National Survey of STEM High Schools' Curricular and Instructional Strategies and Practices

by Jennifer Forman, Elizabeth Jean Gubbins, Merzili Villanueva, Cindy Massicotte, Carolyn Callahan, Colby Tofel-Grehl

The theory of human capital (e.g., Becker, 1993) posits that societies benefit from thoughtful investment in education, health care, and other services that enable citizens to become more economically productive. Given finite resources, policymakers must decide which investments will yield the greatest returns in developing human capital. The Obama administration's focus on science, technology, engineering and mathematics (STEM) education and careers over other fields reflects its belief that U.S. productivity in these fields is most vital to the nation's viability (H. Res. 5116, 2010). The G. W. Bush administration signed similar legislation, indicating that the promotion of better STEM education has garnered bipartisan support (H. Res. 2272, 2007). Authors of recent national reports (e.g., Committee on Highly Successful Schools or Programs in K-12 STEM Education, 2011; Committee on Prospering in the Global Economy of 21st Century, 2007; National Academy of Sciences, 2010) concur that our nation's continued financial, environmental, and military security rest on developing highly skilled U.S. citizens in STEM professions.

Theories of individual talent development situate economic theories of human capital in the context of the education system (both public and private), suggesting how talent can be optimally nurtured. Bloom (1985) posited that talented high school students may have a passion for a specific discipline and are ready to develop a self-identification as part of that professional community. Some may even be ready to benefit from systematic mentoring from practicing professionals. Considerable evidence (see Dai, 2010 for a summary) suggests that the manifestations of human abilities become increasingly domain-specific with progressive talent development. Therefore, general talent development models (Brody & Stanley, 2005; Gagné, 2005; Renzulli & Reis, 1997; Subotnik & Jarvin, 2005) can be justifiably applied to specific disciplines, including those in the STEM fields (Subotnik, Duschl, & Selmon, 1993; Subotnik, Pillmeier, & Jarvin, 2009).

A limited number of highly selective high schools specializing in STEM education have existed for many decades, encouraging youth with identified STEM talent to pursue careers as STEM leaders and innovators. As members of the National Consortium for Specialized Secondary Schools of Mathematics, Science, and Technology (NCSSSMST), many of these selective schools benefit from scholarly interaction and dialogue on how to best serve their students. However, research on selective STEM schools has largely been limited to internal program evaluation, making it difficult to assess any causal inferences related to effective school features and practices. As of the writing of the present study, one in-progress study sought to evaluate the effectiveness of these schools using a quasi-experimental design (National Research Council, 2011), but published results of that study were not available.

Even if evidence should accumulate showing the effectiveness of selective STEM schools, the nation's many challenges will require more than an elite cadre of STEM leaders. The nation will also need "a greater portion of populace that is better prepared in STEM, and generally more STEM literate" (Lynch, Behrend, Burton, & Means, 2013, p. 2). Expanded views of gifts and talents (Gagné, 2005; Renzulli & Reis, 1997) and policymakers' priority of developing a greater proportion of young people with rigorous STEM training provide justification for broadening STEM-specific talent development frameworks to include all students with the interest and motivation to pursue them. Students' latent talents may emerge when they have opportunities to interact with engaging and enjoyable STEM curricula—a process that has been described as emerging "opportunity structures" (Lynch et al., 2013, p. 4). Even students who do not go on to pursue advanced degrees or STEM careers need a better understanding of these disciplines to become informed, productive citizens (National Research Council, 2011). To this end, the President's Council of Advisors on Science and Technology (PCAST, 2010) recommended creating 1,000 new STEM schools (800 elementary and 200 high schools) over the next decade.

New STEM schools are proposed across three broad categories: (a) selective STEM-focused schools, (b) inclusive STEM-focused schools, and (c) STEM-focused career and technical schools (National Research Council, 2011; PCAST, 2012). Because new STEM- focused high schools are developed based on local communities' needs and resources, they are likely to adopt an extremely wide range of policies, programs, and practices. In reference to inclusive STEM-focused high schools, Lynch et al. (2013) noted, "[They] may share common goals but there is no explicit theory of action that undergirds how they function; they are too new on the scene and varied in their designs and origins" (p. 5). Even greater variety in school design and implementation is likely to exist when all three categories of new STEM-focused schools are considered holistically.

The proposed proliferation of new STEM schools creates a vital and unmet need to understand the myriad of factors influencing the success of all specialized STEM high schools in fulfilling their own missions (Subotnik, Tai, Rickoff, & Almarode, 2010), as well as contributing to the broader societal goal of enlarging the pool of STEM talent within the United States. Recent efforts made to further describing and studying factors influencing STEM schools include the implementation of case-control studies of effectiveness in inclusive STEM high schools (Lynch et al., 2013; Means, House, Young, Wang, & Lynch, 2013); however, this line of research is still nascent and limited in scope. Additional exploratory studies that identify potential "critical components" (Lynch et al., 2013, p. 5) of effectiveness across different types of STEM-focused schools will greatly aid enhanced understanding of "what works" in a broader range of settings. The National Research Council (2013) articulated this research need:

> [M]aking informed decisions about improvements to education in STEM requires research and data about the content and quality of the curriculum, teachers' content knowledge, and the use of instructional practices that have been shown to improve outcomes. However, large-scale data are not available in a readily accessible form, mostly because state and federal data systems provide information about schools (personnel, organization, and enrollment) rather than *schooling* (key elements of the learning process). (p. 4)

The first step in creating a research agenda is to identify the population of schools that can legitimately be designated as STEM schools and describe current practices in those schools. To that end, we addressed the following questions across a national sample of STEM-focused high schools:

1. What are teachers' and administrators' perceptions of the importance and frequency of various curricular and instructional practices in STEM-focused high schools?

2. What are the different structural features (e.g., admissions policies, population served, school type) of STEM-focused high schools?

3. How do administrators perceive the roles of teachers in curriculum development, the critical qualities of teachers in a STEM school, and the ways outcomes should be evaluated?

METHOD

We conducted an extensive search to identify the sampling frame of STEM high schools throughout the United States. We identified a total of 949 unique STEM school by searching websites, reviewing articles identified through electronic searches using key search terms, contacting state departments of education, and soliciting names of schools from the National Consortium of Specialized Secondary Schools of Mathematics, Science, and Technology. These schools served as the sample for the study.

To develop the STEM administrator and STEM teacher survey for the study, we first observed and interviewed key stakeholders (teachers, students, and administrators) in 12 STEM high schools. Using the qualitative data from these visits, we inductively coded a comprehensive set of curricular and instructional strategies and practices, school policies, and school culture factors that were present at the STEM schools. Common features across schools, especially those that seemed to represent best practices in STEM education based on the literature, were developed into item stems for the surveys.

The 48-item administrators' survey was divided into five sections: Professional Culture, Curricular and Instructional Practices, Policies and Procedures, Description of Practices, and Demographics. In the Professional Culture and Curricular and Instructional Practices sections, one response scale focused on administrators' perceived importance of each item; the other scale assessed the frequency with which administrators perceived that the practice occurred. Only the importance of each item was measured in Policies and Procedures. The Description of Practices section contained four open-ended questions regarding faculty policies and program evaluation. Finally, the Demographics section included questions about structural features of the school as well as admissions criteria, course offerings, and students' eligibility for free and reduced lunch.

Importance was measured on a 6-point Likert-type scale with anchors ranging from *unimportant* (1) to *essential* (6). The Frequency scale response options were (1) *never*, (2) *once or twice a year*, (3) *once or twice a grading period*, (4) *once or twice a month*, (5) *at least once a week*, (6), and *every day* (6). Both scales included a *not applicable* option.

The 41-item STEM teacher survey was comprised of four sections: School Climate, Curricular Approaches, Instructional Strategies, and Learning Environment. The first three sections of the teacher survey used both the Importance and Frequency scales, but only the Importance scale was used in the final section.

Sample

We sampled all 949 identified schools by sending hard copy and electronic versions (via e-mail links) of the survey to each site. Administrators were asked to forward copies of the teachers' surveys to five of their faculty members. Two hundred and five administrators and 777 teachers completed the surveys. Teachers from 291 unique schools completed the surveys, indicating that teachers at some schools chose to respond even though their administrators did not. Respondents were not asked for personally identifying information, but were asked to supply the state in which their school operates. The geographic distributions for the administrators and teachers who responded to the survey are shown in Figures 1 and 2.

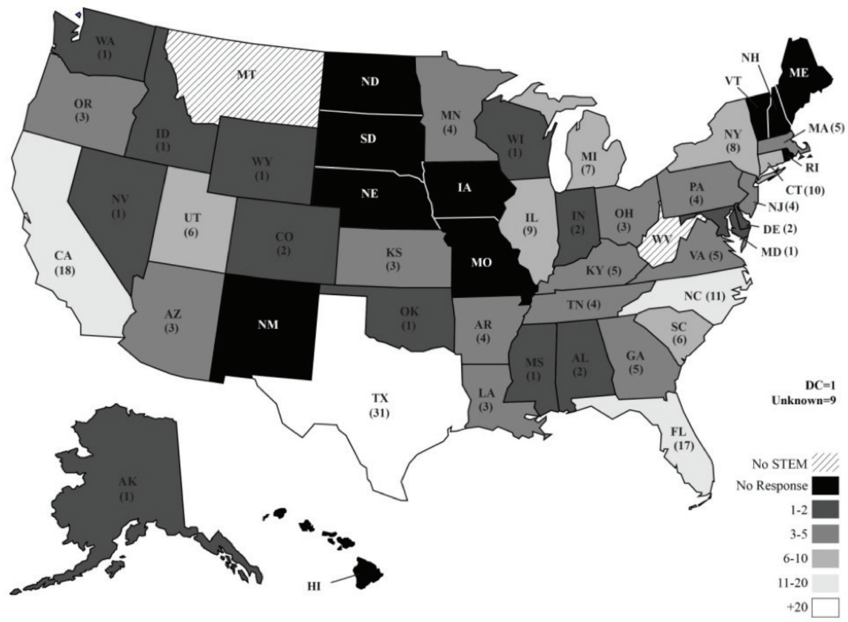

Figure 1.

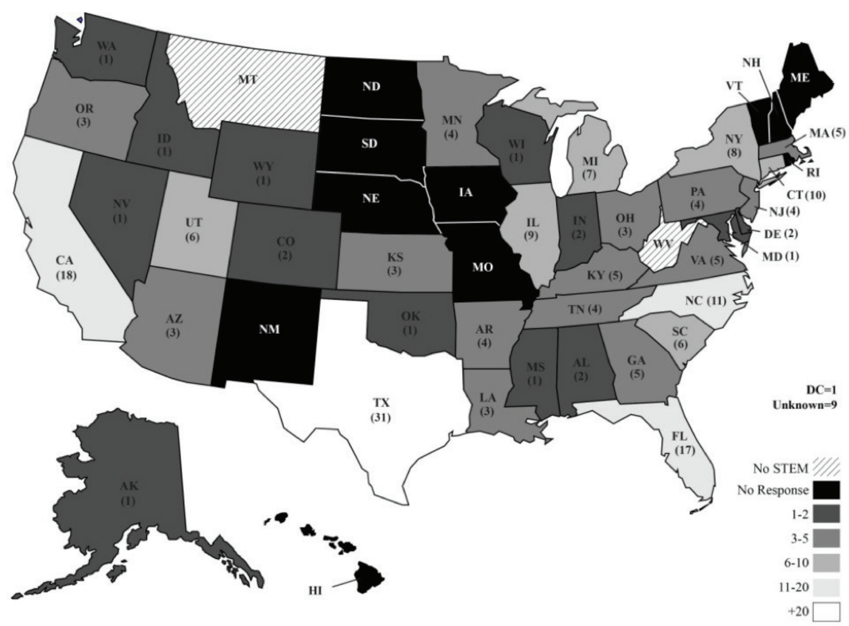

Figure 2.

SCHOOL AND STUDENT CHARACTERISTICS

School Structure and Demographics

Of the 205 administrator respondents, the largest number reported that they served a student population from urban areas (38.0%), followed by suburban (31.2%) and then rural areas (19.0%). Some administrators (7.8%) reported serving students from multiple urbanicities.

The administrator respondents identified a wide variety of school types. As indicated in Figure 3, the greatest percentage (25.9%) classified their school as a comprehensive high school; sizeable numbers categorized their school as a magnet school (19.5%) or as a charter school (16.6%). Nearly 10% of the administrators selected multiple school types to describe their schools. The vast majority (86.8%) of respondents described their school program's organization as *full day*.

School Size

Approximately half of the administrators (50.2%) reported schools serving more than 400 students; approximately one-third (34.1%) reported between 200 and 400 students; and 12.7% reported serving fewer than 200 students. Approximately half of the schools in the sample (48.2%) employed fewer than 30 teachers and the other half (51.2%) had more than 30 teachers. Slightly more than half (60.3%) had three or fewer administrators, while in a sizeable minority (39.7%) more than three administrators were on staff.

Admission Criteria

Administrators were allowed to select more than one response when indicating criteria used for admission to their schools. The most frequently reported criterion used to select students (45.4%) was students' grades, report cards, or transcripts. More than a third of respondents (40.0%) reported using no admission criteria for student enrollment, indicating these schools were inclusive STEM-focused high schools. Figure 3 summarizes the responses to this item. Other admission criteria added by respondents included lottery systems, auditions, and residency requirements.

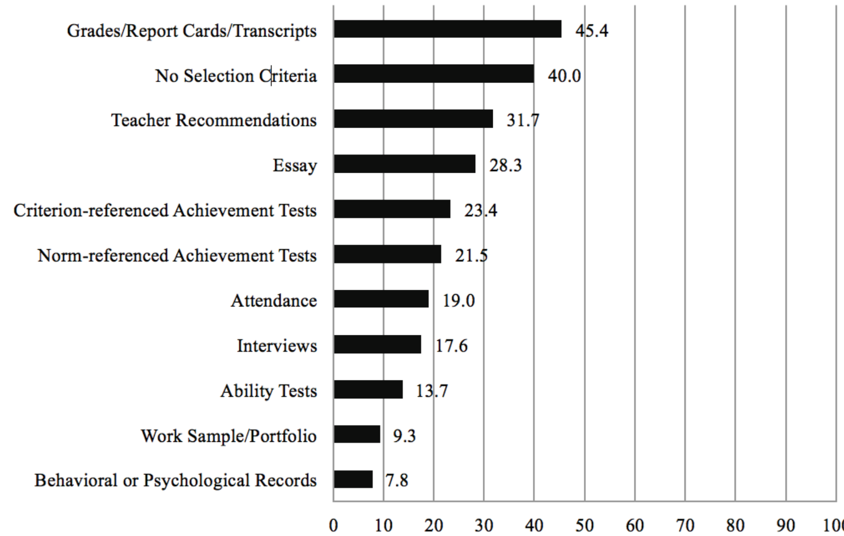

Figure 3.

Student Characteristics

About 28% of administrators in the sample reported serving a student population with less than 25% eligibility for free and reduced lunch; approximately the same proportion (27%) of respondents were from schools with 26% to 50% student eligibility. Slightly fewer administrators reported serving populations with 51% to 75% eligibility, and even fewer served populations among the highest category of eligibility (76% to 100%). Despite these differences, a full range of school-level SES levels was represented in the schools responding to the survey (see Figure 4).

Student gender ratios were well balanced at nearly all of the schools surveyed. A small percentage (4.5%) of schools served fewer than 25% or greater than 75% female students. The survey did not ask administrators if their school was a single-sex school, which may have been the case for these few schools.

ANALYSES OF ADMINISTRATORS' AND TEACHERS' SURVEY RESULTS

We used descriptive statistics to summarize administrators' and teachers' responses to the survey items. Medians were selected because of the ordinal nature of the data and the highly skewed response patterns for many items on the Importance scale (Hinkle, Wiersma, & Jurs, 2003). We reported these statistics for respondents' choices on both scales of the survey items. We also examined items for which there might be discrepancies between respondents' perceived importance and reported frequency of use by calculating the difference in medians. We considered more than one point of difference between the medians on the two scales to be indicative of a potential mismatch between perceived and enacted priorities. For some items, this discrepancy was not problematic due to high importance practices that would not be expected to occur frequently. But for many other items, we believed it was important to compare the differences between responses on the two scales. As another way to describe the relative importance of the items on the survey, we reported the percentage of respondents who selected one of the two highest possible importance scale rating categories (*very important* or *essential*) for each item.

Administrators' Survey Results

Professional culture. Two items, *Encourage teachers to ask open-ended questions with no solution path* and *Provide students with opportunities to participate in extra-curricular activities*, received a median importance rating of *essential* by the administrators who responded (see Table 1). No Professional Culture items received a median frequency rating of *every day*; however, the following items had a median rating of occurring *at least once a week: Allow teachers flexibility in modifying curriculum*; *Encourage teachers to ask open-ended questions with no single answer of solution path*; *Provide students with opportunities to participate in extra-curricular activities*; and *Provide specialized counseling services for students' social- emotional needs*. The only item on the Professional Culture section with a greater than one point difference in medians between the two response scales was *Recruit students from culturally diverse or underrepresented groups (e.g., females, African Americans, Native Americans, SES)*. Although administrators viewed this practice as very important, it only occurred on average once or twice a grading period, which may reflect their recruitment and admissions cycles.

Although STEM administrators generally rated most items in the Professional Culture section highly, differences existed among items in the percentage of administrators who selected either *very important* or *essential*. Over 80% of administrators rated within-field teacher collaboration and sustained professional development as *very important* or *essential*. In contrast, less than 50% of administrators rated *Collaboration between STEM and non-STEM teachers* as *very important* or *essential*. Figure 4 shows the percentage of administrators rating each Professional Culture item as *very important* or *essential*.

Item	Median Importance	Median Frequency	Median Difference
1. Communicate a STEM-specific vision of the school	5	4	1
2. Provide scheduled time for teacher collaboration within each STEM discipline	5	4	1
3. Provide scheduled times for teacher collaboration across STEM disciplines	5	4	1
4. Provide scheduled times for teacher collaboration between STEM and non-STEM disciplines	4	3	1
5. Promote change through faculty involvement in decision-making	5	4	1
6. Provide sustained opportunities for teacher learning within the school	5	4	1
7. Allow teacher flexibility in modifying curriculum	5	5	0
8. Conduct observations of teachers focused on their use of inquiry-based pedagogy	5	4	1
9. Encourage teachers to ask open-ended questions with no single answer or solution path	6	5	1
10. Recruit students from culturally diverse or underrepresented groups	5	3	2
11. Provide students with opportunities to participate in extra-curricular activities	6	5	1
12. Require students to complete community service	5	4	1
13. Provide counseling services for students' social-emotional needs	5	5	0
14. Provide specialized counseling for students' long-term career plans	5	4	1

Table 1. Administrators' Median Responses to the Professional Culture Items (n = 205)

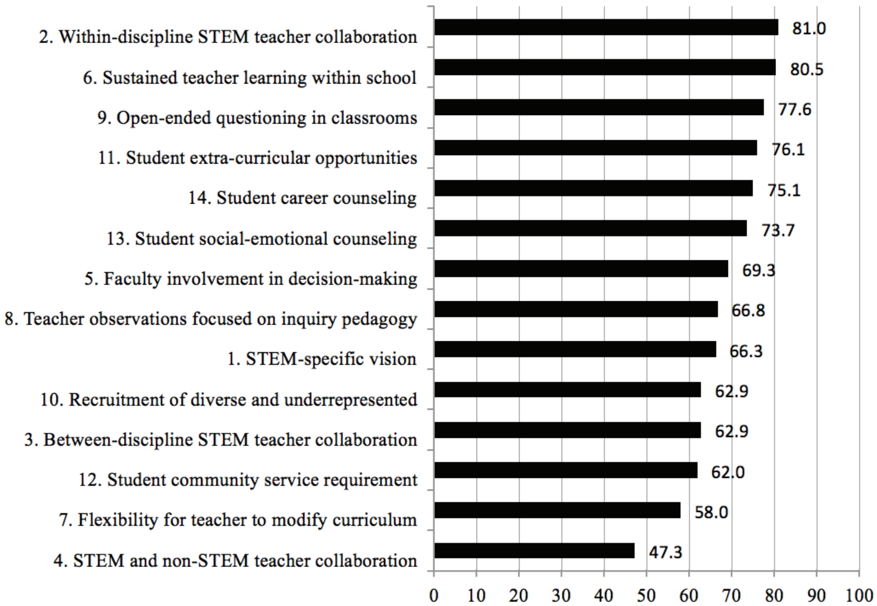

Figure 4.

Curricular and instructional practices. Providing students with access to basic STEM resources, such as computers, Internet, graphing calculators, and laboratory equipment received a median importance rating of *essential*. All other items in this section had a median rating of either *important* or *very important*. On the Frequency scale, administrators reported providing access to basic STEM resources and providing access to visual and performing arts classes with a median frequency of *every day*. Items associated with program evaluation, faculty research, student participation in STEM competitions, and student shadowing of STEM professional had a median frequency rating of *once or twice a year.* Approximately one third of the administrators reported *never* in response to requiring external program evaluation and promoting student participation in international STEM competitions. A number of the items in this section had a difference in median importance and frequency ratings, including internal program evaluation, student participation in national STEM competitions, and student shadowing of STEM professionals. Some discrepancies between importance and frequency ratings, such as participation in competitions, may be due to factors outside of the administrators' control. Results of the curricular and instructional practices section of the survey are summarized in Table 2.

Figure 5 illustrates the percentage of administrators who responded to each of the curricular and instructional

Item	Median Importance	Median Frequency	Median Difference
15. Require preassessment of student knowledge in STEM classes	4	3	1
16. Require formative evaluation of student progress	5	5	0
17. Require summative evaluation of student progress	5	4	1
18. Require that the effectiveness of the specialized STEM program be internally assessed	5	2	3
19. Require that the effectiveness of the specialized STEM program be externally evaluated	4	2	2
20. Provide time for students to meet with research advisors	5	3	2
21. Promote faculty-based research	4	2	2
22. Provide students access to professional STEM journals	4	3	1
23. Provide students access to basic STEM resources	6	6	0
24. Provide students access to advanced STEM resources	5	5	0
25. Promote student involvement in national STEM competitions	5	2	3
26. Promote student involvement in international STEM competitions	4	2	2
27. Provide students access to visual and performing arts classes	5	6	-1
28. Provide students opportunities to shadow professionals in STEM fields	5	2	3
29. Offer students dual enrollment at local colleges or universities	5	5	0
30. Provide students opportunities to complete internships in STEM fields	5	3	2

Table 2. Administrators' Median Responses to Curricular and Instructional Practices Items (n = 205)

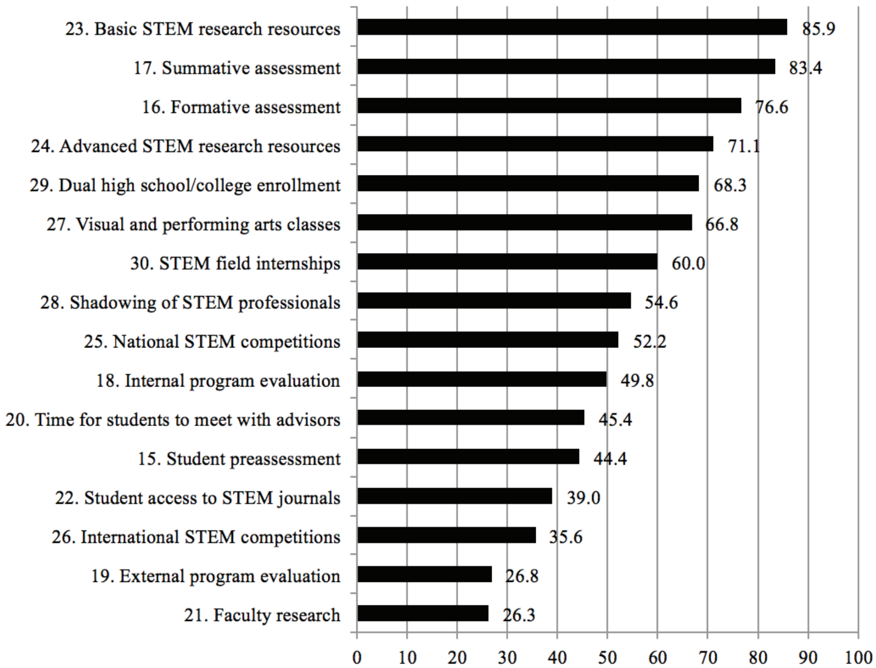

Figure 5.

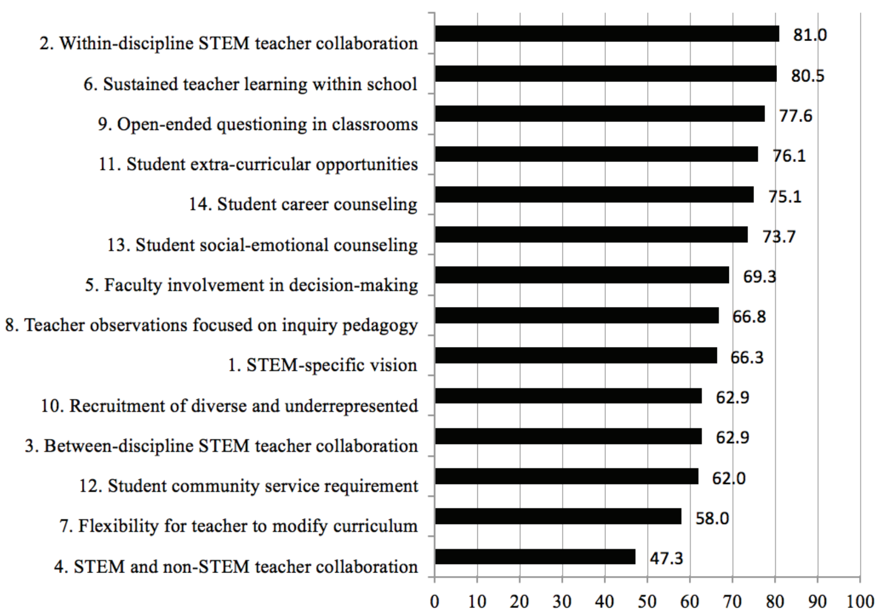

Figure 6.

practices items with a rating of either very important or essential. Providing basic STEM resources and requiring summative and formative assessment of students received the highest percentage of these ratings, while only about 25% of respondents rated promoting faculty research and requiring external program evaluation as very important or essential.

Policies and procedures. Only the Importance scale was rated in the Policies and Procedures section. Administrators gave a median importance rating of *very important* to all of the items in this section except for the item referring to providing students opportunities to obtain industry certifications, which had a median rating of *important* (Figure 6).

Teachers' Survey Results

School climate. The median teacher importance rating for offering students tutoring or extra help in STEM courses and encouraging students to use their knowledge to better the world was *essential*. All other items in this section obtained a median importance rating of *very important*. Two of the School Climate items that were rated as very important but only enacted *once or twice a year* related to students' meeting and collaborating with STEM professionals. Ratings for the School Climate items are summarized in Table 3.

Approximately four-fifths (80.8%) of the teacher respondents reported that it was *very important* or *essential* to offer students extra academic help if needed, while about half of the teachers responded with these highest two importance rating choices for working to enhance their schools' reputations, providing opportunities for students to meet with diverse STEM professionals, and facilitating student collaboration with working STEM professionals. Figure 7 shows the percentage of teachers who rated each of the School Climate items as *very important* or *essential*.

Curriculum development and implementation. The median rating for designing real- world oriented curriculum was essential, with most other items receiving median ratings of *very important* on the Importance scale. Several items, including encouraging students to present products to authentic audiences, were rated as very *important* but only reported as occurring in practice infrequently (see Table 4).

Teachers rated most of the items in the Curricular Approaches section as *very important* or *essential*. Few (21.6%) rated adopting curricular units without

Item	Median Importance	Median Frequency	Median Difference
1. Work to enhance and promote the reputation of excellence at your school	5	3	2
2. Collaborate in STEM curriculum development	5	3	2
3. Arrange collaborative projects for students with working professionals	5	3	2
4. Expect students to maintain a professional lab	5	5	0
5. Offer students tutoring/extra help in STEM classes if needed	6	5	1
6. Offer guidance and counseling for student social/emotional needs	5	5	0
7. Celebrate student accomplishments, achievements, and awards	5	4	1
8. Encourage students to use their knowledge for the betterment of the world	6	5	1
9. Offer students opportunities to meet with STEM professionals of various backgrounds	5	2	3

Table 3. Teachers' Median Responses to School Climate Items (n = 777)

Item	Median Importance	Median Frequency	Median Difference
10. Teach academic writing skills	5	5	0
11. Adopt preexisting challenging and advanced STEM units of study without making modifications	4	3	1
12. Modify preexisting challenging and advanced STEM units of study	5	4	1
13. Create challenging and advanced STEM units of study	5	4	1
14. Modify units to meet students' readiness levels	5	5	0
15. Emphasize depth of conceptual understanding of STEM topics	5	5	0
16. Design problem-based learning opportunities	5	5	0
17. Model making connections across and within STEM disciplines	5	4	1
18. Design curriculum that promotes real- world applications	6	5	1
19. Integrate controversial and/or timely STEM topics into class content	5	4	1
20. Require students to apply research skills to complex real-world problems	5	4	1
21. Teach research skills	5	4	1
22. Encourage students to select STEM research topics	5	3	2
23. Provide an opportunity for students to design and complete self-selected research project(s)	5	3	2
24. Encourage students to present products to authentic audiences	5	3	2
25. Provide explicit lessons to teach students to take notes effectively	5	3	2
26. Provide direct instruction to students on time management skills	5	3	2

Table 4. Teachers' Median Responses to Curricular Approaches Items (n = 777)

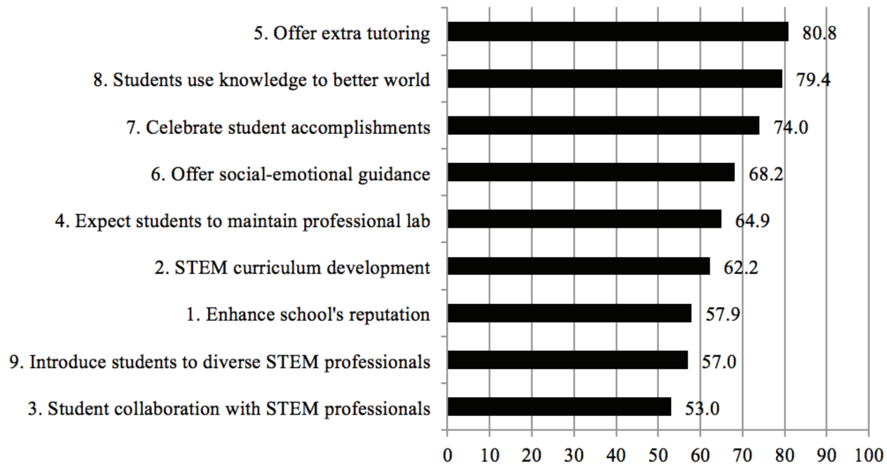

Figure 7.

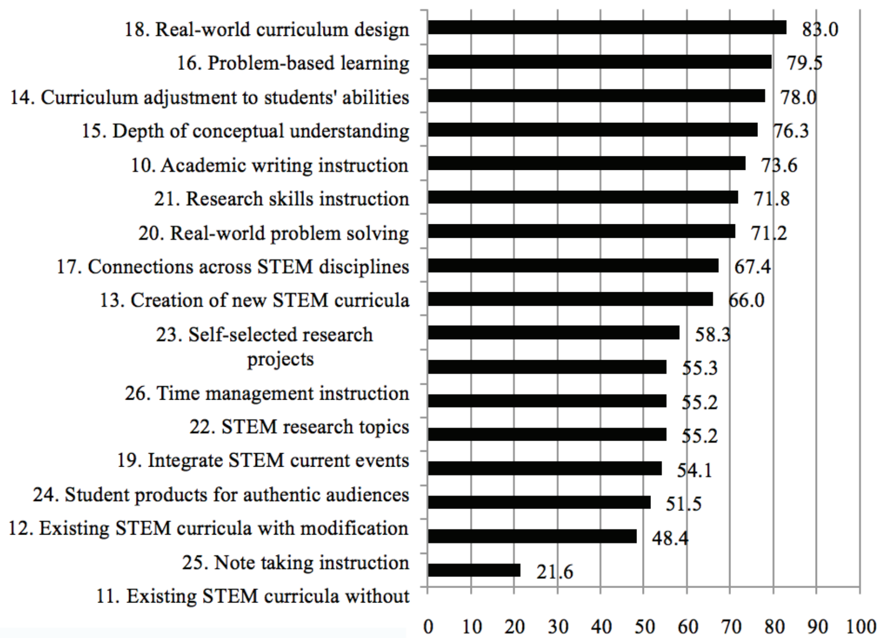

Figure 8.

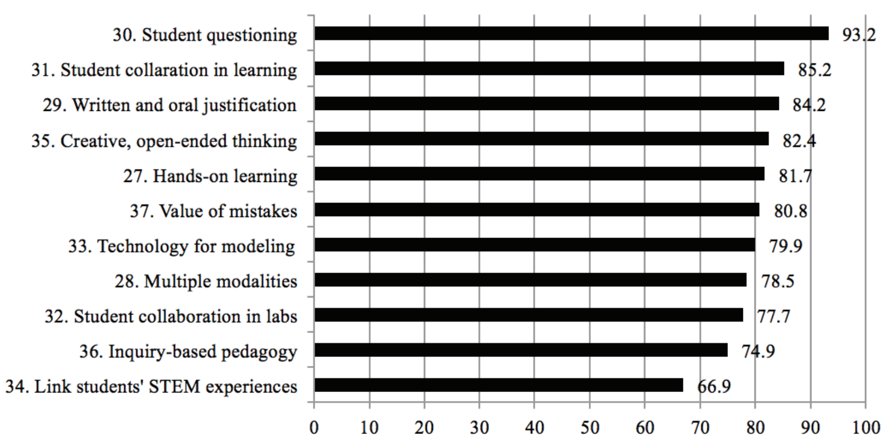

Figure 9.

modification in these highest two categories of importance. For the other items, the percentage ranged from approximately 50% to 80% of teacher respondents (Figure 8).

Instructional strategies. Teachers rated all items in the Instructional Strategies section as quite important, with all items receiving a median rating of either *very important* or *essential*. In terms of frequency, nearly all of the items in the section had a median frequency of at least once a week, except for encouraging student questioning, which had a median frequency rating of *every day*. No items in this section had a difference between the median importance and the median frequency of greater than one point. The largest percentage of teachers rated student questioning as *very important* or *essential*. This information is summarized in Figure 9.

Learning environment. In the section on Learning Environment, teachers only selected responses from the Importance scale options. The median rating for promoting a common vision of excellence at the school was *essential*, and directly instructing students on help-seeking behaviors was *very important*. The vast majority of teachers (83.8%) considered promoting a common vision of excellence for the school to be *very important* or *essential*, with a sizeable majority (70.7%) responding with one of the two highest importance ratings for providing direct instruction in seeking help. In contrast, fewer than half of the teacher respondents perceived promoting STEM careers over other careers (46.2%) or student articulation of long-term career plans (39.4%) to be *very important* or *essential*.

SUMMARY AND DISCUSSION

This study offered an exploratory description of the importance and frequency of various policies and practices in STEM-focused high schools in the United States. Items for the surveys were developed based on inductive analyses of common practices found in different types of STEM-focused high schools (e.g., selective, inclusive, and career and technical schools) with varied types of service delivery models (e.g., magnet, charter, school-within-a-school, comprehensive, and Governor's schools). The purpose of the study was to gather a nationally representative sample of administrators' and teachers' perceptions about practices and policies to help identify and assess the critical components (Lynch et al., 2013) of STEM-focused education. This evaluative process led to the beginning stages of developing a descriptive framework based on the features unique to these specialized academic settings, which might inform future inductive and deductive studies, the creation of new STEM schools, and improvement of those currently operating (Scott, 2012).

Administrators rated three areas as essential: *Provide students access to basic resources needed to engage in STEM-related research and projects (e.g., lab equipment, computers, Internet, graphing calculators, lab supplies)*; *Provide students with opportunities to participate in extra-curricular activities*; and *Encourage teachers to ask open-ended questions with no single answer or solution path*. Conversely, administrators perceived the items addressing faculty-based research, external program evaluation, and student participation in international STEM competitions to be relatively unimportant. A number of administrator items that were rated as very important were reported as occurring with low frequency, such as *Recruit students from culturally diverse or underrepresented groups (e.g., females, African Americans, Native Americans, low SES*; *Provide time for students to meet with research advisors*; and *Provide students opportunities to complete internships in STEM fields*.

Teachers rated importance and frequency quite high for most of the items on the teacher survey. Ten items received median importance ratings of essential from teacher respondents, 28 items had a *very important* median rating, and only three items had an *important* median rating. Across the four sections, the item with the highest proportion of *very important* or *essential* ratings on the STEM teacher survey was *Encourage student questioning*. It may indeed be somewhat alarming that 7% of teachers in the survey did not rate student questioning as *very important* or *essential* given the centrality of curiosity to scientific thinking and inquiry and literature on establishing inquiry-based teaching and learning environments (see Saunders-Stewart, Gyles, & Shore, 2012). The least important items to teachers were *Adopt preexisting challenging and advanced STEM curricula without making modifications*; *Promote STEM careers over other career options*; and *Require written or oral articulation of long term career plans beyond undergraduate education*. It is possible that these career-planning tasks do not reflect the missions of a majority of STEM high schools. Perhaps teachers are uncertain of how to provide such support or perhaps teachers feel that placing these unnecessary academic burdens on adolescents is exclusive of their roles as teachers. In either event, this perception is worth noting because of its disparity with the societal goal of increasing the number of students who pursue STEM-related majors in college and enter STEM-related careers.

Also of concern was that only 44% of administrators rated pre-assessment of students as *very important* or *essential*, suggesting that the perception of these students as a homogenous group may lead to homogeneous curriculum and instruction—failing to challenge the more advanced students and not providing appropriate scaffolding for those who may come to the schools less prepared. Another concern lies in the low importance teachers placed on student- selected research projects (only 58% rated this practice as *very important* or *essential*), and on STEM research projects and STEM current events (only about 55% of teachers rated these strategies as *very important* or *essential*).

LIMITATIONS

Several limitations influenced the findings of this study. First, the Importance scale appeared to have considerable ceiling effects for many of the items. Although it is not surprising that administrators and teachers would find many practices to be very important, research should continue to document which features are the most fundamental to high-quality STEM education. In future studies, researchers may obtain more variable responses by scaling responses without affixing anchor words such as *important* or *essential* to the scale points.

From the nearly 1,000 high schools to which we distributed surveys, 205 administrators and 777 teachers responded from 291 different schools. Because the response rate was not higher, it is reasonable to consider that those administrators and teachers who chose to respond may not have been fully representative of the entire population.

Perhaps administrators and teachers who were most enthusiastic or had the most available time were able to respond, which could create bias in the results. In short, a higher response rate could have strengthened the validity of our findings and increased the generalizability of our recommendations.

RECOMMENDATIONS AND CONCLUSIONS

As more STEM-focused schools and programs are developed, it is critical to systematically identify them and determine the impact they have on their students. The National Research Council (2011) established three broad goals for K-12 STEM education in the United States: expand the number of students who ultimately pursue advanced degrees and careers in STEM fields; expand the STEM-capable workforce; and increase science literacy for all students. Effective instruction and conditions and cultures that support learning (National Research Council, 2013) were identified as the two most proximal influences that should enable students to attain these goals. This study's findings indicated that teachers and administrators rated many related survey items as *very important* or *essential*, but the frequency of some practices did not match their perceived importance. These differences may exist because of barriers and limitations to implementing these practices in their respective schools, such as lack of time, materials, or teacher training. Future studies could investigate administrators' and teachers' perceptions about why the disparity occurs. In addition, the ways that schools address their effectiveness to fulfill their mission should be examined.

The next step is to determine the degree to which the factors identified as important and frequent affect student outcomes, and then to identify ways to support stakeholders in developing internal and external evaluation criteria for assessing their effectiveness in implementation. It is understandable that some schools may be required to follow mandated policies and procedures. Administrators and teachers at STEM high schools have indicated a variety of important aspects of the curricular, instructional, and environmental aspects of their schools. Analysis of the survey responses provided an overview of the state of STEM high schools in the United States. The administrator and teacher surveys in the present study are, in part, tools for assessing growth, which may inspire a continuous cycle of evaluation, reflection, and improvement.

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