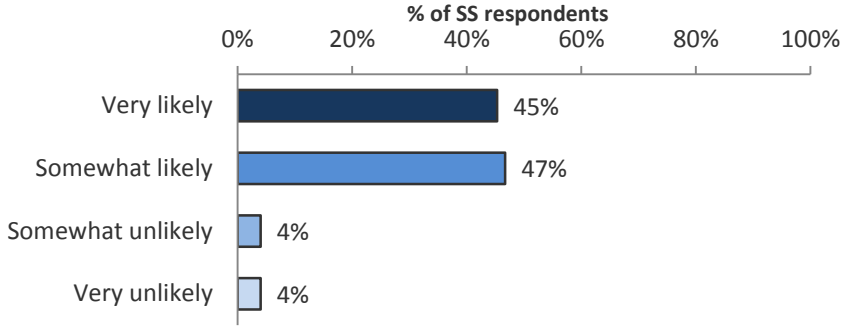
Additional comments revealed that traditional math and science teachers often have little applied experience to share with their students and need added funds for field trips to higher education institutions and effective after-school STEM clubs. Comparatively, only 13% of SS respondents requested additional resources for laboratory tools/activities as well as funds for updated classroom equipment and technology. SS respondents also identified a lack of pre-service instruction and/or preparation for teachers as challenges to professional development.

When asked an open-ended question about SS STEM educator needs, SS respondents cited lack of time as a serious problem. Specifically, SS respondents indicated that more time is needed for collaboration with HE institutions, and for the development of hands-on activities for STEM specific classes. SS respondents repeatedly stated the need for more time and funds to learn, develop, and prepare activities, projects, and labs focused around the Next Generation Science Standards (NGSS). NGSS, developed by 26 states, aims to reinvigorate student scientific learning and aims to provide students with the necessary academic skills for success in STEM fields.

Current STEM Practices in Maine's School Districts

Secondary school respondents' perception of their school's commitment to STEM education was relatively high. Seventy-four percent (74%) stated that their school had some level of commitment. Only 26% of SS respondents believe that their school is uncommitted to supporting STEM education. Concurrently, NGSS and STEM core concepts are making their way into the schools. Although 69% of SS respondents' schools or districts have not currently integrated NGSS and STEM Core Concepts across the curriculum, 45% of SS respondents who have yet to integrate them indicated that their school will "very" likely do so within the next three years (Figure 3).

Figure 3. Likelihood that your school will integrate NGSS and core concepts of STEM into the curriculum in the next three years as identified by SS respondents.



STEM Approaches Integrated into the Classroom or Curriculum

Maine SS educators reported using various teaching techniques to engage students in STEM. The six most frequent STEM approaches currently integrated into classrooms or curricula identified by SS respondents were: hands-on activities, online resources, small group work, real world problem solving, experiments and large class discussions (Table 1).

Table 1. Currently Integrated STEM Approaches

STEM Approach	Response
Hands on activities	**95%**
Using computers to search for information	**93%**
Small group work	**85%**
Real world problem solving	**81%**
Conducting experiments and recording results	**80%**
Whole class discussions	**80%**

In response to open-ended questions about the **most** effective strategies for engaging students in STEM, SS respondents stated strong support for hands-on work and real world activities. Many referenced posing a problem or asking a question with hands-on investigation prior to instruction as the most effective method. SS respondents felt active learning is critical because it helps students apply what they learn in science and math to their own experience and real world circumstances. Examples of comments include:

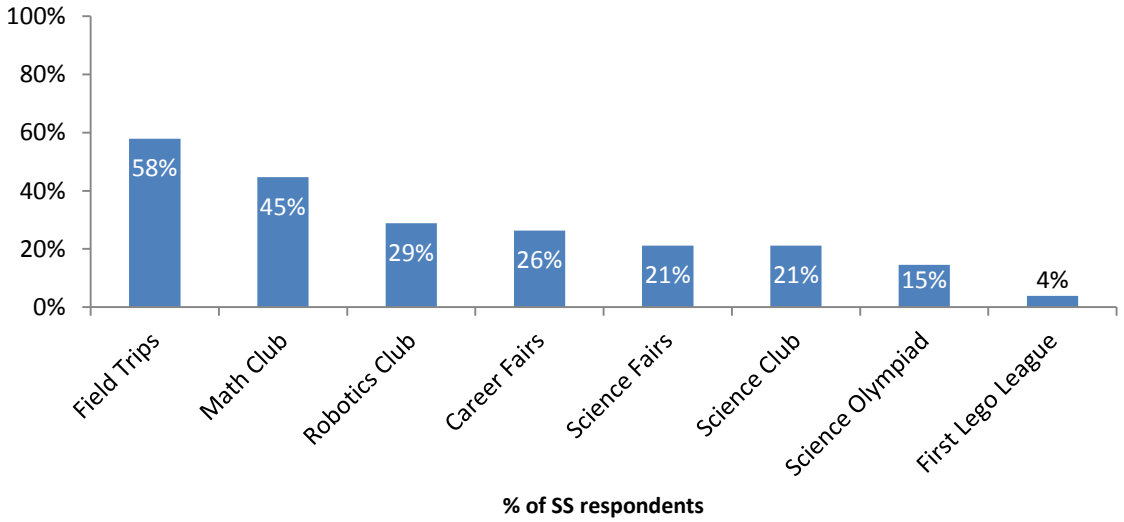
> *"The most effective way for me to engage my students in STEM work is to have it applicable to their lives."—Science Teacher, Gardiner Area High School*

> *"I want my students to invest their best efforts, for that to happen the students must see the real world connections between what we do in class and what goes on out in the community and beyond." – Technology Education Teacher, Brunswick High School*

Current Co-/Extra-Curricular STEM Activities

In concurrence with STEM approaches in the classroom, SS respondents were asked to identify current STEM activities organized at their schools. Although field trips were offered by 58% of schools (Figure 4), SS respondents reported that budget constraints and long distance restricted accessibility of trips. Clubs and after-school programs were difficult to orchestrate at some schools due to demanding schedules and transportation costs. STEM competitions, although available, were not affordable to all students.

Figure 4. Currently offered STEM activities in secondary schools in Maine as identified by SS respondents

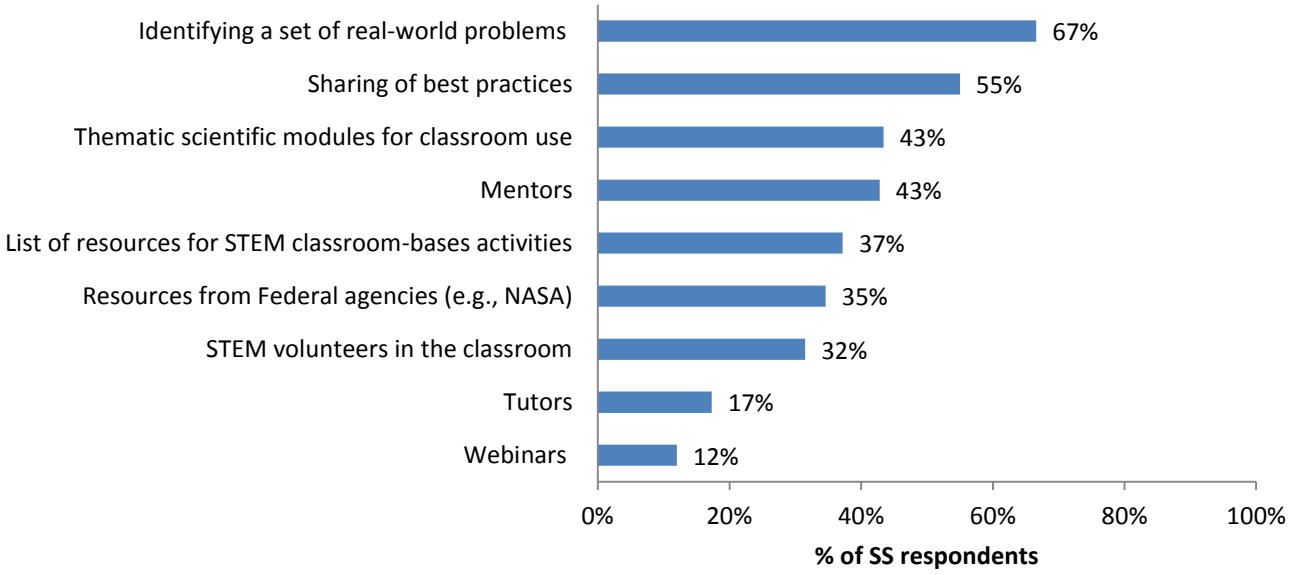


Effective Opportunities for Strengthening STEM Education in Maine's K-12 School Districts

Perspectives on Effective STEM Strategies

When SS respondents were asked to choose from a list of strategies that would be most effective in supporting their STEM needs, the top three responses were: identifying real world problems to which students could apply their learning (67%), sharing of best practices (55%), and mentors and thematic scientific modules for classroom use (43%) (Figure 5).

Figure 5. Effective strategies for supporting STEM education as identified by SS respondents



Professional Development

Findings from the SS survey showed only 21% of SS respondents believe there are sufficient STEM professional development opportunities regularly provided to teachers in their school or district (Figure 6). Of the list of effective professional development strategies offered in the survey, the top three choices were field seminars (46%), curriculum development (43%) and best practice sharing (43%). In contrast, webinars (7%) were deemed the least effective (Figure 7). Additional comments included the need for more resource materials as well as the need for sustainable professional development opportunities.

Figure 6. Percentage of SS respondents that believe there are sufficient STEM professional development opportunities regularly provided to teachers at their school

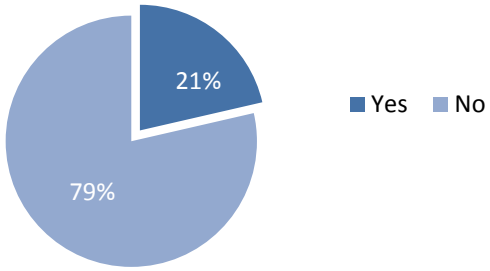
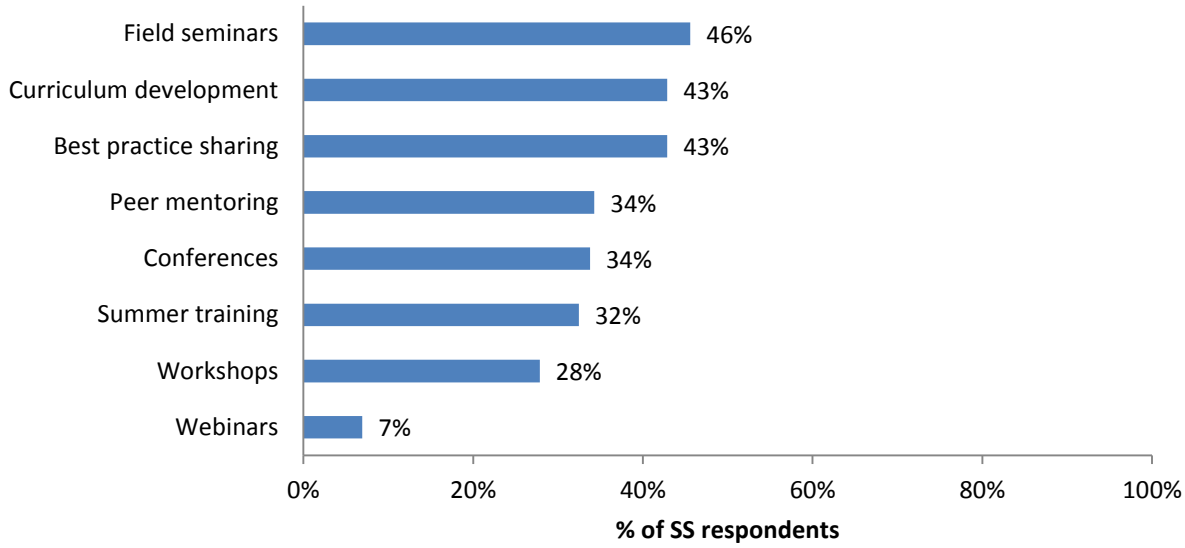


Figure 7. Effective professional development strategies as identified by SS respondents



Community Engagement

Ninety-three percent (93%) of SS respondents believe that community engaged learning strengthens STEM education (Figure 8). However, only 61% of SS respondents reported that service learning or community engagement is being integrated into their school's curriculum (Figure 9). This discrepancy presents an opportunity for teachers to incorporate more experiential learning into STEM curricula by engaging students with the local and global community. In fact, studies indicate that community engagement improves student success on many important measures, including student retention and the likelihood of completing a college degree.[13]

Figure 8. Percentage of SS respondents that believe community engaged learning including hands-on, real world experiences strengthen STEM education

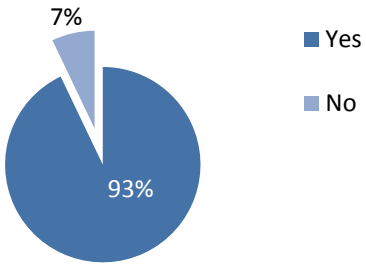
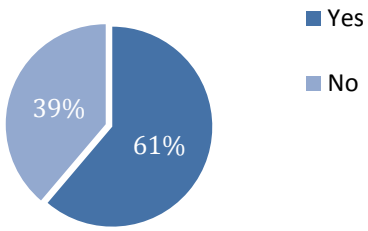
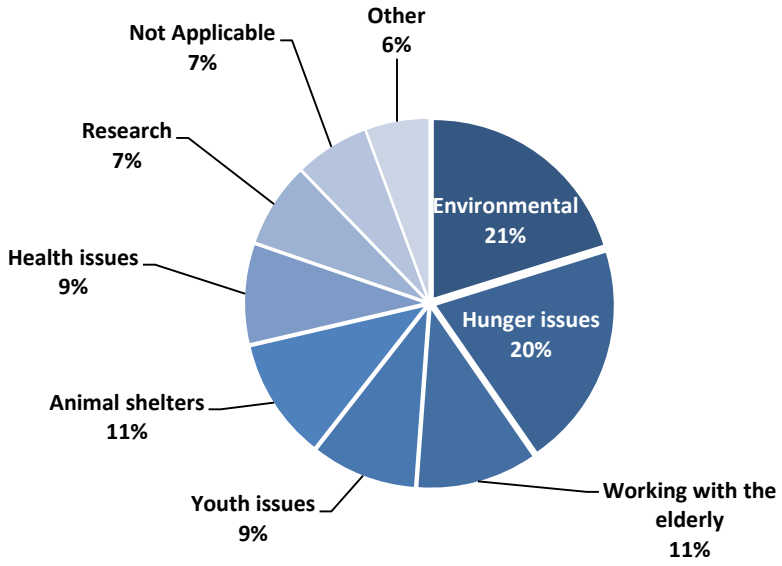


Figure 9. Percentage of SS respondents that state their school integrates service learning or community engagement into curriculum



The top two subject areas integrated into service learning curriculum by SS respondents were the environment (21%) and hunger issues (20%), followed by working with the elderly and supporting animal shelters (Figure 10).

Figure 10. Current themes of service-learning integrated into SS curricula in Maine



Despite the urgency of critical issues such as climate change, only 49% of SS respondents reported that their school specifically integrates *environmental sustainability* into their STEM curriculum. SS respondents indicated that there is little systemic program or school support for community engagement endeavors. Community outreach is generally done on a teacher-by-teacher basis and very little programmatic sustainability exists. Respondents expressed a desire to do more civic engagement, but lack of funding and time act as barriers.

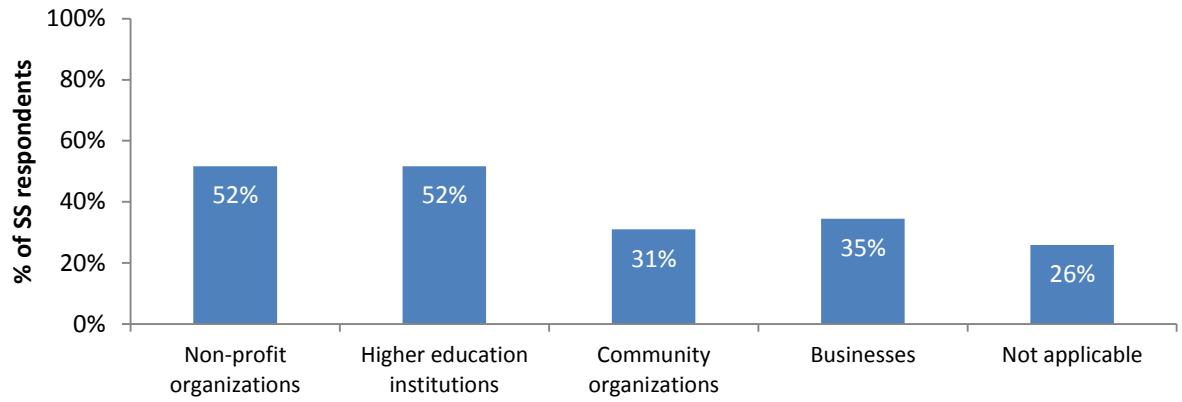
Science Education for New Civic Engagements and Responsibilities (SENCER)

One effective professional development strategy that integrates critical issues and community engaged learning into STEM curriculum is called Science Education for New Civic Engagements and Responsibilities (SENCER). Funded in part by the National Science Foundation, SENCER incorporates civic engagement into teaching curricula, and has proven to be an accessible, easily shared, and replicable model for teaching at all levels. STEM teachers understand the power of using hands-on, real world experience as a pedagogical tool, and they see the importance of civic engagement in a vibrant and exciting learning environment. Despite professional development, collaboration with higher education, and more hands-on approaches being identified as a high-need by SS respondents, only 6% knew of SENCER, and only 8% of those who were aware of it integrated SENCER's methods into their teaching. The SENCER model addresses hands-on, critical, real-world issues within educational curricula while offering an ideal opportunity for more professional development for educators through trainings.[14]

Secondary School STEM Partnerships

Findings from the SS survey showed that 52% of secondary schools have some type of collaborative partnership with nonprofit organizations and/or HE institutions. Thirty-five percent (35%) cited partnerships with local businesses while 31% partnered with community organizations (Figure 11). These findings present a tremendous opportunity for future growth.

Figure 11. Types of SS STEM partnerships as identified by SS respondents



SS respondents were asked to share any best practice program ideas involving collaborations between secondary schools and higher education. Although 78% stated they did not know of any programs, some reported that they knew about STEM education best practices including dual enrollment, field trips, and research programs with higher education as well as after-school SS STEM clubs and STEM diploma programs. Some of these programs helped inform the development of MCC's *STEM Engaging Initiatives*, which are described on page 14 in the *Broader Impacts: STEM Engaging Initiatives* section of this report.

Collaborative Opportunities for Strengthening STEM Education in Maine

Data from our survey overwhelmingly supports the statement that increased collaborative opportunities strengthen STEM education in Maine. Ninety-one percent (91%) of HE respondents, as well as 90% of SS respondents, believe stronger connections between higher education and secondary schools would strengthen STEM. Of HE respondents requesting stronger connections between secondary schools and higher education institutions, 49% believe college students leading STEM activities would be the most effective type of collaboration. Professional development for SS teachers by faculty (45%), access to research sites for SS education (44%), and more course opportunities for high school students (44%) were the next three most common responses cited by HE respondents.

Despite having identified some successful STEM approaches and partnerships, SS respondents felt that more could be done to strengthen STEM programming throughout the state. Many stated that increased collaborations between K-12 schools and higher education would not only direct students toward STEM fields, but would also reinvigorate educators to strengthen STEM programs at their schools. To eliminate identified barriers between K-12 schools and higher education, MCC aims to encourage new relationships and collaborative opportunities within the STEM pipeline.

Collaborations with Higher Education

Overwhelmingly, SS respondents (90%) and HE respondents (91%) felt that stronger connections with a higher education institution would help address STEM needs in their school (Figure 12). Ninety percent (90%) stated that there were not enough collaborative opportunities between secondary schools and higher education (Figure 13).

Figure 12. Percentage of SS respondents that believe stronger connections with higher education help address STEM needs at your school

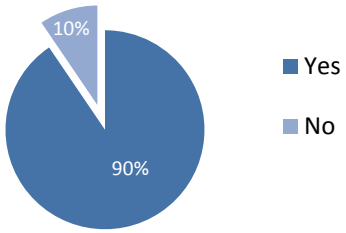
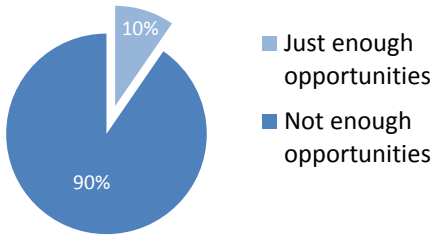


Figure 13. Percentage of SS respondents that believe there are not enough collaborative opportunities between SS and HE institutions



Of those who agreed that stronger connections between SS and HE institutions would address STEM needs, 55% of SS respondents believed that field trips to HE research sites would be the most effective type of collaboration, followed by professional development opportunities (52%), and one-week learning modules around specific topics for classroom use (52%). Forty-four percent (44%) felt that STEM activities led by college students would be beneficial (Table 2). Respondents emphasized that to better address SS STEM needs, hands-on activities and real

world problem solving skills need to play a central role in outreach to secondary schools. Feedback from two SS focus groups reinforced this by noting that making HE campus/lab tours more interactive and immersive for SS students, versus simply having them observe a lab, goes a long way toward providing a more effective and integrated experience for SS students.

Figure 2. Most effective collaborations with HE as identified by SS respondents

Effective Collaborations	Response
(Interactive) Field trips to higher education learning labs/research sites	55%
Professional development opportunities	52%
One-week learning modules around specific topics for classroom use	52%
College student-led STEM activities	44%
Mentoring for students	37%
College student or college faculty speakers bureau	28%
More AP or dual enrollment opportunities for students	28%
Tutors for students	21%

Of the small percentage of respondents who were not in favor of stronger connections between SS and HE institutions, several respondents felt that a lack of time and funding restricted development of such connections.

When asked for open-ended responses about *specific* collaborations with HE institutions that would help better prepare students for STEM competencies in college, 18% stated that dual enrollment programs could help to better prepare students in the future and indicated that these programs are currently being explored.

Collaborations with Career and Technical Education

SS respondents commented about the effectiveness of vocational programs noting that career and technical education (CTE) program areas are vital for helping to connect a broader range of students with STEM learning opportunities statewide. Adding to this point, some SS respondents cited that STEM programs need to be less exclusive, forging outreach opportunities that benefit all students. This will benefit not only those interested in medicine or computers, but also those on vocational career tracks. Considering Maine's network of 27 career and technical high schools, where hands-on learning is the norm, a unique opportunity exists for collaboration.

Additional Approaches for Strengthening STEM in Maine

SS respondents provided additional feedback through open-ended responses about how to improve STEM programs in secondary schools in Maine. Some suggestions included:

- Start STEM education earlier
- Offer a STEM-endorsed high school diploma
- Require STEM teachers to have a degree in a STEM subject

- Collaborate within the school district by using and sharing resources
- Increase communication between educational disciplines
- Use multi-disciplinary teams as a powerful tool for STEM learning
- Strengthen the role of guidance counselors to include introducing STEM career options to students

SS respondents also provided suggestions about how higher education can strengthen STEM in K-12 schools. Recommendations included:

- Greater alignment of curriculum
- Clarity about STEM college standards so students are prepared for such courses
- Be more inviting to STEM K-12 teachers
- Offer better STEM teacher training
- Develop links to university and lab researchers

Key SS Survey Conclusions

Key challenges facing SS education with STEM programming in Maine are **insufficient funding, lack of professional development opportunities for teachers,** and **inadequate links between the K-20 pipeline**.

Ninety percent (90%) of SS respondents felt that **stronger connections with higher education institutions** would help address STEM needs in their secondary school or classroom.

Hands-on work and **real world activities** garner strong support as effective strategies for engaging students in STEM.

Seventy-nine percent (79%) of SS respondents feel there are **insufficient STEM professional development opportunities** regularly provided to teachers in their school or district.

The **most effective collaborations** with higher education as identified by SS respondents are: field trips to HE learning labs/research sites (55%); professional development opportunities (52%); and one-week STEM learning modules for classroom use (52%).

Ninety-three percent (93%) of SS respondents believe **community engagement** and **service-learning** strengthen STEM education.

Career and technical education schools in Maine offer vital STEM educational and training opportunities for enrolled vocational students.

Broader Impacts: STEM Engaging Initiatives

Feedback from MCC's statewide landscape surveys (SS and HE) show overwhelming support, and many opportunities for greater collaborative efforts and community engagement between K-12 and higher education for strengthening STEM programming. The results of the SS and HE surveys have provided a valuable road map for helping to address gaps in STEM education, and have culminated in the development of a menu of achievable, easily replicated, collaborative models, referred to as *STEM Engaging Initiatives*.

To help make these initiatives readily available, in 2016, MCC will offer technical assistance support to K-12 schools and postsecondary institutions interested in identifying and implementing collaborations focused on the following six *STEM Engaging Initiatives*:

- ✓ *Community Conversation Starters* – To help initiate new STEM collaboration efforts in communities, MCC will organize and facilitate meetings with representatives from local higher education institutions and K-12 schools. The goal of each meeting will be to conduct introductions, share current best practices, and identify/initiate potential collaborative STEM opportunities.
- ✓ *Field Seminars* – Technical assistance support will be provided for developing hands-on, field-based experiences for college faculty and students to partner with K-12 classrooms to implement research activities that also promote civic engagement. Seminars will also provide professional development for educators at all levels.
- ✓ *Interactive Speakers Bureau* – Students and faculty from higher education institutions, business and industry leaders, as well as STEM role models will be identified for the Interactive Speakers Bureau. The speakers will visit school districts to run interactive, hands-on STEM activities with a special emphasis on rural schools/districts.
- ✓ *Interactive STEM Fairs* – Teams of college students will be on site at schools and communities to lead interactive STEM-related stations (identified to meet the needs of the school) for K-12 students. College students will receive training prior to working with elementary and secondary school students.
- ✓ *SENCER Trainings for Educators and Faculty* – Professional development training sessions will be offered on SENCER (Science Education for New Civic Engagements and Responsibilities) techniques. SENCER courses and programs are hands-on and connect STEM content to critical local, national, and global challenges.
- ✓ *Thematic STEM Modules* – STEM module toolkits will be a resource available to educators, formal or informal, working with K-12 students. These toolkits provide the STEM content needed to successfully complete experiential, science-based activities focused on central, real-world themes such as Maine Lakes.

Through the implementation of these collaborative, hands-on *STEM Engaging Initiatives,* a sample of anticipated benefits to be yielded includes:

- Elementary and middle school students become more enthusiastic about STEM subject matter, while high school students become more cognizant of post-secondary STEM education, training and research opportunities that address vital community issues.

- Undergraduate and graduate students learn useful teaching techniques and develop leadership and other 21st century skills through HE student led initiatives for K-12 classrooms.

- SS educators have greater access to professional development opportunities and improved STEM curriculum development among a constantly changing landscape.

- HE faculty members enhance community outreach skills and increase communication and collaborations with their K-12 counterparts resulting in greater alignment of STEM education and student learning outcomes.

- Community needs are addressed through the integration of civic engagement into STEM curricular and co-curricular activities.

Evolving from STEM Pipeline to STEM Ecosystem

When referencing STEM education, the term 'STEM pipeline' is used to describe the trajectory of preparing K-20 students in STEM subjects from an early age to graduation and beyond. Metaphorically speaking, this unidirectional pipeline seems to address the focus necessary for students to begin and complete academic programs in STEM. However, after reviewing many of the findings from the survey reports and combined with Jay Labov's comments, it is apparent that this traditional and unidirectional approach to STEM education may be limiting the parameters of student learning. Educators and administrators report the need for a paradigm shift in STEM education toward a new, non-linear model necessary to guide the next generation of scientists and problem solvers. By moving towards a multi-dimensional, inclusive educational ecosystem, MCC aims to encourage greater depth and a wider reach for higher education and community collaboration and partnership.

Higher education has an instrumental role to play in the move towards a vibrant, interactive STEM ecosystem and is well-positioned to do so. Through the resources of MCC's higher education network, our expertise with service-learning, and implementation of the *STEM Engaging Initiatives*, MCC aims to support Maine STEM education's transition from a

unidirectional pipeline, or traditional model, into a vibrant, interconnected ecosystem. Most importantly, this inclusive model removes isolating barriers between pre- and post-secondary schools and encourages new relationships and collaborative opportunities throughout the STEM ecosystem. This approach is a win-win for everyone: schools, K-20 students, K-12 educators, higher education faculty, and communities.

Conclusion: Our Vision for Maine's STEM Ecosystem

Envision…

HE faculty and SS teachers working reciprocally to lead the next generation of scientists and problem solvers while addressing critical issues.

> *HE student-led initiatives serving as important resources for SS schools that have the dual-benefit of providing college students with a "hands-on professional laboratory" to test out new teaching techniques under the guidance of faculty members.*
>
> > *Educators at all levels better connected with one another, having more opportunities for collaborative professional development, and unified by the common goal of encouraging students to explore their interests in STEM while addressing real world problems.*
> >
> > > *Increased student exposure to hands-on STEM education that helps develop 21st century skills.*

This vision is possible through added campus/K-12 school community partnerships and greater STEM educational alignment, collaboration and resource sharing as highlighted in this report. To ensure that the United States retains its position as one of the most educated populations in the world, K-12 schools and community organizations need to enhance their utilization of post-secondary school education effectively to foster the next generation of STEM professionals.

It is MCC's hope that the STEM survey findings in this report and the subsequent *STEM Engaging Initiatives* will be effective tools for increasing multi-dimensional collaborations within Maine's educational ecosystem to strengthen STEM education. By encouraging new relationships, MCC aims to connect educators through collaborative opportunities and prepare students to become effective problem-solvers and citizens for building and sustaining vibrant, healthy communities as the next generation of scientists and STEM professionals.

Appendix Table 1. Geographic areas in Maine housing secondary and middle schools that received the SS survey

Towns

- Auburn
- Augusta
- Bangor
- Biddeford
- Bonny Eagle
- Bradley
- Brewer
- Brookville
- Brunswick
- Cape Elizabeth
- Castine
- Easton
- Eddington
- Fairfield
- Falmouth
- Farmington
- Fort Kent
- Freeport
- Frenchville
- Gorham
- Hallowell
- Lewiston
- Lisbon
- Lyman
- Machias
- Manchester
- Minot
- Oakland
- Orono
- Portland
- Presque Isle
- Sabattus
- Saco
- Scarborough
- Sebago Lake
- Shawmut
- South Windham
- Thorndike
- Topsham
- Troy
- Waterville
- Westbrook
- Winslow

Consolidated Towns

- Cape Cottage
- Cape Rosier
- Danville
- East Limington
- East Machias
- Eggemoggin
- Fairbanks
- Farmington Falls
- Fort Kent Mills
- Freedom
- Harborside
- Jacksonville
- Kennebec
- Maple Grove
- Mapleton
- Marshfield
- Mechanic Falls
- Penobscot
- Poland
- Pond Cove
- Sprague ville
- Standish
- Steep Falls
- Stillwater
- Temple
- Unity
- Whitneyville

Technology Centers

- Biddeford Regional Center of Technology
- Capital Area Technical Center
- Foster Regional Appli Technical Center
- St. John Valley Technology Center
- Lewiston Regional Technical Center
- Mid-Maine Technical Center
- Portland Arts & Technology Center
- Presque Isle Regional Career and Technology Center
- Somerset Career and Technical Center
- St. Croix Regional Technical Center
- Tri-County Technical Center
- Westbrook Regional Vocational Center

Charter Schools

- Baxter Academy for Technology & Science
- Harpswell Coastal Academy
- ME Academy of Natural Sciences

STEM Schools

- Yarmouth High School STEM School
- Maine School of Science and Mathematics

Appendix Table 2. Maine higher education colleges and universities that received the HE survey

- Bates College
- Bowdoin College
- Central Maine Community College
- Colby College
- Eastern Maine Community College
- Kaplan University
- Maine College of Art
- Maine Maritime Academy
- Northern Maine Community College
- Saint Joseph's College
- Southern Maine Community College
- Unity College
- University of Maine at Augusta
- University of Maine at Farmington
- University of Maine at Fort Kent
- University of Maine at Machias
- University of Maine at Presque Isle
- University of Maine
- University of New England
- University of Southern Maine – Portland

Endnotes

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About Maine Campus Compact

Founded in 1994, Maine Campus Compact is a coalition of 18 member campuses whose purpose is to catalyze and lead a movement to reinvigorate the public purpose and civic mission of higher education. We seek to transform our campuses in ways that develop better informed, active citizen problem-solvers, stronger communities, and a more just democratic society. We believe that our campuses must be vital agents and architects of a flourishing democracy.

About Maine EPSCoR

Experimental Program to Stimulate Competitive Research (EPSCoR) was initiated at the National Science Foundation (NSF) in 1978 and now encompasses EPSCoR programs at several other Federal agencies. Maine EPSCoR at the University of Maine oversees and implements the state's NSF programs. Since 1980, Maine has received more than $62M in NSF EPSCoR funding. These statewide programs advance Maine's research capacity and competitiveness for a sustainable future through cutting edge science, STEM education, workforce development, cyber infrastructure, and economic development.

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