A Preliminary Assessment of Maine Students’ Interest in Science, Technology, Engineering and Mathematics Careers:

The Tip of the Iceberg?

David L. Silvernail
Alexis M. Berry

Center for Education Policy, Applied Research, and Evaluation
University of Southern Maine
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Published by the Center for Education Policy, Applied Research, and Evaluation (CEPARE) in the College of Education and Human Development, University of Southern Maine.

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A Preliminary Assessment of Maine Students' Interest in Science, Technology, Engineering and Mathematics Careers: The Tip of the Iceberg?

Prepared by:

David L. Silvernail
Director

Alexis M. Berry
Research Assistant

Center for Education Policy, Applied Research, and Evaluation
University of Southern Maine

January 2010
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Executive Summary

The need for technological advances, improved problem solving strategies, new discoveries, and new products has continued to grow over the past decade and the call for employees who are skilled in STEM-related areas has grown as well. Thus, it is very timely to examine the interest levels of Maine’s youth in pursuing STEM-related careers. To that end, this Brief provides some preliminary information about Maine middle school and high school age students’ interest in STEM related careers.

At present, interest on the part of Maine’s youth in STEM-related careers is at best, mixed, and rather disconcerting. This preliminary assessment reveals that less than one in three middle school students indicate they are interested in STEM-related careers. In fact, about one-half of the middle school students are either not interested in these types of careers or perceive that these careers are too difficult or challenging.

There also appears to be a gender gap when comparing the interest levels of male and female students in regard to STEM careers. While females are slightly more interested in science careers than males, females are generally less interested than males in technology, engineering, and math careers.

The evidence in the choices of college STEM-related majors by Maine high school students is also significantly below that found in other states, and students in other states appear to be better prepared for these majors.

It is important to note that this Brief only provides a preliminary assessment of student interest levels. We would be the first to point out that the disparate sources of information profiled in this Brief may not present a complete picture of Maine’s youth. At the same time, we believe dismissing this evidence outright would be very unwise. As we attempted to make sense of the data, one image often came to mind: that of an iceberg. Is the evidence presented in this Brief only the tip of the iceberg? Are more deep-seated problems lurking below the surface?

We believe this information is only the tip of the iceberg, and we believe it is essential that we seek answers to a wide range of questions. For example, why, given the size of the state, do we have what appear to be so many unconnected programs and initiatives? Where is a master plan for connecting these initiatives in order to tap into potential synergies? And which of these programs should be connected? Which ones are successful? Which ones provide models deserving of wider promotion, dissemination, and funding?

Equally important to program development is a critical need to better understand the views of Maine’s youth. Why are so few interested in STEM-related careers? How much do they know about these careers and is their lack of interest attributable to a lack of information? Are they aware of the breadth of careers that are STEM-related? Is the lack of interest due to the fact that they do not feel prepared to pursue these careers? Are students being challenged, and helped, to acquire strong STEM-related knowledge and skills? What explains the gender gaps, and how can they be addressed?

In summary, we believe the evidence presented in this Brief, albeit limited, does represent only the tip of the iceberg. Many more deep-seated questions and problems exist below the surface. We believe that these questions and problems need to be addressed quickly, and systematically in the near future, so Maine’s youth may have rewarding long-term career options and opportunities.
A Preliminary Assessment of Maine Students’ Interest in Science, Technology, Engineering and Mathematics Related Careers: The Tip of the Iceberg?

David L. Silvernail
Alexis M. Berry

Introduction

The world that we currently live in is constantly growing and changing, in part as a result of increased access to technology and other resources. The need for technological advances, improved problem solving strategies, new discoveries, and new products has continued to grow over the past decade and the call for employees who are skilled in these-STEM related areas has grown as well. Impacted by these changes, the types of jobs that are in demand and integral for the success of our economy have shifted towards careers that are more related to the fields of science, technology, engineering, and mathematics (STEM).

In the 21st century, the modern economy is highly reliant on STEM related training. Due to the increased need for jobs related to science, technology, math and engineering skills, these types of careers are among the fastest-growing in our country. In fact, STEM occupations are projected to grow 22 percent nationwide between 2004 and 2014, compared to an average of 13 percent for other types of occupations (Davulis, 2008). Between the years 2004 and 2014, employers are projected to hire approximately 2.5 million new STEM employees, employees entering their occupations for the first time (Terrell, 2007). While it is estimated that these employees will come from a variety of educational levels, ranging from a high school diploma to a PhD, all of the jobs within this field will require an individual to have the ability to think logically and to possess good problem solving skills.

Similarly, STEM related careers are projected to grow within the state of Maine. As employers in Maine move towards using more sophisticated technological tools, manufacturing methods, and scientifically driven systems, a significant shift towards STEM-related careers is expected to occur. Employment in technology-related occupations is expected to grow by 16.4 percent in the state of Maine between 2004 and 2014. Employment for analysts and other computer support specialists is expected to grow by 19 percent, employment opportunities for life scientists by 12.2 percent, and the employment opportunities for natural science technicians by 12.1 percent.
STEM occupations tend to have higher salaries than many other occupations. In general, individuals employed in STEM occupations receive overall median salaries that are above the national average. Individuals employed in STEM occupations earned roughly 70 percent more than the national average during 2005 (Terrell, 2007). A similar pattern is reported in Maine. The average salary of Maine individuals employed in STEM occupations is $55,690, which is over twice as much as the average annual salary for all employees in the state (Davulis, 2008).

The combination of these two factors: the projected growth of STEM employment opportunities and the higher salaries in these careers, suggest that these types of occupations present a bright prospect for the young people in the state of Maine, and nationwide. Thus, it is very timely to examine the interest levels of Maine’s youth in pursuing STEM-related careers. To that end, this Brief provides some preliminary information about Maine middle school and high school age students’ interest in STEM related careers. While this Brief is preliminary in nature, it may simply bring to the reader’s attention only a fraction of what must be researched in the future about this topic. In other words, the information in this Brief may only reveal the tip of the iceberg.

**Students’ Attitudes toward the Importance of STEM**

Before exploring interest levels, it may be useful to know what importance Maine students place on their knowledge of mathematics and science, two core components of most STEM-related careers. In order to gather some information about this topic, student responses to a survey item administered in 2007 were analyzed. Each year, middle school students in the state of Maine complete the Maine Educational Assessment (MEA), a standardized curriculum based test, along with an interest and attitude survey. As part of the interest and attitude survey in 2007, eighth grade students were asked to indicate their level of agreement with two STEM-related items:

1. “My knowledge of mathematics will be useful to me as an adult.”
2. “My knowledge of science and technology will be useful to me as an adult.”

The students were asked to select one of four options: (1) Strongly Agree, (2) Agree, (3) Disagree, and (4) Strongly Disagree. Student responses to these items may be found in Chart 1 and Chart 2.
Chart 1: Student Perceptions about the Usefulness of Mathematics  
(n=15,062)

"My knowledge of mathematics will be useful to me as an adult."

Chart 2: Student Perceptions about the Usefulness of Science and Technology  
(n=14,949)

"My knowledge of science and technology will be useful to me as an adult."
The information displayed in Chart 1 and Chart 2 is encouraging. This data suggests that middle school students in the state of Maine do realize that their knowledge of mathematics, science, and technology will be useful to them in the future. 83.4% of eighth graders responded that they either Strongly Agreed or Agreed that their knowledge of science and technology would be useful to them as adults. In addition, 92.9% of eighth graders responded that they either Strongly Agreed or Agreed that their knowledge of mathematics would be useful to them as adults. Clearly, based on the results of the 2007 MEA Student Questionnaire, a majority of eighth grade students in the state of Maine do recognize the importance of these STEM skills.

**Student Interest in STEM Careers**

Does the recognition of the importance of STEM skills translate into a greater interest in STEM careers? To answer this question, Maine’s middle school students were surveyed about their interest in STEM related careers in 2009, as part of the Spring 2009 middle school MLTI Student Survey conducted by the Maine Education Policy Research Institute (MEPRI). Middle school students were asked to think about the type of job they may want to have when they become adults. Specifically, the students were asked to respond to the following four statements related to STEM careers:

1. “I would like to have a job that is related to science.”
2. “I would like to have a job that is related to technology.”
3. “I would like to have a job that is related to engineering.”
4. “I would like to have a job that is related to math.”

When responding to these statements, students were asked to select one of the following five options:

1. “No, this type of job is too hard.”
2. “No, I’m not interested.”
3. “I might be interested if I knew more about this type of job.”
4. “Yes, I have some interest.”
5. “Yes, I’m very interested.”

The percent of responses to each of these four statements appears in Charts 3 through 6.
Chart 3: Student Interest in Science Careers  
(n=11,403)

- Yes, I'm very interested: 36.8%
- Yes, I have some interest: 20.4%
- I might be interested if I knew more about this type of job: 15.2%
- No, I'm not interested: 14.8%
- No, this type of job is too hard: 12.8%

"I would like to have a job that is related to science."

Chart 4: Student Interest in Technology Careers  
(n=11,388)

- Yes, I'm very interested: 23.9%
- Yes, I have some interest: 21.0%
- I might be interested if I knew more about this type of job: 15.1%
- No, I'm not interested: 11.8%
- No, this type of job is too hard: 10.8%

"I would like to have a job that is related to technology."
Chart 5: Student Interest in Engineering Careers  
(n=11,391)

- Yes, I'm very interested: 14.1%
- Yes, I have some interest: 15.6%
- I might be interested if I knew more about this type of job: 15.9%
- No, I'm not interested: 20.2%
- No, this type of job is too hard: 34.1%

"I would like to have a job that is related to engineering."

Chart 6: Student Interest in Mathematics Careers  
(n=11,357)

- Yes, I'm very interested: 17.2%
- Yes, I have some interest: 10.2%
- I might be interested if I knew more about this type of job: 16.2%
- No, I'm not interested: 19.7%
- No, this type of job is too hard: 36.8%

"I would like to have a job that is related to mathematics."
As may be seen in Charts 3 through 6, approximately one-third, on average, of Maine’s middle school students indicate an interest in one or more STEM careers. When looking at the percentage of students who have either “some interest” or who are “very interested” in STEM careers, approximately 28 percent of students feel this way about science, 36 percent about technology careers, 32 percent about engineering careers and 26 percent about mathematics careers. These are encouraging statistics since they indicate that some of Maine’s seventh and eighth grade students have an interest in these subject areas. In addition, and equally as important, approximately another 20 percent of the students indicate they “might” be interested in STEM careers if they knew more about them.

However, when taking a closer look at the data, one also notices that many Maine middle school students are not interested in these careers, or feel as if these types of jobs are too hard for them. More specifically, approximately 52 percent of students felt this way about science careers, 40 percent about technology careers, 48 percent for engineering careers, and 54 percent about math careers. And approximately one in five of these students expressing the opinion that they think these careers are too hard for them. Thus, while it appears that some students are interested in STEM careers, it also appears that a considerable percent of Maine’s middle school-age students are not interested in STEM careers. It is important to note that middle school students held these views generally across the state. Views did not differ by regions of the state. In fact, no middle school could be identified in which a majority of students indicated an interest in STEM careers.

**Student Interest in STEM Careers Nationwide**

How do Maine student attitudes about STEM careers compare to middle school students nationally? As part of the Project Tomorrow’s *Speak Up 2007 National Findings*, researchers surveyed 319,223 K-12 students from 3,729 schools. One of the questions that they asked students was related to student interest in STEM careers. The results of this survey item may be found in Chart 7. Although students nationwide, and those in Maine, were asked slightly different questions and the national data only reflects approximately 80 percent of the respondents, the survey items are similar enough to permit some cautious comparison.
When comparing the results of the Spring 2009 MLTI Student Survey, which are displayed in Charts 3 through 6, to the national data, which is presented in Chart 7, it is clear that both some similarities and differences among the interest level of students exist. First, in regard to similarities, 32.0 percent of middle school students reported having some interest or being very interested in STEM careers on the national survey. In the case of Maine, 28.0 percent of students felt this way about science careers, 36.1 percent felt this way about technology careers, 31.6 percent felt this way about engineering careers and 26.4 percent of students felt this way about mathematics careers. In regard to those students who do express a moderate to high level of interest in a STEM career, the results of the Maine survey and the national survey are generally comparable.

Although the percentage of Maine’s students who expressed moderate to high levels of interest in STEM careers was roughly equivalent to the national sample, the responses of those who are not interested in STEM careers are dissimilar when comparing the responses of Maine’s students to the responses of the national sample. While approximately 26.0 percent of students nationwide responded that they were either not interested in a STEM career, had other interests, or considered a STEM career too hard, the percent of students from Maine who responded in this manner was much larger. 51.6
percent of Maine’s middle school students responded that they were either not interested in or considered a career related to science to be too hard, 40 percent felt this way about technology careers, 48.2 percent felt this way about engineering careers, and 54.0 percent felt this way about mathematics careers.

When taking a closer look at the responses of those students who did not express an interest in pursuing a STEM career, additional differences appear when comparing the Maine data to the national data. While only about 4.0 percent of middle school students nationwide responded that a STEM career would be too hard, a much higher percentage of students from Maine responded this way. Particularly, 14.8 percent of students felt this way about science careers, 11.8 percent felt this way about technology careers, 14.1 percent of students felt this way about engineering careers, and 17.2 percent of students felt this way about mathematics careers.

While it is encouraging to see that roughly the same percentage of middle school students from Maine may be interested in STEM careers as students at the national level, the percentage of students from Maine who believe that a STEM career is too challenging is much higher than the national average and additional research may need to be conducted in order to determine why this difference currently exists.

**Academic Achievement Differences and Student Interest in STEM Careers**

How do these interest levels compare for different academic achievement levels? In an effort to learn more about student interest level in STEM careers a secondary analysis was conducted on student responses using self-reported achievement levels. As a part of the Spring 2009 MLTI Student Survey, students were asked to report the types of grades they received during the previous academic year. For the purpose of this analysis, students that stated that they received mostly A’s or mostly B’s were placed in one group and students that stated that they received mostly C’s or mostly D’s were placed in another. A comparison between these two groups may be found in Charts 8 through 11.
Chart 8: Academic Achievement Differences in Student Interest in Science Careers
(n=11,300)

<table>
<thead>
<tr>
<th>Response</th>
<th>Mostly A's and B's</th>
<th>Mostly C's and D's</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, I'm very interested</td>
<td>14.0</td>
<td>7.3</td>
</tr>
<tr>
<td>Yes, I have some interest</td>
<td>16.4</td>
<td>9.3</td>
</tr>
<tr>
<td>I might be interested if I knew more about this type of job</td>
<td>21.0</td>
<td>17.9</td>
</tr>
<tr>
<td>No, I’m not interested</td>
<td>36.3</td>
<td>38.9</td>
</tr>
<tr>
<td>No, this type of job is too hard</td>
<td>12.3</td>
<td>26.6</td>
</tr>
</tbody>
</table>

Chart 9: Academic Achievement Differences in Student Interest in Technology Careers
(n=11,286)

<table>
<thead>
<tr>
<th>Response</th>
<th>Mostly A's and B's</th>
<th>Mostly C's and D's</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, I'm very interested</td>
<td>15.2</td>
<td>15.2</td>
</tr>
<tr>
<td>Yes, I have some interest</td>
<td>21.5</td>
<td>18.8</td>
</tr>
<tr>
<td>I might be interested if I knew more about this type of job</td>
<td>24.5</td>
<td>21.1</td>
</tr>
<tr>
<td>No, I’m not interested</td>
<td>28.5</td>
<td>26.0</td>
</tr>
<tr>
<td>No, this type of job is too hard</td>
<td>10.3</td>
<td>18.9</td>
</tr>
</tbody>
</table>
Chart 10: Academic Achievement Differences in Student Interest in Engineering Careers  
(n=11,291)

<table>
<thead>
<tr>
<th>Response</th>
<th>Mostly A's and B's</th>
<th>Mostly C's and D's</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, I'm very interested</td>
<td>15.2</td>
<td>17.7</td>
</tr>
<tr>
<td>Yes, I have some interest</td>
<td>16.0</td>
<td>15.6</td>
</tr>
<tr>
<td>I might be interested if I knew more about this type of job</td>
<td>20.6</td>
<td>18.3</td>
</tr>
<tr>
<td>No, I'm not interested</td>
<td>35.5</td>
<td>27.6</td>
</tr>
<tr>
<td>No, this type of job is too hard</td>
<td>12.7</td>
<td>20.9</td>
</tr>
</tbody>
</table>

Chart 11: Academic Achievement Differences in Student Interest in Mathematics Careers  
(n=11,256)

<table>
<thead>
<tr>
<th>Response</th>
<th>Mostly A's and B's</th>
<th>Mostly C's and D's</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, I'm very interested</td>
<td>11.1</td>
<td>5.6</td>
</tr>
<tr>
<td>Yes, I have some interest</td>
<td>17.8</td>
<td>8.4</td>
</tr>
<tr>
<td>I might be interested if I knew more about this type of job</td>
<td>20.4</td>
<td>16.3</td>
</tr>
<tr>
<td>No, I'm not interested</td>
<td>36.4</td>
<td>38.8</td>
</tr>
<tr>
<td>No, this type of job is too hard</td>
<td>14.3</td>
<td>30.9</td>
</tr>
</tbody>
</table>
When looking at figures 8 through 11, it is evident that a number of differences in interest levels in STEM careers do exist when comparing students by their reported academic achievement levels. Particularly, in the case of academic achievement differences in student interest in science, technology, and mathematics careers, a statistically significant difference was found between the means of these two groups in regard to their interest levels in these STEM career areas. Specifically, students who reported earning A’s and B’s also reported significantly higher interest levels in science, technology, and math careers than the students who reportedly receive mostly C’s and D’s. However, no statistically significant differences were found in the area of student interest in engineering.

In addition to this general difference in responses between students who reportedly earn A’s and B’s in comparison to those who reportedly earn C’s and D’s, one may also note a specific response pattern related to the perceived difficulty of these careers. As one might expect, many more students who reportedly earn C’s and D’s responded that jobs related to science, technology, engineering, and mathematics were too hard for them in comparison to the students who typically earn A’s and B’s. This difference is most apparent when looking at the results related to the questions regarding careers in both science and mathematics.

**Gender Differences and Student Interest in STEM Careers**

Students’ interest levels were also explored by gender and the results are displayed in Charts 12 through 15. When comparing the responses from the Spring 2009 MLTI Student Survey some significant differences between the responses of males and females became evident.
Chart 12: Gender Differences in Student Interest in Science Careers

(n=11,403)

Females | Males
--- | ---
Yes, I’m very interested | 13.7 | 11.9
Yes, I have some interest | 16.3 | 14.0
I might be interested if I knew more about this type of job | 20.3 | 20.6
No, I’m not interested | 37.0 | 36.5
No, this type of job is too hard | 12.7 | 17.0

Chart 13: Gender Differences in Student Interest in Technology Careers

(n=11,388)

Females | Males
--- | ---
Yes, I’m very interested | 7.7 | 23.0
Yes, I have some interest | 16.9 | 25.4
I might be interested if I knew more about this type of job | 25.9 | 21.7
No, I’m not interested | 19.1 | 36.8
No, this type of job is too hard | 12.7 | 10.8
Chart 14: Gender Differences in Student Interest in Engineering Careers (n=11,391)

- Yes, I’m very interested: Females 4.4%, Males 27.5%
- Yes, I have some interest: Females 8.0%, Males 24.4%
- I might be interested if I knew more about this type of job: Females 19.1%, Males 21.4%
- No, I’m not interested: Females 17.7%, Males 49.6%
- No, this type of job is too hard: Females 9.1%, Males 18.9%

Chart 15: Gender Differences in Student Interest in Mathematics Careers (n=11,357)

- Yes, I’m very interested: Females 8.8%, Males 11.7%
- Yes, I have some interest: Females 15.7%, Males 16.8%
- I might be interested if I knew more about this type of job: Females 20.1%, Males 19.2%
- No, I’m not interested: Females 38.8%, Males 34.6%
- No, this type of job is too hard: Females 16.5%, Males 17.8%
In the case of gender differences in student interest levels in technology, engineering and math careers, the analysis revealed statistically significant differences between the means of the two groups in all three of these STEM areas. Specifically, male students’ interest levels were significantly higher than those of female students in regard to technology, engineering and math. However, the opposite was the case for students’ interest in science careers. The analysis indicated that females were significantly more interested in science than males. In terms of job difficulty, generally a similar percent of males and females thought these careers were too hard, except for engineering, when approximately twice as many females as males thought a career in this field would be too difficult.

In summary, the results of these analyses suggest that female middle school students in the state of Maine are generally more interested than males in pursuing careers related to science, whereas males are more interested than females in pursuing careers related to technology, engineering, and math.

**Student Interest in STEM Careers at the High School Level**

What about Maine’s high school students? Do they have similar interest levels to their counterparts in middle school? To date, Maine’s high schools have not been asked a specific interest level question, but the data that were collected when students completed the SAT® provide some insight into their views. Each year, all high school students in Maine complete the SAT®, a test that measures skills related to mathematics, critical reading, and writing. During the 2008-2009 academic school year, as part of the SAT®, students were asked to complete a student questionnaire which contained a variety of survey questions related to various academic areas. One component of this questionnaire asked students to select their intended college major. The information gathered from this component of the questionnaire may be interpreted, generally, as an indication of career interest level. Table 1 summarizes the responses related to STEM careers that were gathered from this survey item. The table displays data for Maine students and those in New York and Massachusetts. These two additional states were selected as a basis of comparison because a similar percentage of students from each of these three states take the SAT® each year.
Table 1: Intended College Majors of 2009 SAT® Test Takers

<table>
<thead>
<tr>
<th>Major</th>
<th>Maine</th>
<th>New York</th>
<th>Massachusetts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science</td>
<td>26.4%</td>
<td>22.8%</td>
<td>22.5%</td>
</tr>
<tr>
<td>Technology</td>
<td>2.4%</td>
<td>3.0%</td>
<td>2.5%</td>
</tr>
<tr>
<td>Engineering</td>
<td>9.5%</td>
<td>9.1%</td>
<td>9.7%</td>
</tr>
<tr>
<td>Math</td>
<td>0.7%</td>
<td>1.0%</td>
<td>1.1%</td>
</tr>
</tbody>
</table>

A. Percent of Survey Item Respondents Interested in a STEM Major

<table>
<thead>
<tr>
<th></th>
<th>Maine</th>
<th>New York</th>
<th>Massachusetts</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Percent of Survey Item Respondents Interested in a STEM Major</td>
<td>39.0%</td>
<td>35.9%</td>
<td>35.8%</td>
</tr>
</tbody>
</table>

B. Percent of Total Test Takers Interested in a STEM Major

<table>
<thead>
<tr>
<th></th>
<th>Maine</th>
<th>New York</th>
<th>Massachusetts</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. Percent of Total Test Takers Interested in a STEM Major</td>
<td>14.3%</td>
<td>22.4%</td>
<td>22.5%</td>
</tr>
</tbody>
</table>

At first glance the information presented in Table 1 may appear to be encouraging. As may seem from Row A, a slightly larger percent of Maine’s high school students (39.0 percent) intend to major in a STEM discipline than their counterparts in New York (35.9 percent) and Massachusetts (35.8 percent). However, these percentages are somewhat misleading. Only about one third (36.7 percent) of Maine students completing the survey item and listed their intended college major, whereas approximately two thirds of New York and Massachusetts students listed an intended major. Consequently, when the total number of intended STEM majors is analyzed as a portion of all test takers in the three states (Row B), a very different picture appears. The percent of Maine high school students intending to major in STEM disciplines is significantly lower than for college bound New York and Massachusetts students.

Furthermore, New York and Massachusetts students appear to be better prepared for majoring in these STEM disciplines. As mentioned earlier, these states were selected for comparison purposes because, like Maine, a very large percent of their students take the SAT®, 90% in the case of Maine, 85 percent for New York and 84 percent for Massachusetts.
Information from Table 2 indicates that Maine’s high school seniors are not achieving SAT® scores that are as high as those achieved by students in both New York and Massachusetts. In fact, average total scores for New York and Massachusetts are anywhere from one-half to a full standard deviation above the Maine average. This difference in scores is especially apparent when comparing the obtained scores on the mathematics section of the SAT® across the three states. Thus, the information presented in these two tables suggests that students from Maine may not be as interested or as prepared to enter a STEM career as students from New York and Massachusetts.

<table>
<thead>
<tr>
<th>Subject Areas</th>
<th>Test Scores</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maine</td>
<td>New York</td>
<td>Massachusetts</td>
<td></td>
</tr>
<tr>
<td>Critical Reading</td>
<td>468</td>
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<td></td>
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<tr>
<td>Mathematics</td>
<td>467</td>
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<td>Writing</td>
<td>455</td>
<td>478</td>
<td>510</td>
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<tr>
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<td>1,390</td>
<td>1,465</td>
<td>1,550</td>
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**Discussion**

In the 21st century, the modern economy is more and more reliant on the integration of STEM disciplines. Not only are STEM related occupations among the highest-paying jobs in the United States, but also the fastest growing. As the types of jobs that are in demand and integral for the success of our economy have shifted towards careers that are related to science, technology, engineering, and mathematics (STEM), student interest and proficiency with these skills need to be fostered.

However, the evidence of interest and proficiency on the part of Maine’s youth at present does not bode well for Maine. This preliminary assessment reveals that less than one in three middle school students indicate they are interested in STEM-related careers.
In fact, approximately one-half of the middle school students are either not interested in these types of careers or perceive that these careers are too difficult or challenging. While at first glance, this seems to turn around by the 11th grade, when students’ choice of a STEM-related college majors appears to mirror the national level, a deeper examination of the evidence suggests otherwise. When the choices of college major by Maine high school students is compared to choices by students in two other states in the region, states with a similar percentage of students taking the SAT®, the percentage of Maine’s students choosing a STEM-related college major drops significantly. New York and Massachusetts have a significantly higher percentage of students planning on pursuing a STEM-related major. In addition, their students may be better prepared for these majors, as indicated by their higher SAT® scores.

There also appears to be a gender gap when comparing the interest levels of male and female students in regard to STEM careers. The results of the Spring 2009 MLTI Student Survey point out the difference in student interest levels. While females are slightly more interested in science careers than males, females are generally less interested than males in technology, engineering, and math careers.

It is important to note that this Brief only provides a preliminary assessment of student interest levels. We would be the first to point out that the disparate sources of information profiled in this Brief may not present a complete picture of Maine’s youth. At the same time, we believe dismissing this evidence outright would be very unwise. As we attempted to make sense of the data, one image often came to mind: that of an iceberg. Is the evidence presented in this Brief only the tip of the iceberg? Are more deep-seated problems lurking below the surface?

We do not know the answers to these questions, but we believe it is essential that they be answered. A recent survey conducted by the Maine Department of Education (MDOE) and the University of Maine System (UMS) revealed over 100 STEM-related programs in Maine, and that for over three decades Maine has been involved in various initiatives to promote STEM. Why then do so few of Maine’s youth show interest in STEM-related careers? Clearly we need to find answers.

Based on the findings from the initial survey, the MDOE and UMS are exploring a more comprehensive landscape study of Maine’s various STEM-related programs and
initiatives. We applaud this effort. It may provide us with critical information in understanding the state of the State. However, as important as it is to have a more comprehensive list of programs and initiatives, we think additional questions need to be answered. Why, given the size of the state, do we have what appear to be so many unconnected programs and initiatives? Where is a master plan for connecting these initiatives in order to tap into potential synergies? And which of these programs should be connected? Which ones are successful? Which ones provide models deserving of wider promotion, dissemination, and funding?

Equally important to program development is a critical need to better understand the views of Maine’s youth. Why are so few interested in STEM-related careers? How much do they know about these careers and is their lack of interest attributable to a lack of information? Are they aware of the breadth of careers that are STEM-related? Is the lack of interest due to the fact that they do not feel prepared to pursue these careers? Are students being challenged, and helped, to acquire strong STEM-related knowledge and skills? What explains the gender gaps, and how can they be addressed?

In summary, we believe the evidence presented in this Brief, albeit limited, does constitute only the tip of the iceberg. Many more deep-seated questions and problems exist below the surface. Finally, we believe that these questions and problems need to be addressed quickly, and systematically in the near future, so Maine’s youth may have rewarding long-term career options and opportunities.
References


Authors’ Biographic Sketches

David L. Silvernail

Dr. David L. Silvernail is Director of the Center for Education Policy, Applied Research and Evaluation at the University of Southern Maine (CEPARE) and Co-Director of the Maine Education Policy Research Institute (MEPRI), a non-partisan institute that conducts policy research and analysis for the Education Committee of the Legislature. Dr. Silvernail has over 25 years of research and education policy experience, and has conducted over two dozen evaluations of STEM-related projects.

Alexis Berry

Ms. Alexis M. Berry is a Research Assistant at CEPARE and has been involved with a variety of research projects related to the Maine Learning Technology Initiative (MLTI). Ms. Berry holds a B.A. in Psychology from the University of New Hampshire and she is currently enrolled as a third year doctoral student in the University of Southern Maine’s School Psychology Program.