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MA Department of Elementary and Secondary Education

Evaluation of the Statewide STEM Advanced Placement Program

Year 2 Interim Report

September 2014

Contents

[Tables and Figures ii](#_Toc399763371)

[Introduction 1](#_Toc399763372)

[Methodology 3](#_Toc399763373)

[Results 5](#_Toc399763374)

[Interviews with ESE and Mass Insight Personnel 5](#_Toc399763375)

[Teacher Survey 14](#_Toc399763383)

[Participation in Mass Insight Teacher Training 37](#_Toc399763397)

[Conclusion 38](#_Toc399763398)

# Tables and Figures

Figure 1. Advancing STEM AP Logic Model 3

[Table 1. Respondents’ School Districts 14](#_Toc399763462)

[Table 2. Type of AP Courses Taught by Respondents 16](#_Toc399763463)

[Table 3. Years Teaching AP STEM or AP English Courses 17](#_Toc399763464)

[Table 4. Professional Development Opportunities and Supports Offered to Teachers in the Advancing STEM AP Program 18](#_Toc399763465)

[Table 5. Effectiveness of Professional Development Opportunities and Supports Offered to Teachers in the Advancing STEM AP Program 20](#_Toc399763466)

[Table 6. Supports from Mass Insight Content Directors Offered to Teachers in the Advancing STEM AP Program 22](#_Toc399763467)

[Table 7. Effectiveness of Supports from Mass Insight Content Directors Offered to Teachers in the Advancing STEM AP Program 24](#_Toc399763468)

[Table 8. Improvement in Professional Capacities Due to Participation in Advancing STEM AP Program 27](#_Toc399763469)

[Table 9. Schools’ Use of Strategies to Encourage Enrollment of Traditionally Underrepresented Students in AP STEM Courses and Exams 30](#_Toc399763470)

[Table 10. Schools’ Use of Strategies to Support the Success of Traditionally Underrepresented Students in AP STEM Courses and Exams 33](#_Toc399763471)

[Table 11. Teachers’ Personal Use of Strategies to Support the Success of Traditionally Underrepresented Students in AP STEM Courses and Exams 35](#_Toc399763472)

[Table 12. Attendance of Teachers in Mass Insight Program Events 37](#_Toc399763473)

# Introduction

The Massachusetts Department of Elementary and Secondary Education (ESE) is engaged in numerous initiatives to increase the college and career readiness of students in the Commonwealth, to reduce proficiency gaps and improve academic achievement for all population groups, and to enhance the “STEM pipeline” of students who are interested in and well prepared for postsecondary education and careers in science, technology, mathematics, and engineering.

One of these initiatives is the Advancing STEM through an Advanced Placement Science and Mathematics program (hereafter “the program” or the “Advancing STEM AP program”). The goals of the program are to:

* 1. Increase AP science and mathematics course availability, particularly at schools with limited AP science and mathematics offerings and high percentages of low-income and minority students;
  2. Increase access to and participation in AP science and mathematics courses, particularly for students from ethnic, racial, gender, English proficiency, and socioeconomic groups that have been traditionally underserved, so the demographics of these courses better reflect the diversity of the student population of the school and district;
  3. Increase student achievement in AP science and mathematics courses, particularly to close Massachusetts academic achievement gaps;
  4. Increase readiness for college-level study in STEM fields;
  5. Improve science and mathematics teacher effectiveness, including content knowledge and pedagogical skills; and
  6. Increase student interest in pursuing a STEM degree or a STEM-related career after high school.

In order to meet these program goals and track efforts to improve student achievement, ESE contracted with Mass Insight Education (Mass Insight) as a vendor to implement tasks and responsibilities aligned with the purposes of the program. The implementation of the statewide Advancing STEM AP program involves four key central tasks to be implemented in 61 partner schools:

* 1. Increase participation in AP science and mathematics courses, particularly among underserved populations;
  2. Increase performance in AP science and mathematics courses, particularly among underserved populations;
  3. Increase the number of new and/or additional AP science and mathematics courses offered by the partner districts and schools; and
  4. Work in conjunction with statewide Race to the Top pre-AP teacher training program to align efforts of both programs in those districts participating in both programs.

In their work to complete these tasks, Mass Insight was responsible for a variety of activities, including maintaining partnerships with schools with high percentages of minority and low-income students, encouraging recruitment of minority and low-income students into AP science and mathematics classes, educating stakeholders about the benefits of the AP program and STEM careers, assisting districts in eliminating barriers to AP STEM courses faced by typically underserved students, conducting extracurricular study sessions and test preparation sessions, providing exam fee subsidies to low-income students, supporting professional development for AP STEM teachers, supporting teacher attendance at the College Board’s AP summer institute, encouraging curriculum alignment, providing guidance and funds for equipment in new or expanded AP STEM courses, monitoring teacher effectiveness and fidelity to the implementation of the program, and assisting vertical teams of grade 6–10 pre-AP-trained science and mathematics teachers and AP STEM teachers.

ESE contracted with the University of Massachusetts Donahue Institute (UMDI) to conduct the second year of a potential three-year evaluation of the Advancing STEM AP program. The goals of the second year of evaluation are to inform immediate programming and to prepare for the following year of data collection and evaluation in the event that additional funding is available to continue the research.

Analysis of the data collected during this second year is intended to yield findings regarding:

* Professional development and support offered to new and existing teachers of science, mathematics, and English at schools that participate in the Advancing STEM AP program, as well as intended increases in knowledge and pedagogical skills among these teachers; and
* Strategies used to increase science and mathematics AP course availability, and to identify and encourage participation of typically underserved students in these courses.

This interim report describes findings from the initial evaluation activities that were conducted during the second year of the project. These activities included interviews with Mass Insight personnel, a teacher survey, and analysis of Mass Insight teacher training participation data. In doing so, it reviews the achievements made by the program toward meeting its initial goals and identifies successful practices and barriers encountered.

# Methodology

**Evaluation Design**

This portion of the evaluation study uses a mixed-method design that focuses on quantitative information gathered through a teacher survey and teacher training participation data provided by the vendor, as well as qualitative data drawn from interviews of key Mass Insight personnel and open-ended survey items. Specifically, the findings generated from the second year of data collection and analysis thus far are meant to inform the following **research questions** about the core activities of the program:

* What support has been provided for district efforts to offer additional AP courses?
* What professional development has been offered to current and newly recruited AP teachers?
* Have STEM teachers who received professional development increased their knowledge and pedagogical skills relevant to increasing student success in AP courses and exams?
* What strategies have been used to increase AP course availability, identify underrepresented students, and encourage them to take AP courses?

These research questions are based on the logic model depicted in Figure 1.

**Figure 1. Advancing STEM AP Logic Model**

Support district efforts to **offer** **additional** Advanced Placementcourses

**Provide PD** to current and newly recruited Advanced Placement teachers

**Identify and encourage** underrepresented studentsfor

Advanced Placement courses

**Increased underrepresented student participation in AP courses**

**Improved teacher knowledge and skills**

**Increased AP course availability**

**More students from underrepresented groups successfully completing ELA, mathematics, and science AP exams coursework**

*Core Activities*

*Intermediate Outcomes*

*Overall Outcome*

**Data Collection Activities**

This evaluation used the following data collection methods and analytical measures to inform the research questions listed above.

**Vendor Interviews**

Interviews were conducted with key personnel at the professional development vendor (Mass Insight) to gain information regarding the following: professional development and support that has been provided to districts; roles and responsibilities of content directors and other Mass Insight staff; their knowledge of school and district strategies utilized to increase AP course availability; identification of underrepresented students and encouragement to take AP courses; any changes to the program design or activities; and other emergent issues. The interviews were conducted with the following five key personnel from Mass Insight Education:

* **Wesley Chin** – *Senior Project Manager*
* **Sally Guadagno** - *English Content Director*
* **Amy Johnson –** *Science Content Director*
* **John Smolenski** – Senior Field Director
* **John Souther** – Math Content Director

**Teacher Survey**

The teacher survey provides data regarding professional development and support received; strategies used to increase AP course availability, encourage traditionally underrepresented students to take AP courses, support the success of these students in coursework and exams, and gauge teachers’ improvements in knowledge and pedagogical skills relevant to the program through self-reporting; and other emergent issues relevant to ESE and the program vendor. The survey was developed by UMDI researchers with iterative feedback from relevant Mass Insight personnel. A link to the online teacher survey was sent to teachers who were included on an Advancing STEM AP participant roster provided by Mass Insight.

**Training Participation Database**

Mass Insight provided a database of all teachers who participated in two program training events held in 2013. This information provides a basic quantitative indicator of the extent of teacher and school participation in the Advancing STEM AP program.

**Data Analysis**

Data collected in the online teacher survey were entered into a database in a statistical software package (SPSS). The data were analyzed using descriptive statistics. Also, in order to compare AP STEM teachers’ responses to the responses of AP English teachers, a Chi Square analysis was employed to test whether differences between the STEM teacher responses and English teacher responses are statistically significant.

Data from interviews and open-ended survey items were analyzed to document characteristics of program implementation from the perspectives of teachers and program vendor staff. These data were analyzed using a standard qualitative technique that involved multiple reviews and readings of the data. Themes and concepts were developed around emergent and recurring ideas that informed the research questions.

# Results

This section of the report contains the results and findings from the analysis of semi-structured key informant interviews with ESE and Mass Insight personnel, the online teacher survey, and teacher training data. It is organized into the following sections:

* + Interviews with Mass Insight Personnel
  + Teacher Survey
  + Participation in Mass Insight Teacher Training

## Interviews with ESE and Mass Insight Personnel

The interviews with key personnel from Mass Insight provided the opportunity to inform the formative research questions articulated above. The section below outlines some key aspects of the Advancing STEM AP program which are, according to the interviewees, relevant to the purpose of the program, the recruitment of districts, providing support for districts to offer additional AP courses, identifying and recruiting students targeted by this program, as well as the supports and professional development opportunities offered to participating teachers. It should be noted that detailed information and examples provided by interviewees are also included in the Teacher Survey section of this report.

**Purpose of Program and District Recruitment**

Mass Insight (originally Massachusetts Math + Science Initiative) was founded in 2007 with funding provided through a national initiative to create an AP training and incentive program. The program was created to address AP enrollment and success of traditionally underserved students in STEM fields. According to Mass Insight, the population of “underserved students” is broadly defined and includes Latino, African American, and low-income students.

Since its first cohort of ten schools in 2007, Mass Insight has identified schools with a high percentage of minority and low-income students. There has been particular interest in recruiting schools in urban areas, though Mass Insight has begun to direct its attention to schools in non-urban districts. Part of the process of identifying potential schools is looking for where the need is greatest or most urgent. In order to do this, Mass Insight considers schools’ AP exam scoring history and the demographics of the student population.

The process of selecting schools is strategic as well as competitive. Participating schools must sign a letter of agreement that outlines the responsibilities of Mass Insight and the school regarding program elements such as professional development and training for teachers and outreach efforts that will be implemented over a five-year period. Schools are provided with an initial assessment visit and program recommendations. They must also meet certain performance targets regarding the number of AP courses and sections offered as well as the number of students enrolled in AP courses and earning qualifying scores on AP exams. This information is constantly tracked by Mass Insight. If schools fail to reach the targets, Senior Field Director John Smolenski will reach out to the schools’ personnel to discuss existing issues and find out what Mass Insight can do to help promote their success. When schools hit their targets Mass Insight personnel are celebratory in their communications with schools. There are 64 schools currently receiving and Mass Insight intends to continue to add new cohorts of schools in future years.

**Mass Insight Support Provided for District Efforts to Offer Additional AP Courses**

Mass Insight usually begins to support the addition of AP STEM courses to a school’s curriculum by convincing teachers and administrators that the pool of potential AP students is much larger than they currently perceive it to be. Mass Insight personnel report that districts and teachers often only encourage high-achieving students to take AP classes and do not see non-honors or “B” earning students as those who can and should take AP courses. Increasing this pool of students or “widening the pyramid” is a foundational part of the Advancing STEM AP program. By opening up AP classes to non-honors students, making adjustments to AP prerequisites, and aligning course sequences, schools can discover a much larger pool of prospective AP students. Math Content Director John Souther reported that the Mass Insight Staff is always thinking which students are the “next reach,” or the next group of students, that they can recruit into AP courses.

Part of changing this preconception of a potential AP student involves aligning pre-AP curriculum with the AP curriculum so that students are ready for these rigorous high school courses. The Advancing STEM AP program encourages vertical team meetings, where middle school and high school teachers can come together to develop a common language and overlapping trajectories within their content areas. By tying grades 6–10 curriculum with AP coursework, schools are able to prepare students in earlier grades for demanding coursework later in their academic careers. Ensuring that schools have appropriate course sequencing is also important in producing AP-ready students. For example, if a school wants to increase enrollment in AP Biology it will want to offer regular biology in 9th grade because students need two years of lab science before they take AP Biology. By offering a regular biology course to freshmen, a school sets them up to then take a regular chemistry or physics class before moving on to AP Biology as a junior. By changing course sequences, schools can bring students to AP courses earlier in their high school career. Chelsea has modified its course sequencing in a slightly different way in order to allow sophomores to take AP Biology; sophomores take AP Biology concurrently with a regular chemistry course. Smolenski reports that this approach has been successful for Chelsea and that the school had 18 students earn qualifying scores on their AP Biology exam last year.

Mass Insight also enables the addition of AP courses and sections by defraying schools’ costs of purchasing equipment and supplies needed for these classes. These courses often require specific and expensive items—such as textbooks, spectrophotometers, and graphing calculators for new and expanded AP science and mathematics courses—that might deter schools from including them in their course offerings.

**Mass Insight Support Provided for District Efforts to Encourage Enrollment of Traditionally Underrepresented Students in AP STEM Courses**

Removing barriers that prevent students from enrolling is a central part of Mass Insight’s program as well. Mass Insight asks schools to only require that students meet *literal* prerequisites, such as having been promoted to the appropriate grade or having taken the correct course sequence in order to take an AP course (e.g., precalculus before AP Calculus). Souther reports that Mass Insight often urges schools with honors-level courses to turn these into AP classes. For instance, Honors Mathematics would become AP Calculus. He also explained that in addition to removing more formal barriers like prerequisites and course sequencing, it is also important to remove unnecessary requirements that students may find daunting or unattractive. For example, some schools may require students to read four particular books before taking an AP English course. Souther related that kids are not going to sign up for a course where they have to do extra work to simply enroll. English Content Director Sally Guadagno has urged schools to remove this requirement and focus instead on the books and content in the actual course.

Mass Insight is sometimes involved in the variety of ways schools use to recruit students for STEM AP classes. First, Mass Insight often holds a “kickoff event” at each school that joins the program. This event can promote awareness of and excitement about available AP courses. Some schools also hold celebrations for students that earn qualifying scores which also draws attention to these classes. Mass Insight personnel including content directors, John Smolenski, and Assistant Director of Enrollment Services Gary Burdick visit schools to help encourage students to enroll in at least one AP course. Souther reported that all of the content directors are on the same page about the importance of getting students to take any AP course. He explained that by enrolling in any type of AP course students come to understand the requirements of a rigorous course and this understanding will prepare them for success in college level courses.

Smolenski and the content directors often focus on encouraging students to take AP English Language and Composition as their first AP course. According to Guadagno and Smolenski, encouraging students to take AP English is effective in both increasing enrollment and promoting student success in STEM AP courses. They noted that for students to succeed in the STEM AP courses, they need to be able to read college-level textbooks, think critically, and be able to synthesize information. AP English Language and Composition prepares them for these difficult tasks by exposing them to nonfiction readings that cover a wide-range of topics including history, science, gender, politics, technology in the form of essays, letters, scientific studies, editorials, historical documents. Taking the AP English course first also increases students’ confidence and facility in AP STEM courses that require lots of reading including case studies and lengthy word problems. Guadagno reported that AP Language and Composition is especially helpful in building the confidence of traditionally underserved students.

Defraying costs of taking AP courses is another way the program attracts students to AP course work. The existence of exam fees may be off-putting to low-income students who may not be able to afford these added expenses. Mass Insight pays for 20 percent of the cost of the exams. Schools typically make up the difference, though there are some schools that do charge students for the rest of the cost of taking the exam. Additionally, students who demonstrate need are able to apply for fee waivers and some schools provide assistance in completing the waiver forms.

**Mass Insight Support Provided for District Efforts to Promote the Success of Traditionally Underrepresented Students in AP STEM Courses**

Participating districts and schools are organized into several “clusters” which serve various functions to support teachers and students. Each cluster provides three Saturday sessions in each content area to students in the districts belonging to that cluster. The sessions are held on a rotating basis at the cluster’s high schools. A session typically consists of three periods taught by four different teachers drawn from the cluster’s districts who are financially compensated by Mass Insight. Of note, Mass Insight recently reduced the blocks of instruction from four periods to three. This change was in response to the observation that students’ attention and energy was depleted by lunchtime. They were not learning effectively in the fourth period after lunch. Smolenski explained that Mass Insight personnel believes that they also can gain better attendance by selling a Saturday sessions as morning-only opportunities rather than all-day events.

Content directors will also work directly with students by modeling lessons, presenting labs, and providing informal coaching. They also provide lesson plans, activities, and mock exams to teachers that are designed to meet students’ particular needs. Johnson stated that she believes that student success “hinges on trusting grownups.” If students do not trust their teachers and content directors to sufficiently prepare them for the AP coursework and exams then students will not enroll or succeed in these classes. According to Johnson this is especially true of AP Science courses that students often see as difficult and scary.

In high poverty schools, students are also offered financial rewards for earning qualifying scores on their AP exams. For example, if a student earns a 3, 4, or 5 on the exam, they receive $50. Notably, participating schools and Mass Insight have begun to shift away from motivating students with financial incentives. In recent years the awards have decreased from $100 to $50 and are only offered in participating schools as part of their initial letter of agreement (student awards are not part of any services offered to schools post-Advancing STEM AP program). Mass Insight and school staff now try to motivate students based on the fact that enrolling in AP classes will better prepare them for difficult college courses. Johnson appreciated the shift away from financial rewards and noted that there was bitterness amongst students whose schools did not provide awards and learned that others did when students from several schools met at the Saturday study sessions.

Mass Insight personnel also explain that taking AP courses can reduce the amount students spend on college. By earning qualifying scores on AP exams, high school students can obtain academic credits that they will not have to pay for later in college.

#### Professional Development Offered to AP Teachers

The professional development and other assistance provided to teachers in the Advancing STEM AP program are intentionally designed to provide layers of support for participants. There are formal professional development sessions, geographically based teacher clusters, and personnel at various levels who can provide resources and guidance for AP STEM and English teachers who participate in the program.

More formal opportunities include the Mass Insight AP Summer Institute (APSI), the Two-Day Workshop, and pre-AP training. Mass Insight stresses the importance of these opportunities and attracts teachers to them in a number of ways. Graduate credit is available to those teachers taking the APSI. Mass Insight recommends that AP teachers in the program take part in at least two AP Summer Institutes and a Two-Day Workshop.

Also, workshops are differentiated to meet the needs of new as well as veteran AP teachers. Smolenski reported that it takes years of experience for a teacher to develop into a proficient AP instructor and that professional development is central to this process.

High-quality presenters are provided at both of these professional development opportunities. Past presenters for the APSI and Two-Day Workshop have included representatives from the National Council of Teachers, AP exam graders, and speakers from national AP workshops. APSI is run according to College Board criteria and is more structured than the Two-Day Workshop, which is more topic driven and tailored to teachers’ input and articulated needs. The Two-Day Workshop is meant to strengthen skills in areas where teachers are struggling.

There are three content directors—subject matter experts in mathematics, science, and English—who provide professional development and coordinate the operation of the Saturday study sessions offered to students. These directors, along with an assistant content director for each subject area, also provide instructional guidance, lesson plans, logistical assistance, and other resources to schools and teachers. These individuals are usually veteran AP teachers with extensive instruction experience in their content area. Content directors’ expertise is sometimes supplemented with assistance from consultants who can help schools and teachers with specific instruction issues usually in a particular subject area (e.g. environmental science).

Again, participating districts and schools are organized into geographic clusters that serve to promote various support and professional development opportunities. Each cluster also has lead teachers (one per content area) who are responsible for organizing the Saturday sessions and facilitating a community of teachers who collaborate to provide support to each other in terms of resources, instruction, and promoting students’ success. Lead teachers are paid a stipend for their contributions. Content directors report that while these individuals are mostly used to promote and organize the Saturday sessions, they are also a means of disseminating important information and resources to teachers throughout the clusters.

The Saturday sessions that are a part of the programming in each cluster also function as professional development opportunities for the teachers presenting the modules. In addition to instructing the students, presenters are also effectively demonstrating their instructional skills and approaches to their peers. Mass Insight intentionally varies the instructors from session to session in order to try to give as many teachers the opportunity to present in front of their peers and get more presentation experience. However, Mass Insight also tries to avoid using instructors who are particularly struggling.

These sessions are also professional development opportunities for the teachers in the audience as well who are able to learn different perspectives and instructional approaches on the same content. Mass Insight incentivizes the turnout of teachers by providing a $90 stipend to those who attend. Souther explained that these sessions can be very valuable to new teachers—even if their students do not attend to the sessions. One teacher who had difficulty getting his students to attend consistently went to the sessions himself. The handouts and information he obtained at the sessions he then implemented when back in his classroom. Souther reported that this teacher “worked the sessions and materials” and his class ultimately earned very good scores on their AP exams. Johnson underscored that the Saturday sessions are a crucial aspect of the program. She reported that it is very helpful to teachers if they come and participate instead of just sending their students. In her experience, teacher who do not attend the sessions or duck out for coffee are the ones who are dissatisfied with the impact of the session on their students. She also commented that teachers’ non-attendance can rub off on their students and affect their motivation.

Mass Insight personnel emphasized that professional development and other teacher-centered support is not only central to encouraging the enrollment and success of underrepresented students in AP classes, it is also vital to the sustainability of the program. Johnson said that unless AP teachers are better trained Mass Insight is effectively “spinning its wheels” and not making any permanent progress. Smolenski concurred that the program’s professional development and other supports can have a lasting effect on a school. He stated that schools exiting the formal Advancing STEM AP program “will never go back to where they were.” The informal and formal professional development provided to teachers “profoundly” changes the instructional capability of teachers as well as the culture in the school. He conceded that after leaving the program there might be some drop-off in the number of qualifying scores; however, he emphasized that the training offered is transformative in terms of how teachers, administrators, and communities think about AP courses and potential AP scholars.

#### Recent Changes to the Program

There have been several notable changes at the organizational and programmatic levels for the Advancing STEM AP program and Mass Insight Education.

**Organizational Restructuring**

The structure of the Mass Insight Education organization is currently being restructured; the two nonprofit divisions, Massachusetts Math + Science Initiative (MMSI) and the School Turnaround Group, are merging (and will be collectively referred to as Mass Insight Education). MMSI formerly housed the Advancing STEM AP program but it now falls under the Mass Insight AP and College Readiness Program and the larger umbrella of the Mass Insight organization. The two divisions of the organization are being combined in order to offer effective “wraparound” services to schools that need strategic planning, educational consulting, and AP-related programming.

**Teacher Awards and Partners in Excellence**

In past years, Mass Insight directly provided financial rewards to teachers whose students earn a “3” or higher on an AP exam. Participating AP teachers received a financial benefit ($100) for each qualifying score earned by their students. This reward was designed to be an incentive to improve their professional skills and help students succeed. However, the implementation of these teacher rewards was sometimes difficult because teacher labor associations often viewed this as merit-based pay. Smolenski described the merit-based pay issue as “radioactive” in some districts. Last year, Mass Insight implemented a new means of rewarding teachers without the risk of raising the concerns of the labor associations. The program no longer pays the teachers directly and automatically upon students’ earning scores as part of the Mass Insight Letter of Agreement with each district. Instead, teachers can apply to Mass Insight’s Partners in Excellence award program for recognition and financial rewards based on students’ success. This award program is funded by philanthropic individuals, charitable foundations, and private corporations. As previously noted, Mass Insight and many of its Advancing STEM AP program schools are moving away from providing financial awards to students as well.

**Mock Exams**

The Advancing STEM AP program has in the past offered a mock exam opportunity to students in participating schools who are taking an AP English course. In addition to allowing students to practice and familiarize themselves with the exam-taking experience, this opportunity also allows AP teachers to gauge whether students are grasping the material and where they are having difficulty. Mock exam results allow teachers to make data-driven decisions in adjusting their instruction and content focus to benefit students. Mass Insight content directors reported that mock exam results are not used to rank or evaluate AP teachers, and results from these exams are not provided to school administrators. Because of the observed benefits of the mock exam for AP English Teachers and students, Mass Insight intends to offer mock exam opportunities to students enrolled in AP STEM courses as well. Souther commented that extending the mock exams to more teachers and students in other content areas allows Mass Insight to provide greater support; as teachers learn where their students are facing difficulties, they can approach their content directors and other Mass Insight personnel with these challenges and receive tailored support and resources. Teachers can be very specific about their own instructional or content needs and the needs of their students. For example, a teacher may come to Souther for assistance if they identify that their students in are having trouble understanding a particular concept like the average value theorem.

**Sustaining Partnership Program**

In recent years, Mass Insight has started to offer schools that have completed the five years of the Advancing STEM AP program the option of sustaining key AP services on a fee-for-service basis through its Sustaining Partnership Program. This program was developed in response to schools that were cycling out of the core program but wanted to sustain the progress they had made in terms of improving AP enrollment and student success on AP exams. Senior Project Manager Wesley Chin explained that this extended program allows schools and teachers to stay connected to the Advancing STEM AP program and networked with other schools in order to continue to expand their AP courses. As part of the Sustaining Partnership Program, schools can continue to receive a limited set of services, including Saturday study sessions, content director support, and online resources. Districts are no longer provided with funds to purchase equipment and supplies, subsidize student exams, and pay for student awards. Sustaining Partnership schools are also provided with a $5,000 matching grant by Mass Insight which is commonly used for professional development or offering mock exams. Smolenski noted that these schools can be very targeted with their own money and the matching funds after they exit the formal program. For example, if a district has a new chemistry teacher the district can choose to focus its funds on providing professional development opportunities for just this teacher through the program. The school might also choose to provide specialized supports for students in that teacher’s AP Chemistry course, such as mock exams or Saturday sessions. The Sustaining Partnership Program is increasingly popular according to Mass Insight personnel.

#### Expanding the Program to New Audiences

Mass Insight is looking to expand the program in Massachusetts. Guadagno reported that there are several parts of Massachusetts where the program has little to no presence, including the North Shore, North Central, and South Shore areas of the state. In addition to its intended expansion within the state, Mass Insight has begun to provide its Advancing STEM AP services in Jefferson Parish, Louisiana. As part of this expansion, some Massachusetts AP teachers are travelling to Louisiana for professional development opportunities and some of their Jefferson Parish peers are attending similar opportunities in Massachusetts.

Mass Insight is also expanding the reach of its AP Summer Institute by including AP History content and teachers. While AP History courses are not part of the Advancing STEM AP program, AP History teachers are also teaching a humanities curriculum much like their AP English peers. Inclusion of AP History teachers provides a broader network of educators with whom the AP English teachers can collaborate, as they have many cross-subject interests.

**Strengths and Successful Outcomes of the Program**

#### Benefits to Non-AP Students

According to Smolenski, the program has value to non-AP students. The professional development that AP teachers receive better prepares them to provide quality instruction in AP as well as non-AP courses. Teachers begin to teach all of their classes based on what they have learned in the Advancing STEM AP program. These teachers can learn how to get their younger students or students in AP prerequisite courses ready for AP level. Some teachers explicitly incorporate AP elements into non-AP classes. For example, one AP English teacher had her AP students present their final projects to her 8th grade class. The AP curriculum can also potentially aid the implementation of educational standards; Guadagno reported that in her experience the AP program—in particular AP English Language and Composition—reinforces what is found in the Common Core. Notably, Mass Insight also offers teacher training devoted to the Common Core as part of its AP and College Readiness program.

There are schools that choose provide Advancing STEM AP program’s professional development opportunities to teachers who are not currently teaching AP. Johnson explained that providing these opportunities to non-current AP teachers is important because it is “training the bench.” Less experienced teachers are able to obtain more training before they are asked to teach an AP course. This practice also guards against unexpected situations where a veteran teacher may be unable to continue to teach their AP course. In this circumstance, there will be an existing, and well-trained faculty member who can fill this void.

Additionally, Mass Insight’s encouragement to schools to “widen the pyramid” or broaden the pool of potential AP students impacts the entire school. Smolenski related that opening up AP classes to more students often makes schools move towards all students taking at least one AP course. This also encourages schools to address pre-AP preparation in earlier grades. Mass Insight offers pre-AP training opportunities as part of its AP and College Readiness Program and can provide support to participating schools. Johnson reported that even if students do not receive pre-AP preparation, many students will see older brothers, sisters, and neighbors enroll in these difficult courses and complete AP coursework successfully with the guidance of helpful and committed teachers.

#### Building a Community of AP Teachers

One of the frequently noted successes of the program is that through its professional development opportunities, content director interaction, and cross-district Saturday study sessions, Mass Insight has created a community of AP teachers who can support each other in increasing the success of their students. According to Wesley Chin, this network of teachers is a “hidden” aspect of the program. He explained that program components are designed to “pull multiple levers”—in particular the Saturday study sessions address the instructional needs of students while at the same time providing a forum for professional development and networking for teachers. Guadagno reports that she frequently receives unsolicited feedback about the network of teachers that has been created by the program. Teachers tell her that they love having other teachers to talk to in order to get ideas, practices, and materials that they have collected over time.

Building a community of teachers is not always easy – particularly in regard to the science content area. Johnson explained that the subject areas that fall under the Science area are quite diverse which may reduce collaboration. However, she maintained that fostering collaboration and community for AP Science teachers is essential. She posited that the creation of community has particular value for science teachers because they are often alone in their discipline in their school (unlike math and English teachers who have colleagues that teach similar content). It is all the more important for these teachers that they have cross-district collaboration.

Mass Insight is reportedly looking to expand its support of this community. Currently the National Math + Science Initiative has an online resource and educational blog presence. According to Chin, Mass Insight is considering providing a similar online resource to teachers so that they are able to have an additional forum in which they can collaborate and share. Mass Insight presently has a similar online platform for its pre-AP program where teachers can find helpful resources and get information from consultants. Johnson also commented that she may develop an AP-Science-specific message board or Wiki to support the participating AP Science teachers.

**Barriers or Difficulties Encountered in the Implementation of the Program**

#### Funding

The most commonly cited challenge facing the program was sustaining and cultivating funding. According to Smolenski, this is the biggest challenge faced by Mass Insight. It is an expensive program because it serves many schools and provides a variety of services. The potential fallout from failing to secure funding is considerable. For example, 25,000 Massachusetts AP students currently attend and arguably benefit from the Mass Insight-provided Saturday study sessions.

There are funding issues at the school level as well. In some cases, schools cannot afford to participate in the Sustaining Partnership Program after they have cycled out of the core program; however, content directors report that there are schools that came up with creative means to continue to expand and hone their AP program. For example, there are schools that have administered their own mock exams and independently used the scoring service used by Mass Insight. Some have simply corrected the exams themselves. Science teachers at another school have run their own set of Saturday study sessions.

The scarcity of funds was viewed pragmatically by the Mass Insight personnel and some have outlined avenues to new sources of funding. Guadagno said that lacking funding is a given in education and continued, “As teachers, we have learned to work with what we have.” Private sources of funding, particularly from charitable foundations and businesses are being explored and cultivated by Mass Insight as well as by individual schools. Johnson explained that teachers are underutilized fundraisers; they can write compelling grant proposals and get donations from philanthropic and business sources who want to help underserved students have access to quality STEM education in order to enter STEM-related careers. She also proposed that a possible model could be for organizations or firms to fund just one AP class of students.

Smolenski reported that he sees a considerably expanded role for private forms of support. He said that getting businesses involved is important to sustaining a steady flow of funds and to creating more opportunities for students interested in pursuing STEM majors and careers. Like Johnson, Smolenski reported that the “adopt a school” model is typically the most feasible way for a business to get involved with supporting the success of underrepresented students in AP STEM classes and careers. This model is logistically convenient; staff from the business can more easily provide supports like being speakers at AP kick-off events or AP classrooms and students can more easily travel to places of business for job shadowing or internships. Smolenski noted that businesses have expressed the desire to help and that STEM employers want to feel closer to education.

He also reported that fruitful relationships between high school AP programs and businesses are beginning to emerge. For example, a financial services firm in Boston recruited and hired interns enrolled in a participating high school’s AP Statistics and Computer Science classes. These were paid internships that allowed underserved students – including low-income individuals – to gain experience while earning money to support themselves or their future educational endeavors. The internships proved to be very successful; the firm reported that the students from the AP classes performed better than their college-level interns. Mass Insight was encouraged by this and is interested in fostering similar relationships in the near future. Possible business partners include Bay State Medical Center, Mass Mutual, Holyoke Medical Center, and Microsoft. Smolenski stated that these private/public partnerships could be “the future of the program.” In addition to monetary support for things like equipment and Saturday sessions, businesses that offer internships and summer jobs to AP STEM students will have added value to the program.

#### School and Teacher Buy-In

The mission of the Advancing STEM AP program is to open the gates of AP courses to more students. Johnson reported that sometimes schools and teachers can be very resistant to the idea that more students (or all students) should have access to AP coursework. Chin reported that Mass Insight can sometimes combat this reluctance by interacting with schools on a personal level; either Smolenski or the content directors have thorough discussions with teachers and administrators to convince them of the merits of the Advancing STEM AP program and the benefits of opening up these courses to underrepresented students. Johnson related that data that outlines the success of participating students is often useful in removing opposition to opening up AP courses. She said that they have to show prospective schools and teachers that they can have *more* students go on to attend highly regarded universities such as Harvard and Yale and well-respected public institutions like the University of Massachusetts and Greenfield Community College.

In addition to the resistance to opening up AP classes to more students, Souther articulated that some teachers “don’t want to play” when it comes to professional development and other supports. Teachers can even be reluctant to support the program when their principals and other district administrators are enthusiastic. Some AP teachers feel that they do not need help delivering the content and Souther is accepting of this position. However, he also makes himself available to help them in any way he can, from offering “cool new materials” to logistics and scheduling. He explained it is his job to “jump up and down” to help them and create a reputation that the content directors have a lot to offer.

Another way he is able to sway more resistant teachers is to have satisfied teachers act as ambassadors of the program and relate the many things it has to offer. Johnson and Smolenski reported that taking reluctant administrators and teachers to other participating schools can also be effective. Reputation of the program is also an effective means of creating interest in the Advancing STEM AP program and establishing long-term buy-in. For example, schools in the Berkshires were hesitant about participating in the program but the STEM pipeline initiatives have spurred places like Drury and Lee to look into the program. Smolenski said that he believed these schools look to the program because they had talked to administrators from other schools who had enjoyed great results that they attributed to Mass Insight’s Advancing STEM AP program. He reported that Mass Insight has cultivated a reputation among school leaders for providing valuable AP and STEM-related programming.

Content directors agreed that it is often essential to convey to schools as well as teachers that they will be there when they need them – even if the need is substantial. They can address minor issues like helping with scheduling extra study sessions or attend to substantial needs such as filling in when a school loses an AP teacher unexpectedly. The latter situation is a reality for some schools. Johnson reports that in one case, the school was without their AP Physics teacher eight weeks before the exam. She was able to fill in via virtual lessons, in-person lessons, and email check-ins with students. Johnson reports that she was sometimes responding to 60 separate students a day. Without the Advancing STEM AP program’s involvement, the school would have been in a bad position. Johnson commented that the students would have felt the loss in particular. She was able to intervene quickly and ramp up support but a couple weeks after losing their AP teacher “already half had lost their confidence and most were angry and frustrated. She was able to get the students back on track for preparing for the exam and expressed optimism about their exam results at the time of the interview. Another district lost its AP Environmental Science teacher and Mass Insight responded by using an educational consultant who specialized in that subject to provide support to the students. Johnson also visited the class twice a week to provide instruction and prepare students for the exam.

Mass Insight’s capacity to fill-in during an AP teacher’s absence was described by Johnson as the program’s “insurance policy.” Not all schools will experience this relatively extreme situation. However, by participating in the program a school can create two “back-ups” for such a situation. They have Mass Insight content directors and consultants who can fill in. At the same time, a participating school can “train the bench” or prepare other teachers in their building to take the reins in an AP course if needed.

## Teacher Survey

A key component of the second year of the Advancing STEM AP evaluation is obtaining the perspectives of teachers who participated in Mass Insight’s Advancing STEM AP program. In late spring, UMDI emailed an online survey link to 371 AP STEM and AP English teachers from 37 high schools in 28 districts that were part of the program and included in the analysis of the FY13 Final Report. In total, 144 individuals responded to the survey, representing about 39 percent of identified participants. With the exception of Narragansett Public Schools, there was at least one respondent from each district participating in the Advancing STEM AP program.

### Respondent Profile

Respondents to the survey included 86 teachers (60 percent) who teach AP STEM courses and 58 teachers (40 percent) who teach AP English courses. These proportions represented by the survey respondents are consistent with the STEM/English teacher breakdown of the total population of the program. See Table 1 for respondents’ school districts.

| Table 1. Respondents’ School Districts  **N: AP STEM Teacher = 86, AP English Teacher = 58** | | |
| --- | --- | --- |
| **School District** | **Number of Responses** | |
| **AP STEM Teacher** | **AP English Teacher** |
| Agawam Public Schools | 2 | 1 |
| Attleboro Public Schools | 1 | 3 |
| Boston Public Schools | 10 | 8 |
| Chelsea Public Schools | 2 | 1 |
| Danvers Public Schools | 3 | 3 |
| Dedham Public Schools | 2 | 2 |
| Dracut Public Schools | 6 | 0 |
| Easthampton Public Schools | 4 | 1 |
| Fall River Public Schools | 4 | 5 |
| Malden Public Schools | 6 | 1 |
| Marlborough Public Schools | 1 | 1 |
| Mashpee Public Schools | 1 | 2 |
| Mendon-Upton Regional School District | 1 | 2 |
| Methuen Public Schools | 3 | 1 |
| Middleborough Public Schools | 3 | 2 |
| Narragansett Public Schools | 0 | 0 |
| Northbridge Public Schools | 3 | 0 |
| Palmer Public Schools | 0 | 2 |
| Peabody Public Schools | 3 | 4 |

|  |  |  |
| --- | --- | --- |
| **Table 1. Respondents’ School Districts (continued)** | | |
| **School District** | **Number of Responses** | |
| **AP STEM Teacher** | **AP English Teacher** |
| Quaboag Regional School District | 0 | 1 |
| Randolph Public Schools | 1 | 0 |
| Salem Public Schools | 3 | 2 |
| Springfield Public Schools | 10 | 5 |
| Uxbridge Public Schools | 1 | 0 |
| Ware Public Schools | 0 | 1 |
| West Springfield Public Schools | 2 | 1 |
| Winthrop Public Schools | 1 | 1 |
| Worcester Public Schools | 13 | 8 |
| **Total** | 86 | 58 |
| **144** | |

Respondents to the survey were asked to indicate which AP course(s) they taught in the most recent school year (SY2013–2014) as well as which courses they taught within the past five years. Mostly, the percentage of respondents who indicated that they taught a given AP course in SY14 was the same or very similar to the percentage who reported that they taught the same AP course over the previous five years. Notably, however, the proportion of respondents who said they taught AP English in SY14 (40 percent) was 7 percentage points higher than the proportion of respondents who indicated that they taught an AP English class within the past five years (33 percent).

Sixty percent of respondents indicated that they taught an AP STEM course during SY14. A somewhat lower proportion of respondents (50 percent) said that they taught at least one kind of AP STEM course within the past five years. Calculus teachers accounted for the largest proportion (12 percent) of those who taught an AP STEM course in SY14 and/or within the past five years.

Of those who indicated that they taught an AP course in SY14, the smallest proportion said that they had taught AP Computer Science (4 percent). Again, just 4 percent reported that they were the instructor for an AP Computer Science class the past five years. Table 2 contains the percentages for all courses.

|  |  |  |
| --- | --- | --- |
| Table 2. Type of AP Courses Taught by Respondents  N = 144 | | |
| **AP Course** | **Percentage of AP Teacher Respondents (English and STEM)** | |
| **Taught Course in SY14** | **Taught Course Within Past 5 Years** |
| Biology | 9% | 10% |
| Calculus | 12% | 12% |
| Chemistry | 10% | 10% |
| Computer Science | 4% | 4% |
| Environmental Science | 8% | 5% |
| English | 40% | 33% |
| Physics | 7% | 6% |
| Statistics | 10% | 10% |

Many of the respondents indicated that they were fairly new to teaching AP classes. About two-thirds of the AP English teachers reported that they taught AP courses for five years or less. Similarly, 64 percent of AP STEM teachers reported that they had taught AP-level courses for five years or less. Responses are shown in Table 3.

This relative inexperience in teaching AP courses may highlight the need for AP-related professional development and other supports provided to teachers through the Advancing STEM AP program. As previously noted, Mass Insight does in fact target teachers who are new to teaching AP classes. Mass Insight urges new teachers to participate in the AP Summer Institute which, according to Johnson, gives participants the confidence to walk in the door as an AP teacher and successfully teach their course.

Johnson also affirmed the need to differentiate professional development and supports for new and more experienced teachers. When she was an AP Physics teacher, Johnson realized that a session that combined new and veteran teachers was “not cutting it.” Now for her trainings, she divides AP STEM teachers into two groups. New teachers are trained in more foundational aspects of the course while veteran teachers are shown a new lab, experiment, or grading system. However, Johnson also noted that the needs of new and veteran teachers “aren’t as obvious as you’d think.” In her experience, some veteran teachers will say that they are doing fine but the principals at the schools would let Johnson know that things are not on track and that additional support is needed. Souther corroborated Johnson’s observation that new and veteran teachers need different supports. He said that even if a teacher is a well-experienced instructor, they might need support in a logistical area, like setting up study sessions.

|  |  |  |
| --- | --- | --- |
| Table 3. Years Teaching AP STEM or AP English Courses  N: AP STEM Teacher = 86, AP English Teacher = 58 | | |
| **Years** | **Percentage of Respondents** | |
| **AP STEM Teacher** | **AP English Teacher** |
| < 1 year | 1% | 0% |
| 1 – 5 years | 63% | 67% |
| 6 – 10 years | 23% | 19% |
| 11 – 15 years | 7% | 7% |
| 16 – 20 years | 3% | 2% |
| 21+ years | 0% | 5% |
| No Response | 2% | 0% |

### Advancing STEM AP Program Professional Development Opportunities and Supports

According to the respondents, most Mass Insight professional development events were widely offered (Table 4). The most commonly offered as indicated by respondents were the AP Summer Institute and the Two-Day Workshop. A slightly larger proportion of AP English teachers (91 percent) than AP STEM respondents (88 percent) reported they were offered the AP Summer Institute. The reverse was true regarding the Two-Day Workshop: 95 percent of AP STEM respondents said that they were offered this opportunity compared to 90 percent of AP English respondents. This finding is consistent with Mass Insight’s emphasis on the importance of these two opportunities.

Four vertical team meetings were reportedly offered to a considerable majority of AP English and AP STEM respondents (78 percent and 76 percent, respectively). Vertical team meetings are an important part of the Advancing STEM AP program’s design. According to Smolenski, it is important that students receive instruction early on that allows them to build skills that they can use in later AP courses. Teachers who teach middle school mathematics and science or high school prerequisite classes are ideally providing rigorous instruction that prepares students for the academic demands of AP coursework.

Somewhat smaller majorities of respondents of both types indicated that they were offered information, materials, and resources by their school’s AP lead teacher. Sixty-nine percent of AP English and 65 percent of AP STEM respondents said that their lead teacher provided them with these supplies. The finding that over two-thirds of AP English respondents reported receiving resources from their lead teacher is unsurprising. It aligns with Sally Guadagno’s account that she regularly disseminates information through lead teachers.

General logistical assistance to maximize teachers’ use of technology, materials, and resources was offered to about half of AP English as well as AP STEM respondents. This moderate response is consistent with the content directors’ description of how they supply logistical assistance. Each explained that offering and providing logistical support was on an as-needed basis. Many teachers do not want or need help implementing technology or materials with their AP students while others do require such assistance.

The least commonly reported professional development opportunity or support was the Mass Insight–sponsored Pre-AP Training Institute. While bolstering the AP program, the Pre-AP Training Institute is not a formal part of the Advancing STEM AP program itself. Still considerable proportions of AP English (48 percent) and AP STEM (44 percent) respondents reported that they were offered this opportunity.

|  |  |  |
| --- | --- | --- |
| Table 4. Professional Development Opportunities and Supports Offered to Teachers in the Advancing STEM AP Program  **N: AP STEM Teacher = 86 , AP English Teacher = 58** | | |
| **Professional Development Opportunity or Support** | **AP STEM Teacher** | **AP English Teacher** |
| Mass Insight AP Summer Institute (5 days) | 88% | 91% |
| Mass Insight Workshop (2 days) | 95% | 90% |
| Mass Insight–sponsored Pre-AP Training Institute (4 days) | 44% | 48% |
| Four vertical team meetings for AP teachers during each year of the grant | 76% | 78% |
| Information, materials, and resources provided by my school’s AP lead teachers | 65% | 69% |
| Logistical support to maximize the use of technology, materials, and resources | 54% | 50% |

### Effectiveness of Advancing STEM AP Program Professional Development Opportunities and Supports

Survey respondents were also asked about the effectiveness of each of these professional development opportunities and supports. Questions about effectiveness of these opportunities were included on the survey in part because of Souther’s suggestion that teachers’ perspective on the relative usefulness and effectiveness of the different types of supports would be beneficial for the evaluation as well as for Mass Insight. Souther and other Mass Insight personnel have their own opinions and experiences in regard to the purpose and effectiveness of the opportunities. As previously noted, Mass Insight staff emphasized that the APSI is central to the program. Notably, Amy Johnson reported that all of the professional development elements are most effective when experienced in concert.

In addition to being widely offered, the APSI was reportedly beneficial to those respondents who attended. Over three-quarters of each type of respondent said that the Summer Institute was very effective. In fact, all AP English and AP STEM respondents who indicated that they went to this professional development event said that it was at least somewhat effective. According to Guadagno, AP English teachers frequently remark that the APSI is “the best PD [they have] ever had.” She attributes the popularity to several features of the training opportunity: the content directors work to hand-pick quality presenters, the sessions are content based, the people and topics are varied and responsive to teachers’ needs, and there are few opportunities to receive content-based professional development in Massachusetts.

The Mass Insight Two-Day Workshop was also rated positively by most respondents. Notably a greater proportion of AP English respondents (81 percent) than AP STEM respondents (68 percent) indicated that the workshop was very effective. Johnson noted that this opportunity offered in October allows for teachers to catch up and review material at a point in the year where they might feel behind or overwhelmed with the curriculum. She remarked that when she was a new AP teacher mid-fall was the point in the year where she felt like she had been “thrown into an Olympic swimming pool wearing cement waders.” Johnson explained that early in the year, AP teachers may not be able to digest and implement the entire curriculum smoothly. By October, teachers are ready to reflect, ask questions, and troubleshoot implementation issues.

AP English respondents were also noticeably more positive about the effectiveness of the Mass Insight–sponsored Pre-AP Training Institute; 64 percent said that the institute was very effective compared to 39 percent of AP STEM respondents who indicated the same.

Respondents were moderately positive about the effectiveness of materials provided through the Advancing STEM AP program. Forty-six percent of AP STEM and 43 percent of AP English respondents reported that the information, materials, and resources provided were very effective. Neither type of respondent indicated that the resources provided were not at all effective. Respondents of each type were also moderately positive about the logistical support they received in order to maximize the information, materials, and resources they received. In fact, 58 percent of AP English respondents and 50 percent of AP STEM respondents said that the logistical support was very effective.

The four vertical team meetings received the least positive responses from both types of respondents. Twenty-eight percent of AP STEM respondents and 29 percent of AP English respondents indicated that the vertical team meetings were very effective compared to the 18 percent of AP STEM respondents and 27 percent of AP English respondents who indicated that the vertical team meetings were not at all effective. While Mass Insight personnel noted the value of early preparation for AP courses and proper course sequencing, none specifically mentioned vertical team meetings as a central support.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table . Effectiveness of Professional Development Opportunities and Supports Offered to Teachers in the Advancing STEM AP Program | | | | | | | | | | |
| **Dimension** | **N** | | **Very Effective** | | **Somewhat Effective** | | **Not At All Effective** | | **Not Applicable** | |
| **AP STEM Teacher** | **AP English Teacher** | **AP STEM Teacher** | **AP English Teacher** | **AP STEM Teacher** | **AP English Teacher** | **AP STEM Teacher** | **AP English Teacher** | **AP STEM Teacher** | **AP English Teacher** |
| Mass Insight AP Summer Institute (APSI) | 76 | 53 | 78% | 77% | 9% | 13% | 0% | 0% | 13% | 9% |
| Mass Insight Two-Day Workshop | 82 | 52 | 68% | 81% | 23% | 17% | 1% | 0% | 7% | 2% |
| Mass Insight–sponsored Pre-AP Training Institute (4 days) | 38 | 28 | 39% | 64% | 21% | 18% | 3% | 0% | 37% | 14% |
| Four vertical team meetings for AP teachers during each year of the grant | 65 | 45 | 28% | 29% | 46% | 44% | 18% | 27% | 7% | 0% |
| Information, materials, and resources provided by my school’s Advancing STEM AP lead teachers | 56 | 40 | 46% | 43% | 43% | 48% | 4% | 8% | 7% | 1% |
| Logistical support to maximize the use of technology, materials, and resources | 46 | 29 | 50% | 58% | 39% | 38% | 0% | 0% | 11% | 4% |

### Advancing STEM AP Program Content Director–Provided Supports

In addition to these opportunities, teachers were asked whether they were offered a variety of supports by their content directors in order to increase student enrollment and success (Table 6). These content directors are Mass Insight personnel who are “master teachers,” specializing in English, mathematics, or science. They provide instructional, content-related, and logistical guidance to teachers in the Advancing STEM AP program.

Notably, the three supports that were most commonly offered according to survey respondents included content-specific professional development focused on AP instruction, the provision of lesson plans or classroom activities, and support in planning and logistics for the student study sessions. This is largely consistent with the content directors’ description of their roles and day-to-day work. Content directors explained that much of their time was spent helping AP teachers improve their instruction through formal training opportunities like the APSI or Two-Day Workshop as well as finding new lessons or activities that would engage students with the AP material.

In regard to each of the other potentially available supports, the majority of AP English and AP STEM respondents said that they were not offered these forms of assistance from their content directors. This is largely unsurprising as content directors reported that many of these supports are provided upon request or are simply not needed by many AP teachers. For example, Souther explained that some teachers will need a support like modelling lessons five to six times during the year, some will need it one to two times, and some will not need it at all.

Less than half of each type of respondent reported that their content director helped them with other types of test preparation activities. Assistance with student assessment was reported more infrequently: 35 percent of AP STEM and 29 percent of AP English respondents said that content directors helped them in this area.

Higher proportions of AP STEM respondents indicated that their content directors strategized and problem-solved with them. In fact, there was a statistically significant difference between the proportions of AP STEM and AP English respondents who reported that they were offered help resolving a variety of issues such as scheduling and time constraints. The difference was quite notable, with 52 percent of AP STEM teachers reporting that they were offered help in this regard and only 24 percent of AP English respondents saying the same.

Again, there was a statistically significant difference in the percentages of AP STEM and AP English respondents who indicated that they had been offered help in increasing student motivation. While half of AP STEM respondents received help from content directors in motivating their students, just 31 percent of AP English respondents reported being offered this type of assistance. It is possible that this disparity reflects the different needs of AP STEM and AP English teachers. Again, Science Content Director Amy Johnson noted that students are particularly anxious about science courses which may affect their motivation. Perhaps students do not view AP English classes with such trepidation and therefore require less support in terms of motivation.

There was no statistically significant difference between the percentages of AP STEM and AP English respondents who reported that they had received assistance in strategizing and problem-solving about increasing student enrollment; however, a higher proportion of AP STEM respondents (47 percent) indicated that they were extended help in this area compared to 38 percent of AP English respondents. These results are shown in Table 6.

|  |  |  |
| --- | --- | --- |
| Table . Supports from Mass Insight Content Directors Offered to Teachers in the Advancing STEM AP Program  **N: AP STEM Teacher = 86, AP English Teacher = 58** | | |
| **Supports from Mass Insight Content Directors** | **AP STEM Teacher** | **AP English Teacher** |
| Observing my classroom and providing feedback and instructional guidance | 34% | 41% |
| Modeling by teaching an AP lesson while I observed | 41% | 29% |
| Content-specific professional development focused on AP instruction\* | 79% | 64% |
| Providing lesson plans or classroom activities | 58% | 60% |
| Support in planning and logistics for the student study sessions | 64% | 62% |
| Assisting with other test preparation activities | 49% | 48% |
| Assisting with student assessment | 35% | 29% |
| Strategizing or problem-solving on ways to increase student enrollment in AP courses | 47% | 38% |
| Strategizing or problem-solving on ways to increase student motivation\* | 50% | 31% |
| Strategizing or problem-solving on other issues (e.g., time constraints, scheduling, other)\* | 52% | 24% |
| *\*A Chi Square analysis was used to test the difference between the responses of AP STEM and AP English respondents. The difference between AP STEM and AP English teachers’ responses was statistically significant for these supports indicated in the table.* | | |

### Effectiveness of Advancing STEM AP Program Content Director–Provided Supports

As with the professional development supports, survey respondents were asked about the effectiveness of the supports they received from Mass Insight content directors. Respondents were generally positive about the effectiveness of the various content director–provided forms of assistance. In a few cases, the percentages of AP STEM respondents who indicated that a given support was very effective was noticeably different from the percentage of AP English respondents who said the same; in these cases, however, there was no statistically significant difference. These results are shown in Table 7.

Content-specific professional development focused on AP instruction was rated quite positively by AP STEM and AP English respondents. Seventy-one percent of the AP STEM respondents and 65 percent of AP English respondents rated this professional development as very effective. AP English respondents were also remarkably positive about content director–provided support in regard to strategizing or problem-solving on ways to increase student motivation: 72 percent rated this support as very effective. AP STEM respondents were somewhat less positive about content director’s support regarding student motivation, with 35 percent saying that this assistance was very effective.

A somewhat higher proportion of AP STEM respondents (56 percent) than AP English respondents (46 percent) reported that the provision of lesson plans or activities was very effective. Conversely, a markedly higher proportion of AP English respondents (53 percent) than AP STEM respondents (30 percent) reported that content directors’ assistance with student assessment was very effective.

Respondents from both groups were moderately positive about the effectiveness of support in planning student study sessions and assistance with other test preparation activities. Similar proportions of AP STEM respondents (53 percent) and AP English respondents (50 percent) indicated that the content director support in planning student study sessions was very effective. Similarly, about half of AP English respondents (50 percent) and AP STEM respondents (48 percent) reported that content directors’ assistance with other test preparation activities was very effective.

There were somewhat less positive responses from both groups of respondents in regard to content director–provided classroom observation, model lessons, and strategizing about increasing student enrollment. Less than half of respondents from both groups said that the supports were very effective. Notably, these were the supports where the largest percentages of respondents indicated that the form of content director assistance was “not applicable.” This finding is largely consistent with reports from content directors; classroom observation, modelling lessons, and strategizing enrollment were mostly provided to AP teachers upon request unlike other supports such as content-specific PD and dissemination of lessons and classroom activities which are provided to all or most teachers.

For example, Guadagno reported that *schools* frequently request that that she help recruit kids for AP English Language and Composition by attending their 10th grade English classes and extolling the benefits of the AP program. However, Guadagno also related that *teacher* requests for recruitment or enrollment assistance “varies” and that she provides most of her supports “upon invitation.” She explained that this assistance often happens organically. She will be in a class to check in with a teacher then start chatting with students which leads to the opportunity to tell them about other AP courses. Often when she is just dropping in to a class she is asked to “stick around” and talk with students. Also, Johnson explained that these supports are provided upon request or on an as-needed basis when she sees that a teacher needs a particular kind of assistance. For instance, modelling lessons is a good way to begin a dialogue with a new teacher because it draws out their real, underlying questions and concerns.

Content director–provided help in strategizing or problem solving on other issues such as time constraints or scheduling was received less positively both groups of respondents. Thirty-six percent of AP English respondents and 33 percent of AP STEM respondents reported that the support was very effective.

| Table . Effectiveness of Supports from Mass Insight Content Directors Offered to Teachers in the Advancing STEM AP Program | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Supports from Mass Insight Content Directors** | **N** | | **Very Effective** | | **Somewhat Effective** | | **Not At All Effective** | | **Not Applicable** | |
| **AP STEM Teacher** | **AP English Teacher** | **AP STEM Teacher** | **AP English Teacher** | **AP STEM Teacher** | **AP English Teacher** | **AP STEM Teacher** | **AP English Teacher** | **AP STEM Teacher** | **AP English Teacher** |
| Observing my classroom and providing feedback and instructional guidance | 29 | 24 | 45% | 38% | 24% | 46% | 10% | 8% | 21% | 8% |
| Modeling by teaching an AP lesson while I observed | 35 | 17 | 43% | 41% | 17% | 41% | 6% | 6% | 34% | 12% |
| Content-specific PD focused on AP instruction | 68 | 37 | 71% | 65% | 22% | 32% | 0% | 0% | 7% | 3% |
| Providing lesson plans or classroom activities | 50 | 35 | 56% | 46% | 32% | 49% | 2% | 3% | 10% | 3% |
| Support in planning and logistics for the student study sessions | 55 | 36 | 53% | 50% | 33% | 47% | 0% | 3% | 15% | 0% |
| Assisting with other test preparation activities | 42 | 28 | 48% | 50% | 40% | 46% | 0% | 4% | 12% | 0% |
| Assisting with student assessment | 30 | 17 | 30% | 53% | 61% | 35% | 0% | 6% | 10% | 6% |
| Strategizing or problem-solving on ways to increase student enrollment in AP courses | 40 | 22 | 45% | 41% | 38% | 50% | 3% | 0% | 15% | 9% |
| Strategizing or problem-solving on ways to increase student motivation | 43 | 18 | 35% | 72% | 51% | 28% | 5% | 0% | 9% | 0% |
| Strategizing or problem-solving on other issues (e.g., time constraints, scheduling, other) | 45 | 22 | 33% | 36% | 53% | 64% | 2% | 0% | 11% | 0% |

### Other Supports Offered from Mass Insight Content Directors

Respondents were asked to describe other forms of support they received from Mass Insight content directors in regard to increasing student enrollment and success in AP STEM courses. A few respondents provided examples of other types of assistance and some elaborated about content directors’ provision of supports listed in the previous table. This section presents a summary of the categories that received at least two responses.

**Supports**

* **Provision of teaching materials and resources** by the content directors was noted by some respondents. Some respondents reported specific resources and materials including a set of AP environmental science textbooks, examples of lessons and activities, current articles, teaching tips, and the website of the National Math + Science Initiative (7 responses).
* **Encouragement and caring support** from content directors was reported by some respondents. For example, one respondent noted that the content director was “very helpful” and another said that the content director advocated for this respondent’s school in “countless ways” (6 responses).
* **Facilitating opportunities to connect and collaborate** with other teachers were appreciated by some of the respondents. Content directors promoted cross-district collaboration among teachers by providing them with each other’s contact information and offering PD opportunities, such as special lead teacher meetings and Saturday sessions (5 responses).
* **Responsive and timely assistance** was appreciated by a few respondents. For instance, one respondent reported, “Any time I asked for support, I was provided with it” (4 responses).
* **Assistance with recruiting students for AP courses** was a support underscored by a few respondents. Respondents reported that content directors helped in getting students enrolled and receiving recruitment materials, and mentioned Mass Insight’s participation in an AP kickoff event where the organization’s representatives gave a motivational speech and presented program statistics to students (3 responses).
* **Access to content area experts** was an aspect of content director support noted by a few respondents. These respondents appreciated the program and the content directors’ efforts to connect them with knowledgeable individuals in the AP field (3 responses).

While the great majority of respondents indicated that they received supports from their content directors, a few respondents noted that the support from their content director was nonexistent, inconsistent, or insufficient.

### Improvement in Professional Capacity

In general, AP STEM and AP English respondents were positive about the impact of the Advancing STEM AP program on their professional capacities. Respondents were particularly positive about the program’s influence on their content knowledge in their AP disciplines. Eighty-nine percent of AP STEM respondents and 88 percent of AP English respondents reported that their content knowledge had improved substantially or moderately because of their participation in the program.

Notably there was a statistically significant difference in the responses of AP STEM and AP English teachers in regard to the improvement in pedagogical skills question. Ninety-one percent of the AP English respondents reported that their pedagogical skills had either moderately or substantially improved in their discipline compared to a considerably lower proportion of AP STEM respondents (79 percent) who said the same. Arguably, 79 percent is still a large proportion that reports substantial or moderate improvement. However, it may be the case that additional attention or interventions are needed to help STEM teachers develop their instruction.

Both AP STEM and AP English respondents were the least positive about how the program improved their capacity to support the success of traditionally underrepresented students. Still, a majority of respondents from each group reported that the Advancing STEM AP program was at least moderately effective in this regard. Full results are shown in Table 8.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table . Improvement in Professional Capacities Due to Participation in Advancing STEM AP Program  **N: AP STEM Teacher = 86, AP English Teacher = 58** | | | | | | | | | | |
| **Dimension** | **Substantially** | | **Moderately** | | **Minimally** | | **Not At All** | | **Not Applicable** | |
| **AP STEM Teacher** | **AP English Teacher** | **AP STEM Teacher** | **AP English Teacher** | **AP STEM Teacher** | **AP English Teacher** | **AP STEM Teacher** | **AP English Teacher** | **AP STEM Teacher** | **AP English Teacher** |
| Improvement in content knowledge in your AP discipline | 48% | 47% | 41% | 41% | 9% | 7% | 2% | 2% | 0% | 3% |
| Improvement in pedagogical skills in your AP discipline\* | 38% | 43% | 41% | 48% | 17% | 5% | 4% | 0% | 0% | 3% |
| Improvement in ability to support the success of traditionally underrepresented students | 37% | 36% | 38% | 43% | 16% | 10% | 8% | 3% | 0% | 7% |
| *\*A Chi Square analysis was used to test the difference between the responses of AP STEM and AP English teachers’ responses. The difference between AP STEM and AP English teachers’ responses was statistically significant for these dimensions indicated in the table.* | | | | | | | | | | |

### Schools’ Use of Strategies to Encourage Enrollment of Traditionally Underrepresented Students in AP STEM Courses and Exams

Overall, moderate and sometimes substantial majorities of respondents reported that their schools used strategies designed to encourage the enrollment of typically underrepresented students in AP STEM courses. With one exception, over half of the respondents indicated that their schools employed a given strategy to support enrollment.

Providing exam fee waivers to students in financial need and helping students complete forms required to register for AP exams were the most commonly reported strategies (79 percent of respondents). Over half of the respondents (55 percent) said that their schools’ provision of exam fee waivers increased as a result of participating in the Advancing STEM AP program. A smaller proportion of respondents (42 percent) said that offering assistance in completing AP exam registration increased because of their school’s participation in the program.

Notably, though offering exam fee waivers and assistance with completing AP registration forms was widely reported, a considerably smaller proportion of respondents (58 percent) reported that their schools helped students to complete forms for exam waivers. A little over a third of the respondents (37 percent) indicated that helping students fill out fee waiver forms had increased because of their schools’ participation in the AP program. In light of the fact that the provision of waivers is evidently widespread, it is possible that the lack of assistance with waiver forms is due to a variety of factors, including that students may not need help, the forms may be easy to complete, and/or schools may not require students to submit waiver forms at all.

Providing outreach to students was also a popular strategy; 78 percent of respondents indicated that their school employed this approach to promote enrollment of underrepresented students. A somewhat smaller majority of respondents reported that the use of this strategy had increased due to their school’s participation in the program. Notably, less than half of the respondents (48 percent) indicated that their school provided outreach to students’ families. Student and parent outreach is a central element of the Mass Insight program.

Over two-thirds of respondents (67 percent) indicated that their school had increased the number of sections of AP science and mathematics courses offered. It should be noted that there was a statistically significant difference in the percentage of AP STEM teachers compared to the percentage of AP English teachers who reported the use of this strategy. Seventy percent of AP STEM respondents said that their school had increased the number of sections while only 43 percent of AP English respondents said the same.

The breakdown of responses regarding increasing the number of courses was similar. Over half of all respondents (58 percent) indicated that their school had increased the number of AP courses offered in order to promote enrollment. Again, there was a statistically significant difference in the percentage of AP STEM respondents compared to the percentage of AP English respondents who indicated the use of this strategy. Seventy-six percent of AP STEM respondents said that their school increased the number of courses while only 40 percent of the AP English respondents said the same—a difference of 36 percentage points. Also about half of all respondents said that these strategies of adding courses and/or sections had increased because of their school’s participation in the Advancing STEM AP program. This is unsurprising given the emphasis on increasing course availability articulated by the Mass Insight personnel interviewed for this report.

Somewhat smaller majorities of respondents reported that adjusting AP and pre-AP course registration policies and holding AP-specific events such as AP Fairs or AP Days were strategies used in their schools (64 and 63 percent, respectively). For each of these strategies, over half of the respondents indicated that their schools use of the approach had increased as a result of participating in the Mass Insight program. Again, this relatively common utilization and increase due to the participation in the program is foreseeable given the fact that Mass Insight stresses the importance of changing prerequisites and course sequences, as well as actively encouraging students to try an AP course. Mass Insight personnel often participate in AP events such as AP Fairs and pep rallies.

Fifty-eight percent of respondents indicated that they notified students of the possibility of receiving awards if they earned a qualifying score on their AP exam. Forty-four percent of respondents reported that this practice had increased as a result of participating in the Mass Insight program. This moderate usage of notifying students about awards may be reflective of the fact that Mass Insight no longer accentuates the importance of this strategy when recruiting students to take AP courses. Smolenski reported that fewer and fewer schools are offering student awards. As previously noted, Mass Insight has moved towards motivating students to take the AP courses because it will improve their chances of success in college.

Just over half of the respondents reported that their school used the College Board’s AP Potential program to identify students who should enroll in AP courses. Just over a third (37 percent) indicated that this practice had increased due to their school’s participation in the Advancing STEM AP program. This moderate level of utilization may be explained by the lack of importance placed on it by the Mass Insight personnel. In general the Mass Insight staff emphasized the importance of making AP courses available for all students and not just those who show “potential” or meet some kind of metric. Also, a couple teachers who took the survey provided an explanation that they do not use the AP Potential tool because it encourages “tracking” or only selecting high-achieving students. For example one respondent reported, “The AP Potential program is tracking in disguise …. Those who feel it's not tracking truly don't understand the ways in which teachers will abuse a system like that in order to exclude students they don't feel are ‘AP material.’” The percentages of respondents using these strategies are shown in Table 9.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Table 9. Schools’ Use of Strategies to Encourage Enrollment of Traditionally Underrepresented Students in AP STEM Courses and Exams  N = 144 | | | | | | |
| **Strategy** | **Our school uses this strategy** | | | **Our school’s use of this strategy has increased as a result of our participation in the Advancing STEM AP Program** | | | |
| **Agree** | **Disagree** | **Don’t Know** | **Agree** | **Disagree** | **Don’t Know** | |
| Providing outreach to students to promote increased participation in AP courses | 78% | 8% | 12% | 64% | 4% | 20% | |
| Providing outreach to families to promote increased participation in AP courses | 48% | 26% | 24% | 40% | 12% | 28% | |
| Notifying students that they will receive awards for qualifying AP exam scores | 58% | 24% | 17% | 44% | 15% | 24% | |
| Providing AP exam fee waivers for students with demonstrated financial need | 79% | 9% | 10% | 55% | 10% | 19% | |
| Helping students complete and submit any forms required for fee waivers | 58% | 7% | 33% | 37% | 8% | 36% | |
| Helping students complete forms required to register for AP exams | 79% | 6% | 14% | 42% | 17% | 28% | |
| Using the College Board’s “AP Potential” program to identify students for enrollment in AP courses | 51% | 17% | 31% | 37% | 13% | 31% | |
| Increasing the number of AP science and mathematics courses offered\* | 67% | 10% | 22% | 55% | 8% | 19% | |
| Increasing the number of sections of AP science and mathematics courses offered\* | 58% | 15% | 24% | 47% | 9% | 23% | |
| Adjusting AP and pre-AP course registration policies (e.g., eliminating requirements such as min. GPA or taking honors-level prerequisite courses) | 64% | 14% | 21% | 55% | 10% | 18% | |
| Holding AP-specific events such as AP Fairs or AP Days | 63% | 28% | 8% | 51% | 11% | 22% | |
| *Note: For some strategies, the total of the percentages does not equal 100 percent. Some teachers did not respond to these questions.*  *\*Although AP STEM and AP English respondents’ answers are not presented separately here, a Chi Square analysis was used to test the difference between the responses of these two types of teachers. The difference between AP STEM and AP English teachers’ responses was statistically significant for these strategies indicated in the table.* | | | | | | |

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### Other Strategies Used by Schools to Encourage Enrollment in AP STEM Courses by Traditionally Underrepresented Students

Respondents were asked to describe other strategies used by their schools to encourage traditionally underrepresented students to take AP STEM courses and exams. This section presents a summary of the categories that received at least two responses regarding these other strategies.

**Supports**

* **Student-to-student appeal** was reported by a few respondents. Students with experience taking AP courses would explain the benefits of taking these classes to their peers (3 responses).
* **Teachers’ direct recruitment of students** was used as an enrollment strategy. AP teachers would speak to prospective AP students about taking these courses (2 responses).
* **Changes to course sequencing or scheduling** was used to encourage enrollment. In one case, a school had students take biology in their freshman year which allowed time for two AP science courses in their junior and senior years. A vocational school offered AP courses during its technical weeks (2 responses).

One respondent noted that though all the strategies listed were being used, the respondent’s school did not specifically target underrepresented students. Another respondent’s school used these strategies before the Mass Insight program, but the respondent said that the continued push to open up AP classes to more students decreased the rigor of their AP course offerings. Also, as previously mentioned, a few respondents criticized the use of the College Board’s AP Potential program.

### Schools’ Use of Strategies to Support the Success of Traditionally Underrepresented Students in AP STEM Courses and Exams

In addition to providing information about their schools’ use of strategies to encourage enrollment of traditionally underrepresented students, respondents also indicated whether their schools used various means to support the success of these students taking AP courses and exams (Table 10). Again, respondents were asked whether their schools’ use of the strategies had increased as a result of their participation in the Advancing STEM AP program.

The most commonly reported strategy used by schools to support the success of underrepresented students was offering the Mass Insight–recommended study sessions. Eighty-eight percent of respondents indicated that their school used this strategy and 74 percent reported that their school had increased the use of study sessions as a result of its participation in the Advancing STEM AP program. The seemingly widespread implementation of the sessions is expected; all of the Mass Insight interviewees noted that the Saturday study sessions are essential to the program. As previously mentioned, interviewees reported that the sessions not only help students succeed but also improve the professional capacity of teachers in attendance.

A majority of respondents (62 percent) reported that their school helped to enable students’ attendance of the study sessions by providing transportation to these events. Almost half of the respondents (49 percent) said that providing transportation to the study sessions had increased because of their school’s participation in the program.

Providing support to students who failed to earn a qualifying score on their AP exams was less commonly reported, as 41 percent said that their schools encouraged students to retake the exam if they failed to earn a “3” or higher. Less than a third said that their school had increased their urging of students to retake the exam since participating in the program. Extra study support for students retaking the exam was even less frequently reported; 22 percent said their schools provided additional support to retakers and just 18 percent said that the use of this strategy had increased as a result of participating in the Advancing STEM AP program. Also of note, there was a statistically significant difference in the percentages of AP STEM respondents and AP English respondents who said their schools encouraged retaking AP exams and provided support for retakers. While 64 percent of AP English respondents said that their school encouraged students to retake exams, only 26 percent of the AP STEM respondents indicated the same. Similarly, 29 percent of AP English respondents said that their schools provided study support for retakers and only 17 percent of AP STEM respondents reported this support.

This difference in utilization of exam retaking strategies corresponds with content directors’ attitudes and perspectives about students retaking the exam. First, many teachers of either type do not encourage students to retake the exam because the students they teach are mostly or all seniors and will have graduated by the time the exam is given in the following year. Guadagno explained that AP English Literature and Composition teachers would not suggest retaking the exam because this course is offered in grade 12.

Secondly, Johnson reported that AP STEM teachers are less likely to encourage and support retaking the exam because of the nature of their courses. She explained that in her experience students will not do well taking the exam for a second time. By the time students retake the exam it will have been a year since they have been immersed in rigorous and specific science or mathematics content and concepts. Johnson does not suggest that AP science teachers in the Mass Insight program encourage their students to retake the exam. This approach is reflected in the survey responses; 19 percent of AP STEM respondents reported their encouragement of students to retake the exam had grown as a result participating in the program and just 13 percent indicated that that provision of additional study support for retakers had increased due to their participation.

Johnson elaborated that this does not apply as much to AP English students; retaking the exam may work for AP English retakers because they have many opportunities to practice and improve their reading and writing skills in the intervening year. English students are required to use and advance their reading and writing skills in other courses and subject areas whereas an AP Chemistry student has little to no opportunity to apply and improve chemistry-related skills in their other classes.

Guadagno does remind schools and teachers of the opportunity for students to retake the AP Language and Composition exam if they have not earned a qualifying score. Mass Insight sends out a reminder to participating schools’ principals about this option. Guadagno also uses lead teachers to pass on this information to other teachers in their school. If Guadagno learns that a teacher is interested in encouraging retaking the exam, she looks to support these efforts and asks, “What can we do to help?” Usually Guadagno’s support involves helping AP teachers provide additional study support including AP Language “boot camps” and general review sessions in the spring. This additional study support varies from school to school with some having formally instituted April study sessions and others having less formal options. Guadagno noted that in her experience, urban schools “push” retaking the exam and provide support to retakers more often than their suburban and rural counterparts.

Schools utilization of collaborating with middle schools to address student preparation for future AP courses was also less commonly reported by respondents. Just 28 percent indicated that their school utilized this strategy and 23 percent said the collaboration increased as a result of participating in the program. Responses regarding schools’ use of these strategies are shown in Table 10.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Table 10. Schools’ Use of Strategies to Support the Success of Traditionally Underrepresented Students in AP STEM Courses and Exams  **N = 144\*** | | | | | | |
| **Strategy** | **Our school uses this strategy** | | | **Our school’s use of this strategy has increased as a result of our participation in the Advancing STEM AP Program.** | | |
| **Agree** | **Disagree** | **Don’t Know/No Response** | **Agree** | **Disagree** | **Not Applicable/No Response** |
| Offering the study sessions prescribed by the Advancing STEM AP Program | 88% | 4% | 8% | 74% | 9% | 17% |
| Providing transportation to study sessions, if transportation is not available | 62% | 27% | 11% | 49% | 15% | 36% |
| Collaborating with curriculum leaders and feeder middle schools to address student preparation for AP courses in grades 6 to 8 | 28% | 43% | 29% | 23% | 25% | 52% |
| Encouraging students to take the AP exam again if they don’t receive a score of ‘3’ or higher\* | 41% | 35% | 24% | 31% | 19% | 49% |
| Providing additional study support to students who are retaking an AP exam\* | 22% | 42% | 36% | 18% | 24% | 58% |
| *\*Although AP STEM and AP English respondents’ answers are not presented separately here, a Chi Square analysis was used to test the difference between the responses of these two types of teachers. The difference between AP STEM and AP English teachers’ responses was statistically significant for these strategies indicated in the table.* | | | | | | |

### Other Strategies Used by Schools to Support the Success of Traditionally Underrepresented Students in AP STEM Courses

Respondents were asked to indicate other strategies used by their schools to support the success of traditionally underrepresented students in AP STEM courses and exams. Very few respondents offered other ways in which their schools were supporting success. Three respondents indicated that their schools provided additional learning opportunities in the form of after-school tutoring and study sessions, practice exams, and make-up sessions for students that missed the Saturday study sessions.

### Teachers’ Use of Strategies to Support the Success of Traditionally Underrepresented Students in AP STEM Courses and Exams

In addition to reporting on their school’s use of strategies to support the success of traditionally underrepresented students, the survey also asked respondents to indicate which strategies they personally used to foster these students’ achievement in AP courses and exams (Table 11). In general, considerable majorities of respondents reported that they used a given strategy to help their AP students. However, much smaller percentages of respondents indicated that they used strategies encouraging and supporting students in retaking AP exams. This was particularly true of STEM respondents.

Providing and supporting students’ use of out-of-class help was evidently important to many respondents. A substantial majority of respondents of both types (91 percent) reported that they personally encouraged students to attend the study sessions. This is consistent with the finding that a large majority of schools offer the Mass Insight–recommended study sessions. Seventy-nine percent of each type of respondent reported that their encouragement had increased as a result of participating in the Advancing STEM AP program. That this strategy was employed frequently among respondents is also consistent with the reportedly wide utilization of this approach in respondents’ schools.

Also, many respondents reported that they attended the study sessions themselves: 87 percent of AP STEM and 88 percent of AP English respondents said they used this strategy. Most AP STEM and AP English respondents (79 and 78 percent, respectively) said that their attendance of the study sessions had increased as a result of participating in the Advancing STEM AP program. In addition to championing the study sessions, large majorities of AP STEM and AP English respondents (87 percent and 88 percent, respectively) said that they provided out-of-class tutoring opportunities to their students.

Teaching the AP curriculum as outlined by the College Board was also a strategy that was widely reported by respondents, as 90 percent of AP STEM respondents and 85 percent of AP English respondents said they taught their AP courses with the assistance of the College Board guidelines. Fifty-eight percent of AP STEM respondents and 64 percent of AP English respondents reported that encouraging students’ attendance of the study sessions had increased as a result of participating in the program.

There was a statistically significant difference between the percentage of AP STEM respondents and the percentage of AP English respondents who said that they encouraged students who failed to earn a qualifying score of a “3” to retake the AP exam. There was also a statistically significant difference between the two types of respondents regarding the percentage who said that they provided extra study support to those students retaking an AP exam. Considerably larger proportions of AP English respondents reported that they encouraged students to retake the exam and provided additional study support for retakers. As previously noted, these differences reflect the feasibility of retaking the exam and content directors’ attitudes and practices regarding the encouragement of students to retake AP exams.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table . Teachers’ Personal Use of Strategies to Support the Success of Traditionally Underrepresented Students in AP STEM Courses and Exams  **N: AP STEM Teacher = 86, AP English Teacher = 58** | | | | | | | | | | | | |
| **Strategy** | **I use this strategy** | | | | | | **My use of this strategy has increased as a result of my participation in the Advancing STEM AP Program** | | | | | |
| **Agree** | | **Disagree** | | **No Response** | | **Agree** | | **Disagree** | | **No Response/Not Applicable** | |
| **AP STEM**  **Teacher** | **AP English**  **Teacher** | **AP STEM**  **Teacher** | **AP English**  **Teacher** | **AP STEM**  **Teacher** | **AP English**  **Teacher** | **AP STEM**  **Teacher** | **AP English**  **Teacher** | **AP STEM**  **Teacher** | **AP English**  **Teacher** | **AP STEM**  **Teacher** | **AP English**  **Teacher** |
| Teaching the AP curriculum as outlined in the College Board guidelines | 90% | 85% | 5% | 10% | 5% | 5% | 58% | 64% | 23% | 14% | 19% | 22% |
| Providing out-of-class tutoring or review sessions to AP students | 87% | 88% | 7% | 9% | 6% | 3% | 55% | 66% | 27% | 16% | 19% | 19% |
| Attending and supporting the study sessions prescribed by the Advancing STEM AP program | 87% | 88% | 6% | 9% | 7% | 3% | 79% | 78% | 7% | 3% | 14% | 19% |
| Encouraging students to attend the study sessions | 91% | 91% | 2% | 5% | 7% | 3% | 79% | 79% | 5% | 3% | 16% | 17% |
| Encouraging students to take the AP exam again if they don’t receive a score of ‘3’ or higher\* | 33% | 64% | 61% | 33% | 7% | 3% | 19% | 48% | 23% | 12% | 58% | 40% |
| Providing additional study support to students who are retaking an AP exam\* | 26% | 53% | 65% | 41% | 9% | 5% | 13% | 40% | 28% | 16% | 59% | 35% |
| *\*A Chi Square analysis was used to test the difference between the responses of the AP STEM respondents and the AP English respondents. The difference between AP STEM and AP English teachers’ responses was statistically significant for these strategies.* | | | | | | | | | | | | |

### Other Strategies Used by Teachers to Support the Success of Traditionally Underrepresented Students in AP STEM Courses

Respondents were asked to indicate other strategies they used to encourage traditionally underrepresented students to take AP STEM courses and exams. This section presents a summary of the categories that received at least two responses regarding other strategies utilized by schools to promote enrollment.

**Supports**

* **Modification or addition of teaching approaches** was a strategy cited by some respondents.For example, one teacher reported that students now present their solution proposals to their peers in class. Another teacher has deliberately been increasing the focus on higher order thinking in the classroom (6 responses).
* **Provision of extra forms of academic support** was a strategy reported by some respondents.Forms of extra academic help included online support through a teacher’s Moodle website, AP “bridge” sessions during the summer, study guides, vacation study sessions, and after-school subject-specific seminars (6 responses).
* **AP exam preparation** was a strategy that a few respondents indicated using to support the success of their students in AP courses. Exam preparation activities included practice exams, providing exam preparation books, and study sessions in the days leading up to the exam (5 responses).
* **Reassurance and encouragement of students** was a strategy cited by a few respondents. One respondent explained that students have trepidations about the AP exams and require support to be successful. Another respondent indicated that ongoing encouragement, counseling, and guidance is an important part of AP instruction (3 responses).

## Participation in Mass Insight Teacher Training

Mass Insight supplied the evaluators with a participation database that provided attendance information regarding two teacher training events held in 2013—the Mass Insight AP Summer Institute (APSI) and the Mass Insight Two-Day Workshop. This database consisted of their current training information regarding 420 teachers who are part of the program. It is meant to provide a “snap shot” of teacher participation.

The Mass Insight Two-Day Workshop offered in the fall of 2012 had higher attendance from AP STEM and AP English teachers than the APSI. Ninety-seven percent of AP STEM teachers attended the workshop and 92 percent of the AP English teachers attended. Less than half (46 percent) of the AP STEM teachers participating in the program attended the 2012 Mass Insight AP Summer Institute. A somewhat lower proportion of AP English teachers were also present at the event. Results are displayed in Table 12.

Notably, a considerable majority of the teacher survey respondents indicated that they were offered the opportunity to attend these professional development opportunities. It is likely that there is widespread knowledge about these offerings among students in schools that participate in the program. The relatively low participation in the APSI may reflect that many teachers had attended an APSI in previous years and did not feel that they needed to go another one.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table 12. Attendance of Teachers in Mass Insight Program Events  **N: AP STEM Teacher = 276, AP English Teacher = 144** | | | | |
| **Event** | **AP STEM Teacher** | | **AP English Teacher** | |
| **Attended Event** | **Did NOT Attend Event** | **Attended Event** | **Did NOT Attend Event** |
| Mass Insight AP Summer Institute (APSI) | 46% | 54% | 42% | 58% |
| Mass Insight Two-Day Workshop | 97% | 9% | 92% | 8% |

# Conclusion

According to interviewees and survey respondents the Advancing STEM AP core program components and strategies are widely implemented in participating schools. More formal and structured professional development opportunities – particularly Mass Insight-run APSI and Two-Day Workshops – were commonly offered to teachers. Conversely, content director supports appeared to be offered less uniformly and were instead distributed on an as-needed basis. Professional development and other supports provided are arguably benefiting teachers’ professional capacity as respondents were fairly positive about the increases in their content knowledge, pedagogical skills, and ability to support the success of traditionally underrepresented students due to their participation in the program. AP STEM and English respondents were generally positive about the effectiveness of program components that they received including the APSI, Two-Day Workshop, resources provided by lead teachers, logistical support, and many forms of assistance provided by content directors. While all opportunities and assistance are not universally offered to or utilized by participants, it appears that training services and other forms of support are supplied effectually when need is either observed by Mass Insight personnel or articulated by participating schools and teachers.

Mass Insight, participating schools, and teachers use a variety of methods to support district efforts to offer additional AP courses, encourage enrollment of underrepresented students, and support student success in AP courses. In general, findings from the interviews and teacher survey suggest that Mass Insight provides considerable assistance in expanding and improving participating schools’ AP course offerings. They work with participating schools to change educators’ perceptions of potential AP students, reduce prerequisite and course sequence barriers, and to defray costs of added AP courses. In concert with teachers and administrators, Mass Insight staff endeavor to attract students to the AP curriculum by creating excitement about the courses, building students confidence, reducing exam costs, and providing academic supports.

There is also evidence that schools and teachers maintain considerable fidelity to the key components of the Advancing STEM AP program. The majority of survey respondents reported that their schools adopted enrollment strategies central to the program including providing outreach to underrepresented students, reducing student costs, offering additional AP courses and sections, and adjusting course sequences and pre-requisites. Also of note, respondents indicated that their schools’ use of these strategies had increased as a result of participating in the program. Many respondents reported that their school had implemented the Saturday study sessions which are much emphasized by Mass Insight as a means of supporting student success.

Substantial majorities of survey respondents indicated that they employed strategies prescribed by the program and highlighted by Mass Insight personnel including: attending the Saturday study sessions, encouraging students to attend the Saturday study sessions, and teaching the AP curriculum as outlined by the College Board. A considerable majority of respondents also reported providing out-of-class academic support to their students. Again, many respondents indicated that their use of these strategies had increased due to their participation in the program.

Other noteworthy strengths and successful outcomes according to the interviewees included the positive impact of the program on non-AP students and the creation of a collaborative community of AP teachers. Interviewees also identified barriers or difficulties encountered during the implementation of the program including sustaining and cultivating funding as well as obtaining school and teacher buy-in. Mass Insight has taken steps to generate new funding models that leverage private philanthropic and business support for the program. Similarly, the organization has responded to buy-in issues by building its reputation for quality professional development and AP program support.

The following discussion is organized into sections which correspond to the four overarching research questions that guide the second year of the evaluation. The discussion also notes some emergent findings regarding successful practices and barriers encountered by the interviewees and the respondents to the teacher survey.

**Support provided for district efforts to offer additional AP courses**

In order to support in the addition of STEM AP courses and sections, Mass Insight begins by helping schools see that the pool of potential AP scholars is actually quite extensive and includes traditionally underrepresented students. When schools realize the large number of prospective AP students, they then work to accommodate these students by expanding the number of AP STEM and AP English course and section offerings.

Mass Insight also works to ensure that many students truly have academic potential and standing to take AP classes. Personnel from Mass Insight work with schools to align pre-AP curriculum with the demands of AP coursework. To support this strategy, Mass Insight encourages vertical team meetings that allow middle school and high school teachers can collaborate to create consistent curriculum that helps students progress as they move up the grade levels. The Advancing STEM AP program also asks schools to make adjustments to course sequencing, prerequisites, and other requirements that create barriers to enrollment for underrepresented students.

Adding AP STEM courses and sections can be quite expensive because these classes often require the purchase of costly items like textbooks, lab equipment, and graphing calculators. To ease this financial burden that could prevent schools from offering more AP classes, Mass Insight provides funding to defray the cost of necessary materials and equipment.

**Professional development offered to AP teachers**

Professional development and other supports were key to the success and sustainability of the Advancing AP STEM Program in participating schools according to Mass Insight personnel. The program is designed to provide layers of formal and informal support for teachers. There are more formal opportunities such as the APSI and Two-Day Workshop. The APSI is run according to College Board guidelines while the Workshop is somewhat less structured and planned to reflect emergent teacher needs. Mass Insight personnel carefully select highly regarded, expert presenters for these events. Survey respondents reported that these more structured opportunities are commonly offered. According to Mass Insight training data, the vast majority of participating AP STEM and English teachers attended the Two-Day Workshop. Slightly, less than half of each group of teachers attended the APSI. The relatively lower attendance figure for the APSI may be explained by the fact that this training is stressed as crucial for new AP teachers while the workshops are described more as brush-up opportunities that can be differentiated for new and veteran teachers.

There are also less formal supports built into the program, most of which are facilitated by content directors. Schools are organized in to geographic clusters though which much of this support is disseminated. Each cluster has lead teachers who are tasked with organizing Saturday study sessions and collaborating with content directors to develop a community of teachers that share materials, resources, and ideas. Content directors provide many forms of support to teachers with the most widely offered being content-specific professional development according to survey respondents. Other forms of support were less commonly reported by respondents. Content directors interviewed for this report explained that other types of assistance are offered and provided as the need arises. Some teachers simply do not ask for or require supports like modeling lessons or planning test preparation activities. Of those who indicated they were offered given supports from content directors, most reported that the assistance was very or somewhat effective.

Another professional development opportunity made available through the clusters is the Saturday study sessions. In addition to providing students with more out-of-class academic support, these sessions are intended to benefit the knowledge and instructional skills of AP teachers. Presenters at the sessions are drawn from the clusters’ member schools. This provides the opportunity for teachers to present in front of their peers and for their peers to learn new approaches and activities that may be effective with supporting the success of their AP students.

**STEM teachers increase in their knowledge and pedagogical skills relevant to increasing student success in AP courses and exams**

Again, Mass Insight interviewees stressed the importance of improving the professional capacity of AP teachers. Creating change in teachers’ ability to promote student success in AP courses is seen as critical in preserving the sustainability of AP programs in participating high schools. While Mass Insight personnel reported that it is important to address the needs of AP students, they articulated that impacting professional capacity has a more lasting effect on schools ability to cultivate students who can earn qualifying scores on AP exams. Overall the survey respondents report that the Advancing STEM has improved their abilities.

AP STEM and AP English respondents were most positive about the program’s impact on their content knowledge in their AP discipline. Notably, there was a statistically significant difference in the responses from AP STEM and AP English respondents in regard to the program’s impact on their pedagogical skills; a considerably higher proportion of AP English respondents than AP STEM respondents said that that their pedagogical capacity had improved substantially or moderately. Respondents from each group were least enthusiastic about the program’s impact on their ability to support the success of traditionally underrepresented students. Still, over three-quarters of AP STEM and English respondents reported substantial or moderate improvement in this regard.

Considerable majorities of respondents reported that they and their schools used study sessions as a means of promoting the success of underrepresented students. The vast majority of respondents indicated that they supported the success of their AP students by encouraging attendance at the Saturday study sessions. Most also said that they attended or supported the study sessions themselves. Also, the majority of respondents indicated that the school provided transportation to the sessions if other forms of transportation were not available. In regard to these Saturday study session-related strategies, substantial proportions of respondents said the use of these approaches had increased due to their participation in the program.

Teaching AP curriculum using the College Board’s guidelines and providing out of class tutoring were also very commonly reported strategies among respondents. However, some strategies for supporting student success were not commonly utilized that addressed students who did not earn a qualifying score. Less than half said their schools encouraged students who failed to earn a qualifying score to retake the exam. Even fewer said that they personally encouraged retaking the exam to their students. Even fewer said that they or the school provided additional study support to retakers. Of particular note, there was a statistically significant different in the percentage of AP STEM an AP English respondents who reported that they or their schools urged and/or supported retaking AP exams. A much larger proportion of AP English respondents noted that they employed retaking strategies. This relative disuse of the strategy is consistent with Mass Insight personnel’s lack of emphasis on the value of repeating the exam. Retaking exams is seldom encouraged to AP Math and Science students who will have little to no additional exposure to relevant topics in the intervening year before the exam. However, AP English students are likely to have many occasions to practice and refine their reading and writing skills in any number of classes before retaking the exam.

**Strategies used by the Advancing STEM AP Program**

* **Increase AP course availability**

The strategies used in the program to increase AP course availability are mentioned earlier in this conclusion. Notably over two-thirds of survey respondents reported that their schools increased the number of AP STEM courses and over half said that the addition of classes was due to the participation in the Advancing STEM AP program.

* **Identify underrepresented students**

As previously mentioned promoting open access to AP courses is a fundamental goal of the Advancing STEM AP program. Mass Insight personnel reported that they work diligently to convince schools that AP should be made available to most or even all students. Part of this process is transforming how schools and teachers view typically underrepresented students. They work to convince them that more students are capable of demanding AP classes so long as they are sufficiently prepared. Almost two-thirds of respondents said that they adjusted course registration policies and prerequisites in order to increase the pool of students eligible to take AP classes. Prerequisites can limit the perceived pool of possible AP students.

While some Mass Insight personnel noted that they sometimes use the AP Potential Tool to identify potential AP students, the instrument seemed only moderately popular according to survey respondents. Some respondents noted that this tool can be used to perpetuate “skimming” or only taking students who are high achievers and who are students who would typically enroll in AP courses.

* **Encourage underrepresented students to take AP courses**

There are many methods employed by Mass Insight personnel, schools, and teachers to encourage students to enroll in AP courses. A great amount of effort is put into outreach efforts. Mass Insight personnel travel to schools to help recruit students face-to-face. Schools frequently collaborate with Mass Insight to organize kick-off events that allow administrators, teachers, and students to celebrate past accomplishments and energize students for upcoming AP courses. Also, over three-quarters of respondents said that they provide general outreach to students and almost two-thirds of respondents reported that their schools hold special AP Fairs or AP Days to demystify AP courses and recruit kids to enroll in the classes.

Some schools still offer financial rewards to students who earn qualifying scores on their exams with over half of survey respondents indicating that their schools notify students of the monetary awards. This practice is currently on the decline among Mass Insight staff and at the school level. Instead, Mass Insight personnel and teachers focus on underlining the future economic advantages of earning college credits for free while still in high school. They also stress that taking rigorous coursework during high school will better prepare them to have success in challenging college courses and careers. Part of the Advancing STEM AP program also works to decrease costs of taking the course - particularly in terms of providing exam fee waivers to low-income students.

Schools and teachers also work to make sure students feel confident and prepared before enrolling in AP courses. Course sequences are changed so that students are exposed to lab science courses earlier and are therefore eligible to take AP courses earlier in their high school career. Through participating in pre-AP training and vertical team planning, curriculum and instruction in the lower grades are coordinated to prepare students for the difficult work they will be required to do in future AP classes. Vertical teams are commonly offered by schools; however these were not viewed as particularly effective by survey respondents. The pre-AP Training Institute offered by Mass Insight is offered less commonly among Advancing STEM AP schools. AP English Language and Composition is often used as an introductory AP course that prepares students to take on dense readings and think analytically in AP STEM courses.

Based on the findings presented in this interim report, there is substantial evidence that Mass Insight has been successful in implementing core components of the Advancing STEM AP program.