New England Association of Schools and Colleges

Commission on Public Secondary Schools

Report of the Visiting Committee for

Massachusetts Academy of Math and Science

Worcester, MA 01605

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STATEMENT ON LIMITATIONS

THE DISTRIBUTION, USE, AND SCOPE OF THE

VISITING COMMITTEE REPORT

The Commission on Public Secondary Schools of the New England Association of Schools and Colleges considers this visiting committee report of the Massachusetts Academy of Math and Science to be a privileged document submitted by the Commission on Public Secondary Schools of the New England Association of Schools and Colleges to the principal of the school and by the principal to the state department of education. Distribution of the report within the school community is the responsibility of the school principal. The final visiting committee report must be released in its entirety within sixty (60) days of its completion to the superintendent, school board, public library or town office, and the appropriate news media.

The prime concern of the visiting committee has been to assess the quality of the educational program at the Massachusetts Academy of Math and Science in terms of the school's stated mission and the Commission's Standards for Accreditation. Neither the total report nor any of its subsections is to be considered an evaluation of any individual staff member but rather a professional appraisal of the school as it appeared to the visiting team.

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INTRODUCTION

The New England Association of Schools and Colleges (NEASC) is the oldest of the six regional accrediting agencies in the United States. Since its inception in 1885, the Association has awarded membership and accreditation to those educational institutions in the six-state New England region who seek voluntary affiliation.

The governing body of the Association is its Board of Trustees which supervises the work of six Commissions: the Commission on Institutions of Higher Education (CIHE), the Commission on Independent Schools (CIS), the Commission on Public Secondary Schools (CPSS), the Commission on Technical and Career Institutions (CTCI), the Commission on Public Elementary and Middle Schools (CPEMS), and the Commission on American International Schools Abroad (CAISA).

As the responsible agency for matters of the evaluation and accreditation of public secondary school member institutions, CPSS requires visiting committees to assess the degree to which the evaluated schools meet the qualitative Standards for Accreditation of the Commission. Those standards are:

Teaching and Learning Standards

Mission and Expectations for Student Learning

Curriculum

Instruction

Assessment of Student Learning

Support of Teaching and Learning Standards

Leadership and Organization

School Resources for Learning

Community Resources for Learning

   The accreditation program for public schools involves a threefold process: the self-study conducted by the local professional staff, the on-site evaluation conducted by the Commission's visiting committee, and the follow-up program carried out by the school to implement the findings of its own self-assessment and the valid recommendations of the visiting committee and those identified by the Commission in the follow-up process. Continued accreditation requires that the school be reevaluated at least once every ten years and that it show continued progress addressing identified needs.

Preparation for the Evaluation Visit – The School Self-Study

   A steering committee of the professional staff was appointed to supervise the myriad details inherent in the school's self-study. At the Massachusetts Academy of Math and Science (the Academy), a committee of seven members, including the principal, supervised all aspects of the self-study.   The steering committee assigned all teachers and administrators in the school to appropriate subcommittees to determine the quality of all programs, activities, and facilities available for young people. In addition to faculty members, the self-study committees included three students and three parents – each of whom was a member of the school's site council.

   The self-study of the Massachusetts Academy of Math and Science extended over a period of 12 school months from February 2008 to March 2009. The self-study process at the Academy was an all-inclusive endeavor as each of the seven faculty members, the principal, and the school's director played an active role in every aspect of writing, reviewing, editing, and approving the final report. It can be truly said that each faculty member and administrator at the Academy owned the report in its entirety.

Public schools evaluated by the Commission on Public Secondary Schools must complete appropriate materials to assess their adherence to the Standards for Accreditation and the quality of their educational offerings in light of the school's mission, learning expectations, and unique student population.   Academy faculty members used the Self-Study Guides developed by a representative group of New England educators and approved by the Commission. These materials provided discussion items for a comprehensive assessment of the school by the professional staff during the self-study.

It is important that the reader understand that unlike other schools undergoing a self-study, there were no subcommittees appointed by a steering committee. All faculty played an active role in the development of each report and no single report developed in the self-study became part of the official self-study documents until it had been approved by the entire professional staff.

The Process Used by the Visiting Committee

A visiting committee of seven educators was assigned by the Commission on Public Secondary Schools to evaluate the Massachusetts Academy of Math and Science. The Committee members spent four days in Worcester, Massachusetts, reviewed the self-study documents that had been prepared for their examination, and met with administrators, teachers, other school and system personnel, students, and parents, shadowed students, visited classes, and interviewed teachers to determine the degree to which the school meets the Commission's Standards for Accreditation. Since the evaluators represented public schools, central office administrators, teachers and building administrators, diverse points of view were brought to bear on the evaluation of the Massachusetts Academy of Math and Science.

The visiting team built its professional judgment on evidence collected from the following sources:

- review of the school's self-study materials

- 14 hours shadowing seven students throughout a day

- a total of 10 hours of classroom observation (in addition to time shadowing students)

- numerous informal observations in and around the school

- tours of the facility

- individual meetings with six teachers about their work, instructional approaches, and the assessment of student learning

- group meetings with students, parents, administrators, and teachers

- the examination of student work including a selection of work collected by the school

Each conclusion on the report was agreed to by team consensus. Sources of evidence for each conclusion drawn by the visiting committee appear in parenthesis in the Standards section of the report. The seven Standards for Accreditation reports include commendations and recommendations that in the team's judgment will be helpful to the school as it works to improve teaching and learning and to better meet Commission Standards.

This report of the findings of the visiting committee will be forwarded to the Commission on Public Secondary Schools that will make a decision on the accreditation of the Massachusetts Academy of Math and Science.

Overview of Findings

Although the conclusions of the visiting committee on the school's adherence to the Commission's Standards for Accreditation appear in various sections of this report, the

committee wishes to highlight some findings in the paragraphs that follow.   These findings are not intended to be a summary of the report.

Teaching and Learning at the Massachusetts Academy of Math and Science

The Commonwealth is truly fortunate to have this school of excellence that very clearly meets the needs of academically accelerated youth in Massachusetts. The Massachusetts Academy of Math and Science is the only school in the state whose students attend a university fulltime as seniors in high school.

The unique partnership between the Academy and Worcester Polytechnic Institute (WPI) makes available a wide variety of services and resources for Academy students as they become actively engaged in their own education. Both the principal and director of the Academy are strong and proud champions of the uniqueness of this school, and they very enthusiastically showcase the positive impact of the Academy's methods on teaching and learning. "The mission of the Massachusetts Academy of Math and Science is to address the changing needs of the technologically advanced community of the 21st century by pioneering a new vision of mathematics and science education embedded within the liberal arts." This mission statement is not a mere plaque on a wall or a statement emblazoned on a banner in a main lobby – it is a way of life at the Academy. From the moment one walks through the door, one knows this is a place where teaching is brought to very high levels, and learning is personal and authentic. They proclaim "a new vision of mathematics and science education embedded within the liberal arts." In all classrooms visited and in all conversations with students and parents, this goal is put into practice on a daily basis. Phrases such as "actively engaged in their own education," "interactive," and "lifelong learning" may seem elusive at many schools where they are but

ideals sought after well-intentioned practices. At the Academy, these very phrases are seen in action day in and day out. Some schools list academic expectations with the hope that some students may be able to achieve those expectations. At the Academy, students regularly demonstrate their abilities to think creatively, to present with exemplary skill, to use technology to support their learning, and to be problem-solvers. Indeed, at the Academy, the mission statement and expectations for student learning are real, observable, and alive.

With a total of just under 100 students in grades 11 and 12 (and senior students take all of their classes on campus at WPI), six faculty members, and two administrators, the small size of the school creates a true sense of community. The students who come to the Academy show great potential in areas such as math and science – potential that could not be fulfilled at their sending schools for a variety of reasons. Here, the commonality of giftedness brings these students together. The students understand each other's abilities and challenges, and this contributes to a shared sense of purpose that could not be realized in a more traditional educational setting. Couple this with faculty members who are not only experts in their fields but also passionate about what they do on a daily basis, and you do, indeed, have a very special place where the emphasis is clearly on learning. Self-improvement is far more important than competition. Learning is of much greater value than high grades. The emphasis during the junior year at the Academy is on project-based, inquiry learning that concurrently fosters teamwork and independence. As seniors, these high school students are utilizing the skills and knowledge gained the previous year to succeed as a college student on campus at WPI. In both years, these students are challenged and supported by a caring, professional faculty.

All junior students take the same core courses with the exception of electives that are geared to an individual's interests and talents. The core courses are advanced inquiry physics,

mathematical modeling, humanities, STREAM (science, technology, research, engineering, and mathematics), Romance languages, computer science, and science and technical writing. In one of the small group meetings, a parent commented that the junior year, "pushes one to the limits, beyond a comfort zone, yet in a very supportive and encouraging environment where one gets to believe in oneself and one's abilities." Upon successful completion of this rigorous curriculum, senior students are then able to enroll fulltime at WPI and complete courses in science, math, and the humanities. The entire structure of the curriculum at the Academy emphasis depth of understanding over breadth of coverage and affords each student many opportunities to apply their newly acquired skills and knowledge to real-world applications. In small group discussions, students say that the rigor and very high expectations that they endure during their junior year become very worthwhile when they put that knowledge to use in STREAM A and STREAM B courses. This is a very concrete example of how students can move beyond *acquiring knowledge* to *using knowledge*. The curriculum at the Academy is specifically geared to zero in on the students' special talents and skills.

Instructional practices at the Academy are very student-centered. There is a clear connection between how the faculty teaches and how such practices align with the school's mission. These practices can best be summed up as project-based, interactive, and collaborative. Within their self-study, the faculty comment that, "The mission and expectations, the professionalism and experience of the faculty and administration, and the high caliber students all combine to create a culture of excellence at the Academy. In this environment, curriculum and instruction continually and naturally evolve to best meet the needs of the students." Each week, the faculty dedicates time to talk about student learning and their craft of teaching. They examine ways to improve how they teach to best meet the needs of all students. As one parent so

appropriately commented during a small group meeting, "These are not just teachers – they are educators." By continually undergoing a process of self-reflection and keeping the emphasis truly on student learning, the faculty at the Academy represents the best of their profession.

"The Academy relies very minimally on traditional 'paper and pencil' assessment, and believes that authentic assessments, such as presentations and exhibitions, are much more valuable in measuring success and determining growth over time." When the visiting team spent Sunday evening examining student work, this statement had a very clear meaning for each member of that team. Assessments are varied to allow for varied learning styles of each student. Assessments are frequent so the teacher can track progress over time. Students are given a wide latitude in the ways they can demonstrate their learning – and this gives further meaning to that section of the mission statement that proclaims that they are "a community of learners committed to…lifelong learning by providing the subjects, tools, skills, and strategies for students to actively engage in their own education." The team commented very specifically that assessments at the Academy clearly indicate what Benjamin Bloom was referring to in his *Taxonomy of Educational Objectives* when citing application and synthesis; namely, that students are given multiple opportunities to solve problems by applying acquired knowledge in different ways, and to arrive at new patterns or ways of looking at situations.

Support of Teaching and Learning at the Massachusetts Academy of Math and Science

Why is the Academy so successful in its endeavors? Why do students achieve to such high levels? In part, this can be attributed to the small size of the school – less than 100 students in two grades, and six to seven faculty members, led by a very capable principal and a very passionate director. But there are other contributing factors to the school's success: a daily and

weekly schedule that is based on student and teacher needs rather than programmed bells or bus routes; time built into that schedule for professional dialogue among the teachers; very low student-to-teacher ratio that contributes so obviously to personalization; and a genuine sense of community that strikes one clearly as soon as one walks through the doors of 85 Prescott Street. It is not just one or two things that contribute to the uniqueness of the Academy – it is the chemistry of many things that make this a special place for teaching and learning.

How are teachers and students supported in their work? It is important that the reader understand that enacted legislation by the Commonwealth of Massachusetts laid the foundation for this unique school. Further, the partnership between the Academy and Worcester Polytechnic Institute made available to all students and all faculty members a wealth of resources and services that could only be the envy of any other high school in any part of this country. In addition, the autonomy was masterful that was given to the school's administrators to mold a program that would help students foster belief in their abilities, generate a need to work collaboratively with like-minded students, and eventually equip those same students with a strong sense of independence and self-advocacy over a two-year period so they could compete with or surpass freshmen college students. WPI is to be commended for its commitment to the success of the Academy. And the Academy is to be commended for its fulfillment of the commitment to provide "excellence and innovation in teaching practice," and "providing a model for schools in the Commonwealth of Massachusetts." This visiting team would go so far as to say a model for schools in the United States.

There is a very genuine and obvious sense of community at the Academy. Continued funding by the legislature of the Commonwealth of Massachusetts makes this dream a reality. If any legislature should question the worth of such an investment – spend a day at the Academy.

WPI's investment in the continuation of this venture is large. Not all graduates of the Academy go on to be students at WPI – but they go on to higher education and they are very successful. That is why WPI stays on as a partner. The parents of the students speak extremely highly of the positive impact the Academy has had on their children. When the visiting team first met with parents and learned of a Parent Support Group (PSG), the team was under the impression that that group provided support to the school in ways such as fundraising or recruiting. The team was pleased to learn that the PSG provides support to each other. They help parents "let go" so their children can realize their potential. They are yet another element contributing to that sense of community that is the Academy - where learning is what matters.

All of the faculty and administrators should be extremely proud of the hard work that was put into the self-study. It is an honest, and at times even modest, reflection of their strengths and areas needing improvement. The visiting team hopes that this report will provide a balanced view – ample recognition for the many things that are done so well at the Academy coupled with recommendations for improvement. These recommendations should be worded in such a way that the school community members working together working can compile the information in the visiting team's report and the school's own statement of needs for improvement to synthesize an effective plan for continued school improvement. The school community as a whole then evolves into creative thinkers and effective problem-solvers.

SCHOOL AND COMMUNITY PROFILE

SUMMARY

I.   <u>The Community</u>

The Massachusetts Academy of Math and Science at WPI (the Academy) is located in Worcester, MA. Worcester is a city of about 300,000 people situated in the middle of the state. Within Worcester, the school has two locales. The first, at 85 Prescott Street, houses the 11th grade. It is a first-floor, fashionably renovated 1920s brick warehouse located amidst other renovated brick warehouses in the downtown area. Fellow tenants include medical clinics, a beauty training school, and various service businesses. Its entrance is on a secondary street with exceptional privacy. Across the street is the new WPI Gateway Biotechnology Center. The second locale is the WPI campus. This provides the classroom, laboratories, and cafeteria for the 12th grade. Access to both sites is easy from I-190 and I-290, and there is ample parking. This is important because students commute to the Academy each day.

Unlike nearly all other Massachusetts public schools, the school community of the Academy extends far beyond its nearby geography. That is, the Academy enrolls students from throughout central Massachusetts. Since its founding in 1993, more than 80 towns and cities have sent students to the school, including places like Webster and East Longmeadow along the Connecticut border, Townsend and Winchendon near New Hampshire, and Greenfield in to the west to Burlington to the east.

According to the 2000 census, Worcester County's median family income was $50,000. This is probably a good estimate for the central Massachusetts area, though quite likely most Academy families have higher incomes because the students have

parents who are predominantly professional or small business owners. Contrasted to these are a few first-generation immigrant families who earn significantly below this median income level. It is not known, however, whether any of these families try to make ends meet with incomes below the poverty level. In a related statistic, current unemployment in Massachusetts is 5.2%, but, to the best of the school's knowledge, each Academy family has at least one employed adult. With regard to its economy, central Massachusetts has a range of businesses and industries, including large firms like Nypro, Saint-Gobain, Intel, and Keaton Industries, as well as many more modest firms scattered throughout its small cities such as Leominister, Fitchburg, Clinton, and Hudson. All of these are important for the area economy but none contribute directly to the school because the Academy's budget is not based on property tax. Rather, the Academy is funded 99% by a single expenditure item in the state's annual budget, a grant that is administered by the Department of Education and awarded to WPI each year. The other 1% comes from generous current-parent support and small grants from local foundations and associations.

The Academy is a one-school district (DOE 04680000). Within the region that the Academy serves, however, there are scores of public schools and dozens of private schools. What percent of students in central Massachusetts enroll in the non-public portion of these is unknown.

The Academy spends on average $14,500 per student per year. The state average is $12,000. The issue of school choice is not relevant to the Academy since students who choose to leave, as one or two do each year, return to their sending schools. As the

school is funded directly from the state, the sending school district bears no cost to have a student attend the Academy.

II. <u>The School and the Students</u>

The Academy enrolls about 95 students in total in its two grades, 11 and 12. These students represent the demography of central Massachusetts with a quarter of them coming from first generation immigrant families, including Japan, Korea, China, Vietnam, India. Albania, Russia, and Africa. These young people create a diverse school community in an international sense, but American minorities are uncommon. Since the last NEASC visit in 1999, the presence of Asians at the school has increased some, but on the whole the ethnic/racial/cultural composition has remained relatively the same. Student enrollment has remained constant in the last 10 yars with the school population averaging 95 students for the two grades.

There are seven faculty at the school: one each in physics, mathematics, computer science/engineering, humanities, Romance languages, and science/technical writing. There are usually two visiting scholars each year, typically placed in mathematics and physics. All these teachers, the principal, and the part-time professional development coordinator (who formerly taught physics here) advise students on the research seminar and project course within the Science, Technology, Research, Engineering, and Mathematics (STREAM) curriculum. Teachers are rarely absent. They typically schedule appointments during vacations. Each teacher has two personal days, but there were only three requests last year.

With regard to working with students, the seven faculty teach the 46 juniors, so the ratio is 1:7. The entire student load for each teacher is 46, with a few teachers helping

to advise seniors. Class size is typically 16 or 17, with some Romance language classes and science/tech writing classes consisting of eight or nine students. Popular electives such as cooking, video film production, kickboxing, and robotics may enroll 20 students each.

The school schedule is unique in that it is planned week to week according to the needs of the teachers and classes. Generally, math, physics, and humanities meet five hours per week; Romance languages meet four hours per week; computer science and STREAM courses meet three or four hours per week; and science/technical writing meets two hours per week. Electives meet three hours per week, typically for one and a half hours on Tuesday and Friday. This schedule is developed each week by conferring with all teachers and using a Lego™ board to arrange the times for each class. All students take the same classes. The only class in which there are levels is Romance language: intermediate and advanced. The school hours are 7:45 – 4:00 on Monday, Tuesday, Thursday, and Friday, and 7:45 – 12:00 on Wednesday.

Teachers have common planning time every Wednesday afternoon from 12:30 – 4:00. The first hour and a half is staff meeting, a time when the entire faculty and principal discuss school issues and student performance. From 2:00 – 4:00, teachers are expected to work on their classes and other duties, either independently or together. In addition, teachers typically have two hours each day of preparation time. Because the schedule is flexible, common preparation time can be arranged.

There are no resident students at the Academy; all come from other school districts, whether public or private. The daily attendance rate is 98-99% and has been that way for years. From time to time, students leave the Academy or are asked to

withdraw, but in all cases except one in the past five years, the student who left completed high school at their sending school or other secondary institution. Although all students at the Academy are exceptional, there are times when the school honors especially unusual achievement. There are book awards at the end of the junior and senior years, and the school has an endowed scholarship in memory of a former PTO president. Many awards are earned from outside the school, including science fairs, computer programming competitions, mathematics competitions, Siemens competition, writing contests, art contests, National Merit recognition, etc. Overall, the school tries not to emphasize awards because all students here perform at very high levels and work very hard. As evidence, the school SAT averages for math, critical reading, and writing are respectively 700, 680, 660. Each year, about one third of the class earns National Merit Commendations or Semi-Finalist ranking. All students score in the advanced or high end of the proficient scale in MCAS, and all go on to four-year colleges, many of which are selective and highly selective.

In addition to the courses of the junior year and the twelve college courses which comprise the senior year, all students must complete a Senior Independent Study Project (SISP) and 112 hours of community service. There are no students in special education, though occasionally there are accommodations (such as extra time on tests) and maybe one student per year is placed in an English Language Learner class with the ESL Director at WPI.

Because the Academy academic program is entirely an advanced academic program, the school has not sought business/industry partnerships or other joint ventures that might be needed to address special education or career interests of part of the school

population. The school does receive a great deal of support from the industry and research community in the form of judges for science and engineering fairs, and mentors for the student research projects. On the other hand, the Academy has a unique relationship with an institution of higher education, WPI, that offers a model for specialized secondary schools around the country. Specifically, this is a public school that is managed by a private institution. Thus, the Academy is an administrative unit within the university and so is closely linked to, and has access to, its administrative, financial, program, and service functions, most notably the library, computer system, and faculty.

COMMISSION ON
PUBLIC SECONDARY SCHOOLS

TEACHING AND LEARNING
STANDARDS

MISSION AND EXPECTATIONS
FOR STUDENT LEARNING

CURRICULUM

INSTRUCTION

ASSESSMENT OF STUDENT
LEARNING

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Our Mission
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The mission of the Massachusetts Academy of Mathematics and Science is to address the changing needs of the technologically advanced community of the 21st century by pioneering a new vision of mathematics and science education embedded within the liberal arts. By creating a public laboratory school focused on nurturing the potential of students with exceptional aptitude in mathematics and science, we have formed a community of learners committed to the following:

- Lifelong learning by providing the tools, skills, and strategies for students to engage actively in their own education
- Evolving curricula which are project-based, interactive, and infused with technology
- Excellence and innovation in teaching practice, providing a model for schools in the Commonwealth of Massachusetts

ACADEMIC EXPECTATIONS

In order for our students to actively engage in their own education and become lifelong learners, we believe that they should be effective:

- Critical thinkers
- Readers and Writers
- Presenters
- Users of technology
- Quantitative reasoners
- Problem-Solvers

SOCIAL EXPECTATIONS

We expect our students to:

- Be civil
- Work collaboratively

CIVIC EXPECTATIONS

We expect our students to:

- Value community service

Our Values and Standards

We believe civility is necessary in order to make everyone's work at the Academy personally and intellectually safe and productive. We want our community to be one in which individuals flourish as a result of mutual respect and concern. This includes respect for each other's property and for the property of the school. Furthermore, our passion for ideas insists on a psychologically safe environment, one in which learners take and allow intellectual risks.

We expect all members of our community to demonstrate the following:

- Civility in social interactions, with an emphasis on support for one another
- Honesty, diligence, persistence, and curiosity in all academic endeavors
- Involvement in community affairs and activities
- Intellectual, ethical, and social growth

1	MISSION AND EXPECTATIONS FOR STUDENT LEARNING

The school's mission statement describes the essence of what the school as a community of learners is seeking to achieve. The expectations for student learning are based on and drawn from the school's mission statement. These expectations are the fundamental goals by which the school continually assesses the effectiveness of the teaching and learning process. Every component of the school community must focus on enabling all students to achieve the school's expectations for student learning.

1. The mission statement and expectations for student learning shall be developed by the school community and approved and supported by the professional staff, the school board, and any other school-wide governing organization.

2. The school's mission statement shall represent the school community's fundamental values and beliefs about student learning.

3. The school shall identify and define school-wide academic, civic, and social learning expectations that are measurable and reflect the school's mission.

4. For each academic expectation in the mission, the school shall have a targeted level of successful achievement identified in a rubric.

5. The school shall have indicators by which it assesses the school's progress in achieving school-wide civic and social expectations.

6. The mission statement and the school's expectations for student learning shall guide the procedures, policies, and decisions of the school and shall be evident in the culture of the school.

7. The school shall review regularly the mission statement and expectations for student learning using a variety of data to ensure that they reflect student needs, community expectations, the district mission, and state and national standards.

CONCLUSIONS

The mission and expectations for student learning of the Massachusetts Academy of Math and Science (the Academy) were developed in preparation for this NEASC reaccreditation visit, approved in May 2008 by the entire professional staff, and supported by the school community. The faculty meets at the beginning and the end of each school year to review and revise the mission and expectations for learning. Once adopted, the mission and expectations for learning are posted to the Academy's website and printed in the student handbook. In addition, familiarity with the Academy's mission is a point of emphasis at orientation sessions for students and parents. As a unique, statewide school of excellence, there is no school board governing the academy. Thus the faculty and administrators are directly responsible for crafting the mission and expectations and they willingly adhere to them. There are four student members on the site council that approves the mission and expectations each year. All parents are asked to sign a form acknowledging their awareness and understanding of all school policies and their receipt of the school's mission and expectations for student learning. Parents who were interviewed openly expressed their awareness and understanding of the Academy's mission and stated their support for that document. As a result, the entire school community supports and adheres to the mission and expectations for student learning ensuring the continued success of the academy. (self-study, students, parents, teachers)

The Academy's mission statement represents the school community's commitment to nurturing independent thinking and learning through an interactive, project-based curriculum. Prospective students and parents are well aware of the fundamental values and beliefs that are held by the faculty and administration before they apply for admission. The

approach to student learning is, in fact, a major attraction for high-achieving students who seek a more autonomous learning experience. Consensus about core values and beliefs is reached at weekly faculty meetings and affirmed by faculty members, administrators, and students at year-end evaluation meetings. Thus, with all constituents working toward a common goal, they are able to successfully deliver on their goal to provide, "…a junior-year program that is rich in project-based assignments, technology, teamwork, and inquiry learning, and a senior year program that is the same as the freshmen year at Worcester Polytechnic Institute…small size…and high expectations create a community that is serious yet informal, demanding while supportive." A strong culture of collaboration among the professional staff members facilitates the integration of these fundamental values into each of the courses in the 11th grade curriculum. The Science Technology Research Engineering and Mathematics (STREAM) course that is part of the junior program provides a prime example of integrated curriculum that demands independent thinking on the part of the students. As stated in the school's mission, the Academy strives to, "…address the changing needs of the technologically advanced community of the 21st century by pioneering a new vision of mathematics and science education…" The school's goal is to help develop "critical thinkers, quantitative reasoners," and "problem-solvers." They achieve this by fostering independent and reflective learners. Parents appreciate the level of autonomy their children gain from the emphasis on self-responsibility for learning. Thus, the faculty, administration, students, and parents trust that the mission statement accurately represents their core values and beliefs about student learning. (self-study, students, parents, teachers, administrators)

The Academy has clear school-wide academic, civic, and social learning expectations that are rigorous, measurable, and reflective of the school's mission statement. The faculty has developed school-wide rubrics for each course offered at the academy. The highest levels in each of the rubrics reflect the expectations for student learning and ensure that students become "effective critical thinkers, readers and writers, presenters, users of technology, quantitative reasoners, and problem-solvers," as stated in the mission. Adherence to the standards established within the rubrics is ensured through weekly discussions at faculty meetings. It should be noted, however, that teachers sometimes use separate rubrics to evaluate certain assignments which do not necessarily match the overarching school-wide rubric for a course. Social and civic expectations are clearly explained in the handbook as are the consequences for failing to meet those expectations in the very rare instances where that might occur. Community service requirements are logged and recorded to ensure that students live up to their 56 hour-per-year commitment in this area. As a result, students and their parents have a clear understanding of what is expected of them academically, socially, and civically during their time at the Academy. (students, teachers, handbook, self-study)

The school-wide rubrics that outline the expected level of performance in the classroom differentiate levels of work. As stated previously, there are teacher-generated, course-specific rubrics used for certain assignments that do not completely mesh with the overarching standards from the school-wide rubrics. As a result, there is some inconsistency in the application of the standards of excellence that were determined by the faculty. (self-study, teachers, administrators, students)

Students at the Academy are keenly aware of their obligation to be civil, to work collaboratively, and to value community service because the indicators for these expectations are specific and measurable. Disciplinary issues are obviously not a major daily concern for the faculty or administration at the Academy. Nonetheless, there is a clear code of conduct included in the handbook that governs both student and professional staff. According to the handbook "civility is essential to the well-being of a small community and must be the hallmark of communication among all members of the community." Thus each person in the building is assured respect for his or her feelings, rights, concerns, and property. In addition, standards of academic honesty are clearly enforced. Any student caught cheating, fabricating, falsifying research, or plagiarizing faces penalties starting with a warning and moving "up to, and including, dismissal" for further offenses. Disciplinary records are maintained in individual student folders. Community service hours are logged and recorded on a regular basis as a promotion requirement for juniors and a graduation requirement for seniors. At the same time, there are no measures in place to formally assess the impact such service has had on the students at the Academy. Without such a process, the school cannot accurately determine the extent to which it fulfills its goal to have students "value community service." The school is active in matching its students up with service sites such as the Interfaith Hospitality Network and The City View School. This ensures that students fulfill their 56-hour per year community service requirement. As a result, every member of the school community understands that they must meet high standards of social and civil behavior on a daily basis. (handbook, teachers, administrators, students)

The mission statement and expectations for student learning permeate the culture of the school and act as the primary drivers behind all decisions regarding policies and procedures. At the weekly Wednesday faculty meetings, discussions about student learning and assessment comprise the bulk of the meeting time. Because every member of the faculty teaches each student in the building at the same grade level, discussions about an individual student's progress are commonplace at these meetings. The schedule of classes is updated weekly and can be adjusted to provide extra instructional time in a needed area. There are also "work at home" days to allow for the completion of science projects, and students are encouraged to schedule meetings with research mentors on the campus of Worcester Polytechnic Institute during the school day. Because of the strong collaborative philosophy among faculty members, any problems that do arise can be identified and addressed promptly and effectively. Academy students thrive within a school culture that supports their independent-minded pursuits. The school's clear mission and expectations for learning guide the exemplary work that is done each day by students and staff. (students, teachers, administrators)

Collegiality is central to the business of teaching and learning at the Academy. At the heart of this collegiality is the practice of reviewing the mission and expectations for student learning as a team on an annual basis. The professional staff reviews data gathered from multiple sources and information on best practices at the state and national level to inform any decisions regarding changes in the mission statement or the expectations. After classes have ended for the year, the professional staff spends two weeks examining data such as grades, college admissions figures, and attendance rates, and spends time discussing anecdotal information reflective of students' successes and struggles. Teachers

at the Academy are well aware of the state frameworks and national standards as each of them has prior teaching experience in regular public schools. Standards set forth by the National Science Teachers Association (NSTA) and the National Council of Teachers of Mathematics (NCTM) are used in designing curriculum, and STREAM projects follow the guidelines from the Massachusetts State Science Fair. Faculty members at the Academy are actively encouraged to participate in professional development opportunities, although there is no formal protocol for sharing professional development participation. This impedes the path to recertification for members of the faculty. All professional staff members have a voice at the weekly faculty meetings and have input into what is included in the mission and learning expectations. As a result, the faculty and administrators at the Academy have ownership of the mission that ensures that the school will continue to meet the learning needs of its students. (self-study, teachers, administrators)

COMMENDATIONS

1. The success of the Academy faculty and administrators in making students and parents familiar with the mission and expectations for learning prior to starting at the Academy

2. The sense of uniformity of educational purpose on the part of students, parents, faculty members, and administrators that is a result of owning the mission and expectations for learning

3. The extraordinarily well developed culture of collegiality and collaboration

4. The integration of the acceptable levels of achievement set forth in the expectations for learning within each course offering

5. The establishment of a culture of respect and appreciation of others which flows from the school's mission statement

6. The pervasive use of the school's mission to guide student work

7. The commitment on the part of the professional staff to use quantitative and anecdotal data to inform practice

8. The practice of actively seeking out particular community service opportunities that will appeal to Academy students and be mutually beneficial to the students and the members of the community that they serve

RECOMMENDATIONS

1. Improve the frequency with which school-wide rubrics are applied in each course

2. Develop and implement a formal means of assessing civil expectations to track progress in fulfilling those expectations stated in the school's mission

3. Develop and implement a means to ensure close alignment of course-specific rubrics with the school-wide rubrics as prescribed in this standard to ensure consistency in defining excellence

4. Develop and implement ways to assess the impact of the students' community service on student learning and attainment of the school's mission and civic expectations

5. Develop and implement a process for recording and crediting teacher participation in professional development that allows the school to closely monitor the extent to which

it promotes excellence and innovation in teaching practice as stated in the school's

mission

Teaching and Learning Standard

2	**CURRICULUM**

The curriculum, which includes coursework, co-curricular activities, and other school-approved educational experiences, is the school's formal plan to fulfill its mission statement and expectations for student learning. The curriculum links the school's beliefs, its expectations for student learning, and its instructional practices. The strength of that link is dependent upon the professional staff's commitment to and involvement in a comprehensive, ongoing review of the curriculum.

1. Each curriculum area shall identify those school-wide academic expectations for which it is responsible.

2. The curriculum shall be aligned with the school-wide academic expectations and shall ensure that all students have sufficient opportunity to practice and achieve each of those expectations.

3. The written curriculum shall:

   - prescribe content;

   - integrate relevant school-wide learning expectations;

   - identify course specific learning goals;

   - suggest instructional strategies;

   - suggest assessment techniques including the use of school-wide rubrics.

4. The curriculum shall engage all students in inquiry, problem-solving, and higher order thinking as well as provide opportunities for the authentic application of knowledge and skills.

5. The curriculum shall:

   - be appropriately integrated;

   - emphasize depth of understanding over breadth of coverage.

6. The school shall provide opportunities for all students to extend learning beyond the normal course offerings and the school campus.

7. There shall be effective curricular coordination and articulation between and among all academic areas within the school as well as with sending schools in the district.

8. Instructional materials, technology, equipment, supplies, facilities, staffing levels, and the resources of the library/media center shall be sufficient to allow for the implementation of the curriculum.

9. The professional staff shall be actively involved in the ongoing development, evaluation, and revision of the curriculum based on assessments of student performance in achieving the school's academic expectations and course-specific learning goals

10. The school shall commit sufficient time, financial resources, and personnel to the development, evaluation, and revision of the curriculum.

11. Professional development activities shall support the development and implementation of the curriculum.

CONCLUSIONS

The Massachusetts Academy of Mathematics and Science (the Academy) curriculum guides clearly indicate the academic learning expectations from the mission for which each curriculum area is responsible. All courses and areas of study utilize and emphasize the skills, tools, and strategies for lifelong learning, identified as essential in the mission of the school. In each written curriculum, there is specific language identifying the academic expectations addressed in the course as well as the instructional and assessment strategies that support these learning expectations. Additionally, there is a school-wide grid supplied in the self-study that summarizes the skills used, taught, and assessed in each course area. As a result, the curriculum in each course is highly aligned with the mission of the school, and there is a great deal of overlap that provides ample opportunity for interdisciplinary learning. (self-study, student work, teachers)

The Academy's curriculum guides show clear connections between course content and the expectations stated in the school's mission. Every course offers a variety of learning experiences related to each of the expectations. Individual assignments and collaborative projects are all designed to actively engage students in critical thinking, reading, writing, quantitative reasoning, and problem-solving. Students are required to assess their own work and present their work to their peers, instructors, and the community at large through various fairs and competitions in all curricular areas. Every course provides a variety of opportunities to practice and achieve

these expectations specifically linked to the content of that course as well as across disciplines. In the first half of the eleventh grade, the Science Technology Research Engineering and Math (STREAM) course requires the student to independently research a topic of interest to them, develop a unique researchable question, a hypothesis, and an experimental procedure, carry out the procedure, analyze the data, form conclusions, and present their research in written, oral, and demonstration form. A great many of these projects qualify for and produce winning results in local, national, and international competitions. Students practice and achieve all of the mission's academic expectations, including the use of technology, within this project in a highly interdisciplinary manner. Beyond the academic expectations, interpersonal skills are also developed by having the students search for and contact mentors in academia and industry. The humanities course requires a weekly journal, part of which is the "grammar patrol." Students find and correct poor grammar and usage they might encounter in a variety of media, from newspapers to advertisements to work submitted by the students they themselves mentor at City View Elementary School - a nearby, inner-city school. Their journal entries reflect a deep understanding of language skills and show them to be developing the habits of critical readers and thinkers while allowing them to personalize their learning and showcase their individuality. These are the skills required for lifelong learners and innovators of the 21st century – a critical component of the school's mission statement. The small size of the school and flexibility of scheduling allows students to be supported in their

efforts to achieve academic expectations by a close working relationship with faculty members. Students also have access to a variety of academic support services at the Worcester Polytechnic Institute (WPI), including the research library, which is unusual for many high school students. Students also support each other in a highly collaborative environment. Because the mission clearly drives and informs the curriculum, students are afforded a rich and deep interdisciplinary learning experience that is authentic and will prepare them for and sustain them through lifelong success as problem-solvers and collaborative leaders. (self-study, student work, teachers, students, classroom observations)

The written curriculum of each Academy course specifically and clearly prescribes content, integrates school-wide learning expectations, identifies course-specific learning goals, and suggests instructional strategies and assessment techniques. Furthermore, interdisciplinary connections are clearly delineated and suggestions for use of school-wide rubrics for assessment are made. The content of each course is aligned with and more than exceeds the Massachusetts frameworks. Each course is redundant in its presentation of content in a variety of project-based instruction and assignments which allows deep mastery of content as well as ample opportunity to achieve the course-specific learning expectations. Written curricula are reviewed, revised, and refined on an ongoing basis as a result of assessment of student learning. Since the curricula are researched, designed, written, assessed, revised, and used by current Academy faculty, they become highly responsive "living" documents on which to base a mission-driven, interdisciplinary course of study which can

be personalized for the students of the Academy. (curriculum guides, self-study, teachers, student work)

Inquiry, problem-solving, and higher order thinking skills are the basis of every learning activity at the Academy. These elements define the nature of curriculum and instruction. The students have ample opportunity to apply their knowledge and skills to authentic tasks outside of the classroom. Students are routinely asked to evaluate, analyze, synthesize, and apply in all of their assignments and projects. These are the highest levels of Blooms' Taxonomy of learning and form the basis of the school-wide critical thinking rubric. Students use these skills in every course and across the disciplines in a multitude of ways including solving challenging weekly math problems, creating experimental designs to test hypotheses, assessing and revising their own writing, and evaluating the merit of various Internet resources for research. The second semester STREAM requirement is a collaborative project in which a small group of students must design and build an assistive technology device which will ultimately be given to and used by a client in the community. Recent students' projects included a device to help with computer use for a young stroke victim. The Senior Independent Study Project (SISP) incorporates higher order thinking skills as it requires students to apply all of the problem-solving and critical reading, writing, and thinking skills they have been mastering to a completely new topic with which they have no previous experience. One recent project was a student's yearlong immersion in the learning of American Sign Language (ASL), in order to be able to

communicate with patients who may be deaf when he becomes a practicing physician. His project portrays a thoughtful approach as to how one goes about learning a new language including a gathering and utilization of varied resources, creation of and adhering to a time-line, attendance at a WPI college class in ASL, weekly practice with his mentor, in-depth and frank reflection about his progress, and adjustment of his learning approach according to his self-assessment. The culminating project was a videotaped speech that he performed in ASL and presented to the school as a whole. The higher order thinking skills that are the very heart of the curricula compel students to undergo an authentic learning process and produce products that are useful to themselves and others. Academy students have received top awards at the Massachusetts State Science Fair, have qualified for international science fairs, have received patents for their creations, have produced an electronic book for young children based on a local museum collection, and have entered and won such prestigious competitions as the Siemens Contest and Dupont Challenge. (student work, teachers, students, self-study, classroom observation)

Virtually all opportunities for learning and skill development are interdisciplinary and emphasize depth of understanding over breadth of coverage. Integration exists within each course and across the disciplines. The humanities course integrates language arts with history and fine arts. Romance language instruction integrates conversation with literature and project-based learning. Math incorporates problem-solving, writing, and the history of mathematics. Physics incorporates problem-solving and writing skills. It is the

highly interdisciplinary nature of the curriculum across the courses that is especially evident in discussions with the teachers and students and in the detailed examination of student work which makes the curriculum effective and unique. The Science and Technical Writing (STW) course is specifically designed to emphasize the stylistic requirements needed for expository writing in science, technology, engineering, and math (STEM) disciplines. The Romance language teacher has students complete a project in which they have to design, build, and describe a working car, using the target languages of Spanish or French. This is a collaborative venture with the physics teacher. The Romance language curriculum is thoroughly infused with technology. The visiting team watched a short film that was a "commercial" for Mac vs. PC entirely written, acted, and produced by students in Spanish and French. Mathematics supports both physics curriculum and all research projects that require data analysis. Writing and technology are infused throughout the curriculum. Academy courses are also aligned with the WPI curriculum, including the computer science curriculum (which includes programming in SCHEME) and the freshman humanities curriculum. The emphasis on depth over breadth is the philosophical basis of instruction and characterizes all Academy courses. Students are given individual and group projects on which they work diligently over the course of weeks or months. Continuous evaluation and refinement are stressed. Because of the extensive integration within and across the curricula of the Academy, students are able to fulfill the mission of becoming "lifelong learners… actively engaged in their own

education." The Academy fulfills its mission of "…evolving curricula that are project-based, interactive, and infused with technology…providing a model for schools in the Commonwealth of Massachusetts," and, indeed, for all schools across the country. (student work, students, teachers, curriculum guides, classroom observations)

Academy students have ample and varied opportunities for learning beyond the normal course offerings and the school campus and access to a variety of co-curricular activities driven by student interest. The eleventh grade year begins with a team building, brainstorming, three-day field trip to Briarwood camp where students begin to develop ideas and questions for their STREAM research projects. Electives are offered twice weekly, including such activities as mock trial, drama, art, filmmaking, puzzle solving, dance, cooking, and sewing. Electives are introduced based on both faculty and student interest. Clubs also often start in response to students' requests and interests. Students participate in robotics and rocketry clubs. Each year, STREAM research projects are submitted to a variety of state and national contests. Academy students design and conduct a summer enrichment program for middle school students. In order to fulfill community service requirements, students work directly with a variety of underserved populations in the local area including an inner city elementary school and veterans shelter. Students also have access to mentorships and internships in all of the facilities at WPI. They find summer intern positions through these connections. The senior independent project requires students to go far beyond the normal course

offerings by requiring them to do research in an area entirely new to them. Recent projects have included opera composition, landscape photography, and learning American Sign Language. Students are able to pursue their musical interests by participating in groups and ensembles at WPI. The school pays particular attention to providing the students with a variety of diverse co-curricular activities and is responsive to students' interests. Because of the affiliation with WPI, students are afforded a rich array of opportunities beyond the normal course offerings not usually found at the high school level. (self-study, students, administrators, parents)

There is extensive curricular coordination and articulation between and among all academic areas within the school, and there is extensive preparation and support for incoming students who arrive at the Academy from many sending districts. There is also curricular coordination with WPI to ensure the success of the seniors who will be taking all of their courses at the college. The visiting team had the opportunity to observe a faculty meeting at the Academy. This was an enlightening experience and showed the essence of teaching as a team. There was plentiful evidence of the degree to which all courses at the Academy are designed to reinforce each other and the extent to which the curricula are integrated. Additionally, each student at the Academy is known and supported by all of the staff. Ample time is afforded for the teachers to plan together, and there is a weekly Wednesday 90-minute meeting with the principal. Because the teachers all eat lunch together, their own lunchtime often becomes additional informal time to coordinate, plan, and make

adjustments for groups of students or individual students. There is formal planning time for several weeks before and after the school year. Academy faculty members are in contact with the individual faculty members on the WPI main campus regarding course content and student placement. This communication and cooperation informs the curriculum for the eleventh graders. Senior students and parents report that the twelfth graders are often better prepared for WPI courses than incoming college freshmen who have completed traditional high school preparation. This is confirmed by their higher grade point averages (3.65 for Academy students vs. 2.95 for WPI freshmen). The school-wide calendar has tremendous flexibility to allow for coordination among all of the courses and can be adjusted to allow more time for certain assignments when necessary. The development of school-wide rubrics to be used in all disciplines further allows for coordination among academic areas. Because the Academy receives eleventh grade students from many different sending districts, the beginning of the year is specifically designed to support students in their transition towards becoming independent learners. After the first quarter of study, the faculty writes detailed individual narratives about student growth, achievement and areas needing improvement. Students and parents report that faculty members are always available and willing to help support students on a one-to-one basis after school. The library resources far exceed those that are typically available to secondary school students. All students and faculty members have complete access to all online databases and journals through the WPI campus server. Students can access the

abundant WPI resources from school or from home via the Internet. The student-to-computer ratio is virtually 1:1 within the building. There are Macs and PCs available to all students. The WPI reference librarians are also available to support and instruct students in their research efforts. Print sources are readily available to eleventh graders, and seniors buy their textbooks in the same way as college students. Highly effective formal and informal curricular coordination between and among all academic areas within the school, support for students from many different sending districts, and alignment with the WPI curriculum afford students every opportunity to achieve the expectations for student learning. (self-study, teachers, administrators, observations)

Instructional materials, technology, equipment, supplies, facilities, staffing levels, and the resources of the library/media center are more than sufficient to allow for the successful implementation of the curriculum. Current editions of textbooks and a variety of resources in print are readily available to all students. Technology, equipment, supplies, and facility resources far exceed what is usually available to other secondary school students. There are ample computers (both Mac and PC) and students have access to current advanced software such as *Mathematica*. Physics classes use the Vernier probes for data collection and all resources are made available to students for their independent research projects. The Microsoft Office Suite supports writing and students have access to Adobe Creative Suite. As noted, students have full access the to WPI research library which provides excellent support for all curricular needs. All WPI software is accessible to students. All

classrooms are equipped with LCD projectors and the language classroom is outfitted with an extensive multimedia system. The Academy has recently acquired a Schimmel grand piano for use by students and faculty members. Adequate number and design of classrooms support the implementation of the curriculum. There is a 7:1 student-to-teacher ratio, which makes the staffing level ideal for implementing the highly interactive and inquiry-based curriculum. The Academy is a school rich in resources not usually found at the secondary school level. The faculty, administration, and students use these resources well to support their exemplary curriculum. (self-study, students, student work, observations)

All members of the professional staff are actively involved in the process of ongoing, regular, formal curriculum review and revision using data to inform curriculum refinement. Weekly Wednesday faculty meetings, daily informal meetings, the close working relationship between students and teachers, and the small size of the school are all factors which allow the staff to be particularly aware of the progress of each student. The faculty can adjust curricula, scheduling, pacing, and student workload accordingly. Faculty members have made curricula adjustments based on a variety of internal formative and summative assessments, both formal and informal, as well as based on standardized testing such at the SAT II physics examination. Faculty members have also modified curricula to improve student performance in such competitions as the Siemens, American Computer Science League exam, and math modeling competitions. Formal review of the curriculum takes place at

the end of the year during a week of meetings devoted to reflection and evaluation. Not widely evident is the solicitation of feedback from students on the effectiveness of the curriculum throughout the school year, rather than end of term, that would contribute to adjustments in delivery of curriculum to best meet students' needs.   Student performance data include the entrance diagnostic examinations, writing assignments, presentations, research assignments, performances, and competitions. The high degree of ownership of the curriculum, and the careful and close observation and assessment of student performance, allow faculty members to continuously evaluate and refine curricula to support the achievement of the school's academic expectations by all students. (self-study, teachers, administrators, observations)

Sufficient time, funding, and leadership are available to support the development, evaluation, and revision of curriculum. The Academy faculty has complete ongoing responsibility for curriculum development and revision. The time and financial support for these activities are essentially "built into" the functioning of the school. The faculty and the principal, who is the academic and curricular leader, all have adequate time in their schedules to devote to the ongoing regular review, evaluation, and refinement of curricula. As a school of excellence, the Academy is mandated to produce and share curriculum with other districts and specialized schools. Ongoing curricular development, completely supported by the entire faculty, is authentic and integral to the school's functioning. (self-study, teachers, administrators, observation)

All teachers have access to intensive and appropriate professional development opportunities that support the development and implementation of curriculum. Moreover, the teachers at the Academy provide professional development for teachers in other districts, and even nationally, by presenting at the meetings for their particular professional associations. Academy faculty members can select specific courses and programs to attend through their respective professional associations such as the National Science Teachers Association (NSTA), the National Council for Teachers of Mathematics (NCTM), and Massachusetts Computer-using Educators. Faculty members regularly attend the annual meeting of the National Consortium for Specialized Secondary Schools of Mathematics, Science, and Technology (NCSSSMST) ensuring professional contact and conversation with professionals at comparable schools nationwide. Faculty members can enroll in graduate level classes at WPI without charge. They participate in the "Round Table" which is a group of local math and science teachers who gather at WPI with WPI instructors for topical discussion. The Academy accepts "visiting scholar" teachers for a term of up to two years. The faculty are modeling the values and behavior of lifelong learners for the students by participating in and providing high level ongoing professional development which supports continuous refinement of curriculum and increases the depth of their own expertise in each of their fields. (self-study, teachers, school documents)

COMMENDATIONS

1. The Academy curriculum which is highly aligned with, driven by, and

indeed fulfills the mission statement in an exemplary fashion

2. The rich, deep, and authentic learning experiences offered to each student that afford numerous opportunities to achieve each of the academic expectations stated in the school's mission

3. The written curricula that guide project-based inquiry using critical thinking skills, marrying technology with all disciplines, creating a living and personalized curriculum for each student

4. The very evident emphasis on higher order thinking skills in all subjects at the Academy

5. The very deliberate connection between STREAM course requirements and community engagement that allows all students the opportunity to apply knowledge and skills in very practical, meaningful, and rewarding situations

6. The integration of curriculum that allows all students to see connections between subjects and promotes higher levels of learning

7. The omnipresent emphasis on depth of understanding over breadth of coverage in all courses that contributes to the high degree of attainment of the school's academic expectations

8. The extraordinary technological and instructional resources available to students and faculty members that support the delivery of the curriculum

9. The varied opportunities to participate in and provide professional development, including the visiting scholar program, that contribute to the faculty's expertise in their fields

10. The efforts of the faculty at the Academy to "push" student learning to new heights as evidenced by science and technical writing, STEM disciplines, and the senior independent study project

11. The outstanding efforts of the Academy faculty to share their knowledge and skills in developing and implementing a curriculum geared to the unique talents of its students

12. The structures and processes in place at the Academy that allow the faculty members to review and revise the curriculum

RECOMMENDATIONS

1. Develop and implement a process to receive and review feedback on curriculum from students throughout a school year

3	**INSTRUCTION**

The quality of instruction in a school is the single most important factor affecting the quality of student learning, the achievement of expectations for student learning, the delivery of the curriculum, and the assessment of student progress. Instructional practices must be grounded in the school's mission and expectations for student learning, supported by research in best practice, and refined and improved based on identified student needs. Teachers are expected to be reflective about their instructional strategies and to collaborate with their colleagues about instruction and student learning.

1. Instructional strategies shall be consistent with the school's mission statement and expectations for student learning.

2. Instructional strategies shall:

    - personalize instruction;

    - make connections across disciplines;

    - engage students as active learners;

    - engage students as self-directed learners;

    - involve all students in higher order thinking to promote depth of understanding;

    - provide opportunities for students to apply knowledge or skills;

    - promote student self-assessment and self-reflection.

3. Teachers shall use feedback from a variety of sources including other teachers, students, supervisors, and parents as a means of improving instruction.

4. Teachers shall be expert in their content area, knowledgeable about current research on effective instructional approaches, and reflective about their own practices.

5. Discussion of instructional strategies shall be a significant part of the professional culture of the school.

6. Technology shall be integrated into and supportive of teaching and learning.

7. The school's professional development programs shall be guided by identified instructional needs and shall provide opportunities for teachers to develop and improve their instructional strategies.

8. Teacher supervision and evaluation processes shall be used to improve instruction for the purposes of enhancing student learning and meeting student needs.

CONCLUSIONS

Instructional strategies and practices are consistent with the school's mission statement and expectations for student learning. The Mission of the Massachusetts Academy of Mathematics and Science (the Academy) is to address the changing needs of the technologically advanced community of the 21st century by pioneering a new vision of mathematics and science education embedded within the liberal arts. There is a strong sense of community among the faculty, staff, and students. This bond furthers students' yearning to become lifelong learners. Through differentiated instructional strategies, teachers at the Academy are able to assist their students in striving for excellence, thinking critically, solving real world problems, and effectively presenting their findings orally and in writing, individually and in groups. In adhering to their mission, educators at the Academy facilitate student learning in a variety of manners. Students complete PowerPoint presentations, create mini-films, and self-reflect upon real world math problems of the week, to name a few. Students are exposed to instructional strategies that are very noticeably student-centered. The teacher acts as a facilitator of student learning. Peer editing is a practice that occurs often at the Academy. This editing

occurs not only in humanities classes where students critique each other's writing, but it is also present in all courses offered at the Academy. Students are able to work in close-knit situations to solve a variety of problems. Pupils utilize teachers once they have sought constructive criticisms from peers. Teachers use Socratic questioning often with their students to lead them to the appropriate ends in their problem-solving. The majority of student work performed at the Academy is project-based, interactive, and collaborative. In humanities, students have been given the task of collaboratively researching seventeenth and eighteenth century authors. Groups of three to four students were given the charge of investigating an author and providing a thirty to forty minute presentation to their peers. Students presented their findings in either an oral or PowerPoint presentation. During their discourse, students focused on the major accomplishments, influences, and characteristics present in the author's work and biographical information. The groups also engaged in a philosophical discussion with their peers. The group entertained any and all questions originating from their peers.

The emphasis for instruction is depth of understanding over breadth of coverage. Teachers believe that the type of instruction being offered at the Academy can best be described as quality over quantity, understanding over volume, delving into a problem in a way that one can go beyond an answer, and a good question often gets one further than a good answer. Students spend sufficient time on areas of study and major assignments to gain familiarity and facility with the concepts taught including many real world applications. Therefore, instructional strategies and practices school-wide are clearly aligned to the Academy's mission

and expectations of student learning. (teachers, students, self-study, observations, documents)

The design of the curricula, the practices of instructors, and the culture of the Academy all support the school's mission and expectations for student learning. The small size of the Academy allows flexibility in meeting students' needs. The size of the school gives significant opportunity for each student to talk to faculty members about his or her work. The calendar and class schedule are often adjusted to accommodate student workload, research projects, and other activities. The academic expectations for the school's students are that they be effective writers and readers, presenters, researchers, critical thinkers, quantitative reasoners, as well as problem-solvers. The faculty members are so committed in working to help each student achieve these expectations that a course was developed and implemented, called science and technical writing (STW), devoted entirely to the craft of writing in quantitative fields. It demands that students value purpose, clarity, organization, mechanics, and even appeal when writing about topics in science and technology. All instructional practices are designed to support the mission and vision. The faculty members at the Academy utilize a variety of teaching methods. Instructional practices personalize instruction, engage students as both active and self-directed learners, emphasize higher order thinking skills, provide opportunities for students to demonstrate that they are able to apply what they have learned within and across curricula, and foster an atmosphere of student self-assessment and reflection. Varied instructional strategies, labs, use of software, and Socratic questioning give students many ways to acquire skills and to demonstrate knowledge. Included in the

process is the opportunity for students to assess their own learning, both formally and informally. In math, students undertake a problem of the week (POW) that requires that they not only solve problems related to specific math concepts, but they must also reflect back on their work, inventorying the challenges and new learnings they have encountered. The weekly journals that students write for humanities encourage and promote students' continual self-assessment and self-reflection in a confidential setting. Students have ample opportunities to review their writing. Teachers include with criteria a caveat that students may submit their work prior to a deadline to receive teacher feedback as a means of strengthening their final submissions. Instructional practices promote higher order thinking skills and real world application of knowledge. Students engage in philosophical conversations during their class time. These conversations foster the theme of the Academy - depth over breadth. Science Technology Research Engineering and Mathematics (STREAM) projects A and B provide students with the opportunity to apply their knowledge in the real world. These student-driven STREAM projects require both individual and collaborative work. During STREAM B, students working collaboratively are soliciting a client and assessing their needs. Students are then applying the skills garnered while at the Academy into the creation and/or production of goods or services. Students are able to keep their STREAM A projects, but every STREAM B project is put to use within the community. One group exposed a need within their community. Students collectively decided an area teenager needed a device to aid in her daily exercise regimen. This teen was a hemiplegic. Students created through an extensive amount of community service

and research hours a device for this individual to assist her in her struggle with exercise. The project was not returned to the school but rather to the teen herself for continued use. Students promulgate that these opportunities are very rewarding. Students frequently experience richness and rigor across disciplines. As a result, the Academy collectively employs instructional practices that personalize instruction, engage students as active learners, promote introspection, foster students to become problem-solvers and critical thinkers, as well as resounds their mantra of depth over breadth. (student work, observations, self-study, students, teachers, class visits, panel presentation, documents)

Teachers at the Academy are using feedback from a variety of sources including other teachers, students, supervisors, and parents as a means to improve instruction. There are typically eight to nine members of the faculty and administration at the Academy, and each one knows his or her students well. Students who have concerns about the instruction that they are receiving may comfortably meet with their teachers. The onus at the Academy is placed directly upon the student. Because eleventh graders will be taking courses on a college campus the following year, the faculty encourages each student to become an advocate for himself or herself. Student comments were used as the basis for change to several of the handouts used in the STREAM writing assignments, as well as to improve the clarity of the literature review assignment. Also in response to this feedback, a teacher worked with the Worcester Polytechnic Institute (WPI) library staff to develop a web page for research done by grade eleven students at the Academy. Wednesday faculty meetings provide a forum for discussion, reflection,

and thoughtful planning. The purpose of these meetings is to serve as conduits for communication between faculty and administration. Part of the agenda in these valuable meetings is to review the work of individual students. During a recent meeting, the faculty at the Academy discussed two particular individuals with whom they had concern. During their discourse, the faculty offered insight into said individuals' progress in their classes. The principal asked many essential questions in his quest to intervene on the behalf of the two individuals under his charge. Classroom observations of students working on labs provide feedback on how well students are understanding concepts. The information acquired aids in the addition of subsequent classroom examples. If some students quickly grasp the material, more challenging problems are posed to further understanding. In a recent parent interview, it was discovered that students who ask for more rigorous problems in the computer science course are never denied. The teacher explains to students that first they must complete the required work currently in the curriculum. The parent went on to elaborate that once her child had finished that work, the child was then allowed to take on more challenging work for the remainder of the year. In her lessons, the computer science teacher always allows "dessert" in her course work. Dessert are those examples which raise the bar for students who so wish. Each lab in computer science requires students to write a reflection detailing new learning as well as any difficulties they may have encountered. It is this reflection that tailors future instruction for the students. A consistent practice among the teachers at the Academy is end of year course evaluations. This provides a basis to update course curriculum, hence the idea of the curriculum being a living document. Individual

structures are in place to facilitate feedback between teachers and students. Every day starts with junior advisory time. This is a time for pupils to check in and make certain their concerns are addressed. The faculty at the Academy has described many informal opportunities for feedback from the administrators. Specifically, the feedback from administrators led to the creation of "the portable language lab" which is a compilation of online audio and video resources. Students now have access to authentic foreign language materials, film clips, music, and Podcasts as well as a way to meet and speak to native speakers of French and Spanish around the globe. In addition, they can send "voice homework" and submit it online from anywhere they have access to an Internet connection. These informal conversations among teachers and administrators have proven to be fruitful. However, the infrequency of formal evaluative feedback from administrators to teachers limits the opportunity of both to enhance the instructional practices at the Academy. (self-study, teachers, parents, observations, class visits, documents)

Teachers at the Academy are true champions, experts within their content area, knowledgeable about current research on effective instructional approaches and pedagogical research, and reflective upon their own practices, continually seeking to improve student learning. Members of the faculty have taught or currently are teaching both content area courses and teaching methods courses at area colleges. One faculty member has taught English courses at Worcester State College and manages a local community-based theater; another is on a committee to improve foreign language teaching in the Greater Lawrence Regional-Vocational School. The science and technical writing (STW) teacher is an author who is in

frequent contact with other science writers. In addition to keeping current in her

craft, this educator also provides external professional development in science

inquiry and writing across the curriculum. These educators also exhibit a true

dedication by their multiple memberships in professional organizations within their

concentrations. The Romance language teacher works through Teachers 21, a

private consulting group that provides seminars and workshops on educational

issues such as curriculum development. This educator also presented on technology

integration at a recent national consortium for specialized secondary schools of

mathematics, science, and technology (NCSSSMST) conference in Dallas, Texas.

The Academy's mission statement focuses on excellence and innovation in

classroom teaching, and thus the Academy and its faculty provide a model for

schools throughout the Commonwealth of Massachusetts. These educators paint a

clear picture of knowledge, effective instruction, and introspection. (self-study,

teachers, parents, observations, class visits, documents)

Discussion of instructional strategies is a significant part of the professional

culture of the school. The small size of the school and collegial atmosphere allow

productive collaboration among all teachers. Significant amounts of common

planning time and weekly faculty meetings provide ample opportunity to discuss the

instruction of students. The visiting scholar program further expands the collegial

exchange. Teachers with varying amounts of classroom experience are hired to

work with the Academy teachers. The visiting scholars broaden the expertise of the

Academy faculty by bringing in new real world experiences. The professional and

collegial atmosphere among faculty members allows informal collaboration and

sharing of ideas regarding instruction. However, there is currently no formal

process or expectation in place to share with colleagues such things as new

learnings from attendance at a conference or workshop. However, teachers do find

the informal time to build interdisciplinary units. The Romance language teacher

infuses history, engineering, and video design into her curriculum, the POW often

incorporates, science, history and at times foreign language. Each Wednesday, the

faculty and principal meet to discuss the school's programs. This meeting

frequently includes a discussion of instructional methods and practices related to a

particular course. Faculty meetings held at the beginning and end of each school

year are times formally set aside for the discussion of instructional methods as they

relate to the school's mission and expectations for student learning. Although there

is no formal process of discussing best practices, administrators and teachers often

engage in informal conversations about them. These educational leaders have

discussed best practices as they are outlined in journals, scholarly articles, and texts.

Wednesday staff meetings, common lunch time, common prep time, and a culture of

collegiality all work together to ensure the fulfillment of the mission and learning

expectations for all students. Formalized sharing of best practices does take place in

pockets in the form of user groups and roundtables. The Academy formed the

Central Massachusetts Roundtable group for area high school math and science

teachers. Several times per year, teachers come together for the sole purpose of

sharing with their area colleagues their best practices in math and science. The

mission and expectations, the professionalism and experience of the diversified

faculty and administrators, and the high caliber of students all combine to create a

culture of excellence at the Academy. In this environment, curriculum and instruction continually and naturally evolve to best meet the needs of the students. (self-study, teachers, parents, observations, class visits, documents)

Teachers and students at the Academy integrate technology in various ways to support teaching and learning. Technology is infused into all classrooms to deliver the curriculum, align with the school's mission and vision, and enhance student learning. The up-to-date technology and one-to-one computer access benefit the educational program at the Academy. Each of the disciplines uses technology to best support clearly delineated learning objectives. In the math classroom, there is a computer for each student, and students frequently work using exploration with computer algebra software, *Mathematica*, or geometry software, Geometer's Sketchpad ©. Computers are available for all students to use before, during, and after the school day. Seniors can access any of the school's computers in lieu of relying on resources at WPI. Math computers are available for students to use in completion of assignments in other curricula. Explorations that would be time-consuming by hand can be done more efficiently on the computer, allowing a more in-depth exploration and a more insightful presentation. In students' words, "Here we have the resources to complete the work." All of the educators describe integrating technology into their instruction, but they do not rely on technology. Technology is used to enhance not to be the sole modus operandi. Teachers bolster their instruction rather than distracting with an excess of technology. Students in foreign language class use the computer and the software Skype to talk with native speakers in France, Spain, and South America. Students in this course are also

responsible for submitting via the computer recordings of themselves for various assignments. These include summarizing texts such as Les Miserables and pronunciations of verb tenses. Teachers have undertaken to create their own web pages where students have access to assignments and rubrics for their courses. Students also utilize a portal for learning hosted by Dickerson College. This language exchange allows students both during class and on their own time to engage in conversations with individuals around the world. This use of technology was implemented by the foreign language teacher as her answer to the antiquated practice of a language lab. Students in STW or STREAM are taught to access, search, and cite on-line scholarly journals for their research projects. Finally, students in computer science class create their own websites, learn computer-algorithm design, and implement their designs using the programming language SCHEME. As a result, technology is effectively and appropriately used in all classes to support instruction in creative and innovative ways to bring student learning to greater evidence. (self-study, teachers, students, observations, student work)

The mission of the Academy stipulates that the school demonstrate "excellence and innovation in teaching practice" and produce "evolving curricula." This is not just the mission; it is the culture of the school. Professional development time is built into the schedule; professional development funds are built into the budget; and the administrators encourage faculty members to continually look for opportunities to improve instruction through professional development. The school's professional development program is guided by identified instructional needs and provides opportunity for teachers to develop and improve their

instructional strategies. The Academy faculty is active in presenting at professional development seminars or serving on committees to improve curriculum and instruction at other schools in the state. Although the Academy does not regularly provide professional development workshops on campus or utilize their own faculty to share best practices with their fellow teachers at the Academy on a regular basis, teachers report that they are encouraged to participate in outside professional development. Teachers continually keep current in their craft by taking courses at WPI, speaking at conferences, and attending conferences as well as working on curriculum design at neighboring schools. At the Academy, teachers collectively participate in an excess of 200 professional development hours per year. The professional development that teachers at the Academy do engage in only further enhances their individual instruction. However, because there are no formal school-wide professional development opportunities regarding best practices, instructional strategies might become limited within classes. (self-study, teachers, parents, observations, class visits, documents)

Teacher supervision and evaluation processes are used to improve instruction for the purpose of enhancing student learning and meeting student needs. Instruction is constantly evolving at the Academy. The faculty and administration come together regularly in an effort to improve the instruction that takes place within their school. This faculty is atypical in that they do not have the presence of a collective bargaining unit and the often accompanying union requirements for supervision and evaluation. The principal alone is responsible for the evaluation of his teachers. The size of the school lends itself to a mutually beneficial evaluation

process. Teachers describe daily conversations with their building leader in reference to individual teacher performance. Since the Academy is a public school that is managed by a private institution, the Academy is an administrative unit within the university. Therefore, WPI requires a yearly inventory from teachers in which they are asked to reflect upon their practices. On a daily basis, the principal or director can walk through the school and have a clear sense of what is taking place in every classroom. Teachers comment that they frequently receive beneficial feedback from the administrators. The small number of faculty members allows this interaction and enables teachers to clearly delineate their instructional goals and the practices used to meet these goals. Wednesday faculty meetings provide a more formal setting for teachers to discuss instructional processes. The Academy faculty has the primary responsibility for the peer evaluation and improvement of the instructional strategies of the visiting scholars. Each visiting scholar shares the teaching of a class with a member of the Academy faculty. There is effective informal teacher supervision and evaluation. A more formalized evaluation process could, however, further improve instruction. (self-study, teachers, parents, observations, class visits, documents)

COMMENDATIONS

1. The student-centered teaching strategies that contribute greatly to the fulfillment of the school's mission statement

2. The facilitative instructional practices that allow teachers to help students become actively engaged in their own scholarship as espoused in the Academy's mission

3. The emphasis for instruction on depth of understanding over breadth of coverage that allows students to take an active approach in their learning

4. The flexibility of the daily and weekly schedule that contributes to high quality instruction based on student and teacher needs

5. The outstanding efforts of the Academy faculty to personalize instruction

6. The noticeable sense of community among teachers and students that manifests itself in highly individualized teaching practices

7. The culture of excellence at the Academy

8. The expertise on the part of the teachers at the Academy that results in high levels of student achievement

9. The willingness by all teachers at the Academy to adjust teaching so all students can achieve at higher levels

10. The culture of the school that promotes continuous self-improvement

11. The frequent informal discussions of instructional methods and practices

12. The well-balanced infusion of technology to support instruction

RECOMMENDATIONS

1. Refine the teacher evaluation process to provide more formal feedback

2. Develop and implement an in-house professional development process that allows sharing and discussion of effective teaching practices

4	**ASSESSEMENT OF STUDENT LEARNING**

Assessment is an integral part of the teaching and learning process. Its purpose is to inform students regarding their learning progress and teachers regarding ways to adjust the curriculum and instruction to respond effectively to the learning needs of students. Further, it communicates to the school community the progress of students in achieving the school's expectations for student learning and course-specific learning goals. Assessment results must be continually discussed to improve curriculum and instruction.

1. The school shall have a process to assess school-wide and individual student progress in achieving the academic expectations in the mission based on school-wide rubrics.

2. The school's professional staff shall use data to assess the success of the school in achieving its civic and social expectations.

3. For each learning activity, teachers shall clarify to students the relevant school-wide academic expectations and course-specific learning goals that will be assessed.

4. Teachers shall base classroom assessment of student learning on school-wide and course-specific rubrics.

5. Teachers shall use varied assessment strategies to determine student knowledge, skills, and competencies and to assess student growth over time.

6. Teachers shall meet collaboratively to discuss and share student work and the results of student assessments for the purposes of revising the curriculum and improving instructional strategies.

7. The school's professional development program shall provide opportunities for teachers to collaborate in developing a broad range of student assessment strategies.

8. The school's professional staff shall communicate:

   - Individual student progress in achieving school-wide academic expectations to students and their families;

   - The school's progress achieving all school-wide expectations to the school community.

CONCLUSIONS

To support the mission and expectations created as part of reaccreditation, the faculty at the Massachusetts Academy of Mathematics and Science (the Academy) developed school-wide rubrics that assess expectations for student learning. In addition, the faculty refined course-specific rubrics to align them more closely with the school-wide rubrics. Currently, Academy faculty members may use the school-wide rubrics in part, fully, or in combination with their own course-specific rubrics to assess student achievement. Because teachers are afforded latitude in the use of the school-wide rubrics, the Academy can not predictably monitor both individual and school-wide student progress in achieving the six specific academic expectations listed in the mission. Without a clear, consistent, and more frequent assessment process for student achievement using the school-wide rubrics, faculty members are missing the opportunity to gather data that can be used to adjust curriculum and instruction to best meet the needs of all students. (self-study, teachers, students)

The Academy is comprised of grades 11 and 12 and totals approximately 95 students and six or seven faculty members. Because of its small size, there is a very obvious closeness among its members. The faculty and administrators serve as advisors to the students, and there are weekly Wednesday faculty meetings that dedicate a substantial amount of time to talking about the school's success in achieving the civic and social expectations of the mission statement. At these meetings, all faculty members examine and discuss student conduct and behavior in

a very personal and supportive manner. Thus, any student who may be experiencing difficulties is often approached with a variety of strategies that would assist in remedying those problems. Deviations from the social expectations that students conduct themselves in a civil manner and that they work collaboratively are very rare. In fact, civility and collaboration are hallmarks of the Academy. All students are required to complete 56 hours of community service during both the junior and senior years. During meetings with students, they described willing participation in numerous community service activities, not because it is a requirement but rather because they believe in giving back to the communities that support them. Each year, the administration logs the hours completed and the services provided. Although there are no formal means to determine the impact of community service on the student body of the Academy, interviews with students indicate that such service is of great value to them. (self-study, students, administrators, teachers, parents)

Teachers are working more closely to clarify to students the relevant school-wide expectations and course-specific learning goals that are assessed. Prior to an assignment being given, the teacher hands out to the students a rubric that makes connections to either the school-wide expectations or the course-specific expectations. Such rubrics are also prominently displayed on the school's website. In the examination of student work, there is a greater emphasis on the course-specific expectations, however. If all faculty members clearly believe that *every* student who leaves the Academy must demonstrate that they are effective critical thinkers, readers and writers, presenters, users of technology, quantitative reasoners,

and problem-solvers, then there must be consistency in the frequency and use of these school-wide expectations. There needs to be every explicit and deliberate alignment of school-wide expectations and course-specific learning goals. Without this, attainment of those desired expectations is left to chance. (self-study, students, teachers, website)

Academy faculty members report on student progress in a variety of ways. Formally, student progress is reported at the end of each of four terms. During the first and third terms, a descriptive narrative addressing strengths and needs is written and distributed to each student and parent. This report gives student and parents more detailed and useful information about what a student needs to know and be able to do than a simple letter grade can possibly supply. Letter grades are provided during the second, third, and last terms. Letter grades reflect a blend of two important educational indicators: progress and achievement. They show how far students have moved from wherever they were when they started, toward the depth of understanding of content and skills demanded by the Academy. At any time during the school year, a faculty member or an administrator can raise concerns about a student, related to academic performance. A portion of the weekly Wednesday afternoon meetings is dedicated to such information-sharing and discussions of possible interventions. The faculty typically conveys sufficient information for each student to know where he or she stands academically and, more importantly, what would be needed to improve performance. The Academy relies minimally on traditional "paper and pencil" assessments and believes that authentic assessments such as presentations and exhibitions are much more valuable in

measuring student success in achieving the expectations for student learning and determining growth over time. It is notable that each subject area uses at least five different types of assessments in order to accommodate different learning styles and to provide a more comprehensive and holistic perspective of student achievement. This approach is very purposeful as the emphasis at the Academy is on learning rather than attainment of high grades. At the Academy, assessment is deliberately structured to promote learning. (self-study, teachers, students, progress report)

Teachers meet collaboratively to discuss and share student work and the results of students' assessments, to improve instructional strategies, and to revise the curriculum. The academy uses a variety of data over time to change and continuously improve instructional strategies. Faculty members annually revise curriculum in response to end of year surveys and evaluations written by students. Also, grades earned at WPI, conversations with WPI faculty, and student success information are often used to change or revise specific teaching strategies. For example, feedback from WPI has led to the algebra through problem-solving and PCP (pattern, conjecture, proof) strategies now utilized in the Academy math program. It is also noted that curriculum changes have taken place when Academy faculty menbers enrolled in and completed courses at WPI, such as when vector-style notations were introduced in physics. Teachers and administrators discuss student work and results of student assessments formally and informally. Formally, the Academy conducts weekly faculty meetings. During this time, student work and assessment are discussed on an individual as well as school-wide level. Informally, teachers may meet during common planning time to discuss student performance on

a variety of assessments. Teachers at the Academy use the results of classroom assessment to modify curriculum and instructional strategies. As a result, the staff is able to meet students' needs effectively. (self-study, teachers, student, student work)

The Academy's professional development program is individualized, personalized, course-specific, and provides some opportunities for teachers to collaborate in developing a broad range of student assessment strategies. The Academy does not have a formal school-wide professional development program. Each faculty member is expected to be proactive about his or her own professional development and remain on the vanguard of new assessment strategies and instructional practices. As stated in the self-study, the lack of this formal school-wide professional development program that would allow for the ongoing sharing and discussion of best practices in assessment and instruction limits the faculty's ability to expand effective teaching and assessment strategies. On an informal basis, programs include regularly scheduled collegiate meetings, collaboration, research, attending conferences, and the reading of scholarly books and journals as well as providing professional development to other schools and school districts in the form of courses, seminars, and workshops. The visiting scholar program allows both public school teachers and individuals looking for a career change the opportunity to teach at the Academy for up to two years. In addition, Academy faculty members conduct professional development workshops for other area schools on numerous topics such as use of calculators in algebra, Sketchpad, or the use of probes by the science department. Based on their affiliation with WPI, all faculty members can take courses at WPI at no cost. They can also take courses

through the Worcester College Consortium at reduced rates. Faculty members of the Academy not only attend conferences and take graduate level courses offered at WPI but are often providers of professional development on a state-wide and national level. (self-study, teachers, administrators)

The Academy's professional staff communicates individual student progress in achieving school-wide academic expectations to students, their families, and the community in a variety of forms. Both students and parents receive letter grades as well as detailed narratives addressing course-specific and school-wide expectations. In addition, each parent meets once per year with each faculty member to personally discuss student improvement. The community at large is made aware of student growth in the many publicized student awards and publications for both academic and civic excellence. Student science fair results and awards are widely reported and are posted on the Academy website. As one of the requirements of the computer science course, students develop their own websites on which they post information about their academic achievement, activities, and honors. The Academy reports student progress in achieving school-wide academic expectations to the school and local community consistently and widely. (self-study, website, students, teachers)

COMMENDATIONS

1. The dedication of time at weekly faculty meetings to deeply discuss students' progress in achieving the academic expectations

2. The dedication of time at weekly faculty meetings to come up with strategies in a very personal and supportive manner to assist students who may be experiencing difficulties

3. The high degree to which students achieve the social expectations of civility and collaborative work

4. The very deliberate use of assessments and reporting mechanisms to promote higher levels of learning

5. The frequent and widespread use of authentic assessments that provide a comprehensive and holistic perspective of student achievement

6. The school-wide use of rubrics to assess student achievement

7. The wide variety of assessment types used in each course that accommodate student learning styles

8. The weekly faculty review of student work to modify curriculum and instructional strategies

9. The requirement that Academy faculty members share effective assessment practices with other educators throughout Massachusetts

RECOMMENDATIONS

1. Develop and implement a formal means for assessing school-wide and individual student progress in meeting the academic expectations as listed in the school's mission

2. Develop and implement a formal process for assessing the school's success in assisting students to achieve the civic and social expectations as listed in the school's mission

3. Align course-specific learning goals with the school-wide expectations to ensure consistency

4. Develop and implement a formal professional development program that allows effective sharing of best practices within the Academy

**COMMISSION ON
PUBLIC SECONDARY SCHOOLS**

SUPPORT STANDARDS

_____

LEADERSHIP AND ORGANIZATION

_____

SCHOOL RESOURCES FOR LEARNING

_____

COMMUNITY RESOURCES FOR LEARNING

_____

5   LEADERSHIP AND ORGANIZATION

The way in which a school organizes learning for students, fosters leadership, and engages its members has a profound effect on teaching and learning. The professional culture of the school is characterized by thoughtful, reflective, and constructive discourse about decision-making and practices which support student learning and well-being.

1. The school board and superintendent shall ensure that the principal has sufficient autonomy and decision-making authority to lead the school in achieving the mission and expectations for student learning.

2. The principal shall provide leadership in the school community by creating and maintaining a shared vision, direction, and focus for student learning.

3. Teachers as well as administrators other than the principal shall provide leadership essential to the improvement of the school.

4. The organization of the school and its educational programs shall promote the school's mission and expectations for student learning.

5. Student grouping patterns shall reflect the diversity of the student body, foster heterogeneity, reflect current research and best practices, and support the achievement of the school's mission and expectations for student learning.

6. The schedule shall be driven by the school's mission and expectations for student learning and shall support the effective implementation of the curriculum, instruction, and assessment.

7. Meaningful roles in the decision-making process shall be accorded to students, parents, and all members of the school staff to promote an atmosphere of participation, responsibility, and ownership.

8. Each teacher shall have a student load that enables the teacher to meet the learning needs of individual students.

9. There shall be a formal, ongoing program through which each student has an adult member of the school community, in addition to the school guidance counselor, who personalizes each student's educational experience, knows the student well, and assists the student in achieving the school-wide expectations for student learning.

10. The professional staff shall collaborate within and across departments in support of learning for all students.

11. All school staff shall be involved in promoting the well-being and learning of students.

12. Student success shall be regularly acknowledged, celebrated, and displayed.

13. The climate of the school shall be safe, positive, respectful, and supportive, resulting in a sense of pride and ownership.

14. The school board shall support the implementation of the school's mission and expectations for student learning.

CONCLUSIONS

The principal of the Massachusetts Academy of Mathematics and Science (the Academy) has sufficient autonomy to ensure the achievement of the school's mission and expectations. The Academy is a unique school with a special relationship between the principal, the director, Worcester Polytechnic Institute (WPI), and the Commonwealth of Massachusetts. WPI entrusts the leadership of the school to the director and the principal and works with the school leadership to integrate Academy students into the WPI campus. The principal engages with the director to determine the direction of the school and collaborates with all faculty members to ensure that the Academy meets the needs of the very talented student body. This structure reflects the principal's commitment to shared decision-making and the director's trust in the principal's leadership. As a result, the Academy has a strong adherence to its mission and student expectations. (self-study, teachers, parents)

The principal has a very strong presence in the Academy, and the Academy reflects his values and vision for the school. The principal's commitment to collaboration leads to ownership of the entire educational program by all of the adults and students in the building. Faculty members routinely take responsibility for the content of weekly Wednesday meetings with the principal and faculty. The principal and faculty meet for two weeks at the end of each year to examine school-wide progress and plan the direction for the year ahead. Students and parents are clear about the expectation that students actively and independently engage in their

own learning. All members of the Academy community share a common vision and focus for student learning. Subsequently, all community members are unified in providing and supporting exceptional learning opportunities for the students of the Academy. (self-study, students, parents, faculty, principal)

The principal shares decision-making with the faculty for all aspects of running the Academy. The weekly Wednesday faculty meeting is hailed by all adults in the building as the life-force of the institution. In this meeting, faculty and the principal discuss and problem-solve issues ranging from curriculum and assessment to individual student needs. As one-person departments, teachers necessarily accept full responsibility for the curricular and instructional decisions for their subject area, often in collaboration with other departments/teachers. Consequently, each adult in the building provides both collaborative and individual leadership in school improvement efforts. (faculty, administrators, self-study)

The organization of the school and its educational programs promotes the school's mission and expectations for student learning. The work of the Academy is based on open, creative interactions between students and faculty members, and between the faculty and the principal. This structure epitomizes the catalytic nature of relationships in the school as well as the open lines of communication among all of the professionals in the school. The junior year core courses, Science Technology Engineering Research and Mathematics (STREAM) program, Senior Independent Study Project (SISP), elective offerings, academic competitions, and course offerings at WPI engage students in a pattern of independent, engaging, interactive academic opportunities. As a result, the school provides an educational

environment that enables the Academy students to reach their potential as learners. (teachers, administrators, self-study)

The Academy draws students from throughout Central Massachusetts who demonstrate excellence in science and/or mathematics. Although Academy students are not significantly diverse in terms of academic ability, students themselves describe the groups as having a diversity of views that yields discussion, divergence, and independent thought. Significant outreach has resulted in consistent enrollment of female students as required by state legislation. However, although some students have diverse cultural or socio-economic backgrounds, members of traditionally underrepresented racial groups in Science, Technology, Engineering and Mathematics (STEM) (Black and Hispanic) are also underrepresented in the Academy's student body. Nonetheless, within the Academy's student population, students are grouped heterogeneously. As a result of the small class sizes in the junior year and enrollment in WPI courses senior year, Academy students experience divergent world-views during their tenure. (administrators, self-study, school and community profile)

The Academy's schedule is jointly constructed on a weekly basis in a manner that directly supports teaching and learning at the school. Teachers provide the principal with their instructional and curricular needs each week. Examples of flexible schedules include two-hour classes in math modeling and physics, all-school blocks for educational programs, and even "work from home" days to support student preparation for science projects. The Academy students are in school for 162 days each year; but, because of an extended school day (8:00 am to

4:00 pm) juniors are in classes for over 1200 hours during the school year, well above that required by state law. Senior students check in daily at the Academy and then participate in classes at WPI during the day. At the Academy, the schedule is directly responsive to the learning needs of the students. (self-study, students, teachers, administrators)

The Academy is an institution that clearly exists for the benefit of the students, is run by the professionals in the building, and enjoys the full support of the parents. The Academy does not engage students or parents in an inclusive decision-making process. However, students and parents believe that their opinions and concerns are valued, heard, and often instituted. Students maintain that the faculty is responsive to their needs. Parents acknowledge that it can be difficult to provide their children the independence necessary for them to become engaged in their own learning; the Parent Support Group acts both to support the Academy and to support parents in this transition. There is a school site council, including four students and three parents, and sometimes a faculty member, that functions primarily as a means to share information with parents. Nevertheless, parents believe that the faculty and principal at the Academy have their children's best interests as their top priority and report that there are few, if any, issues that they would want to have a greater say in. Consequently, parents and students trust that the expectations and demands of the Academy will benefit students in their future academic endeavors. (students, parents, administrators, self-study)

The teaching load at the Academy enables teachers to individualize and personalize instruction for each student. Class sizes stand at 15; total teacher load is

46 students. Teachers intentionally challenge each student, designing "dessert" questions, for example, that push even the most adept student in each subject. Seniors take college courses at WPI but receive ongoing mentoring and support from the Academy faculty and administrators. As a result of the small class sizes, students' individual abilities are well known, and students are pushed to reach the limits of their potential. (teachers, self-study, students, parents)

School starts each day with an advisory period with the ratio of adults to students at 7:1. In addition, each student has a faculty advisor for his or her STREAM project. Also, seniors are assigned an academic advisor, a Senior Independent Study Project advisor, and a college counselor. Finally, students regularly speak with individual faculty members with whom they feel most comfortable. Each Academy student has multiple opportunities to be known well by an adult member of the Academy community. As a result, students are well supported as they develop independent learning skills. (teachers, self-study, parents)

The professional staff at the Academy takes great pride in its collaboration across departments. The schedule affords ample time to faculty members for both formal and informal interactions among the academic team, including common lunch time, weekly full staff meetings, professional development days, and three full weeks combined of professional development/team planning before and after the school year. This collaboration is evident in many aspects of the educational program, including integrated classroom curricula, agreed-upon school norms for student (and adult) behavior, common expectations for student performance on STREAM projects, and articulation to college level work for the senior year.

However, while Academy faculty and administrators mentor and support seniors as they navigate WPI, there is infrequent and limited formal communication between WPI professors and Academy faculty and administrators. Nevertheless, as a result of the culture of collaboration at the Academy, students are extremely well prepared for academic success at WPI during their senior year. (self-study, teachers, administrators)

All school staff members contribute to promoting the well-being and learning of students. Students who struggle to meet deadlines or who exhibit questionable behavior are quickly noticed and discussed at the Wednesday meeting. Faculty members serve as advisors during the senior year and mentors during the junior year. They also each teach elective courses in areas of interest, further developing connections between the faculty and students. Subsequently, the student body and parents are extremely positive about their educational experience at the Academy. (students, parents, teachers)

Celebrations and acknowledgements of student success are deliberately managed to promote a supportive community among students and to de-emphasize competition among students. Students are given only qualitative feedback during their first few months at the Academy. Student grades are never posted for comparison, and class rank is not utilized. However, displays of student work and projects abound, including student endeavors during elective courses, the school's award-winning FIRST (For Inspiration and Recognition of Science and Technology) robot, and classroom assignments. Students' achievements are regularly recognized at Monday morning all-school meetings, and the school holds special days to

celebrate student art or cultural diversity. More importantly, student work is displayed in the community, as students present the results of their engineering projects to the real-world subjects for whom the projects were designed. Students also lead workshops in areas of interest for middle school students during SPLISH each spring. As a result of the thoughtful ways that the school celebrates student success, students are proud of their accomplishments, proud of their classmates, and they provide a vital support service and cheering section for each other. (students, self-study, student work)

The Academy students take great pride in their school and have ownership and a vested interest in their own education and in each other. Teachers set "civility" as a common expectation from the outset of the school year. Students and teachers support each other, are respectful of multiple voices, and are genuinely happy to be at the Academy. The campus is secure, and safety measures are in place to ensure that seniors taking courses at WPI have safe transport between WPI and the Academy. Consequently, the climate of the school is highly conducive to extraordinary levels of learning and achievement. (students, teachers, parents, self-study)

The Commonwealth of Massachusetts and WPI function as the de facto school board for the Academy. The Commonwealth supports the mission by continuing funding for the school on an annual basis. WPI provides the Academy with many services, including a business office, health services, research library, security, maintenance, professional development, and policies. Most importantly, WPI provides classrooms and professors during Academy students' senior year. These

supports ensure that the Academy is able to meet the school's mission and expectations for student learning. As a result, Academy students excel at WPI during their senior year. (self-study, administrators, students)

COMMENDATIONS

1. The unique relationship between the Academy and WPI

2. The vision held by the school's principal to foster a unique school of excellence through collaboration

3. The untiring efforts of the school's director to increase enrollment at the Academy and to procure adequate funding to support this school of excellence

4. The commitment of all adult members of the Academy community to provide and support exceptional learning opportunities

5. The shared-decision making among the professional staff that governs the school

6. The cohesive educational structures (small cohorts, authentic learning tasks, inquiry-based instruction, qualitative assessment) that directly support the mission and student expectations for learning

7. The flexibility of the school schedule that is directly responsive to the learning needs of the students

8. The exceptional trust that students and parents have for school faculty members and administrators

9. The commitment to personalization and individualization of instruction

10. The multi-tiered support for students as they develop independent learning skills

11. The collaboration among all faculty members that promotes the well-being and learning of all students as evidenced in the advisory structures and weekly meetings

12. The manner in which student work is celebrated that fosters an obvious sense
   community and discourages competition

13. The school climate that is highly conducive to extraordinary levels of learning and
   achievement

RECOMMENDATIONS

1. Continue to examine ways in which the Academy can actively reach out to
   underrepresented student populations to further increase the diversity of the
   student body

2. Improve the frequency and extent of the communication between WPI and the
   Academy concerning student academic achievement

| **6** | **SCHOOL RESOURCES FOR LEARNING** |

Student learning and well-being are dependent upon adequate and appropriate support programs and services. The school is responsible for providing an effective range of integrated resources to enhance and improve student learning and well-being and to support the school's mission and expectations.

All Student Support Services

1. The school's student support services shall be consistent with the school's mission and expectations for student learning.

2. The school shall allocate resources, programs, and services so that all students have an equal opportunity to achieve the school's expectations for student learning.

3. Student support personnel shall enhance student learning by interacting and working cooperatively with professional and other staff, and by utilizing community resources to address the academic, social, emotional, and physical needs of students.

4. All school resources for learning shall be regularly evaluated and revised to support improved student learning.

5. There shall be a system for effective and ongoing communication with students, parents/guardians, and school personnel, designed to keep them informed about the types of available student support services and identified student needs.

6. Student records, including health and immunization records, shall be maintained in a confidential and secure manner consistent with federal and state law.

7. There shall be sufficient certified/licensed personnel and support staff to provide effective counseling, health, special education, and library media services.

Guidance Services

8. The school shall provide a full range of comprehensive guidance services, including:

    *   individual and group meetings with counseling personnel;

    *   personal, career, and college counseling;

- student course selection assistance;

- collaborative outreach to community and area mental health agencies and social service providers;

- appropriate support in the delivery of special education services for students.

Health Services

9. The school's health services shall provide:

- preventive health services and direct intervention services;

- appropriate referrals;

- mandated services;

- emergency response mechanisms;

- ongoing student health assessments

Library Information Services

10. The library/information services program and materials shall be fully integrated into the school's curriculum and instructional program.

11. Library/information services personnel shall be knowledgeable about the curriculum and support its implementation.

12. A wide range of materials, technologies, and other library/information services that are responsive to the school's student population shall be available to students and faculty and utilized to improve teaching and learning.

13. Students, faculty, and support staff shall have regular and frequent access to library/information services, facilities, and programs as an integral part of their educational experience before, during, and after the school day.

14. The library/information services program shall foster independent inquiry by enabling students and faculty to use various school and community information resources and technologies.

15. Policies shall be in place for the selection and removal of information resources and the use of technologies and the Internet.

Special Education Services

16. The school shall provide special education services related to the identification, monitoring, and referral of students in accordance with local, state, and federal laws.

CONCLUSIONS

The School Resources for Learning Standard for Accreditation as it applies to the Massachusetts Academy of Mathematics and Science (the Academy) will differ in its application due to the very unique nature of the Academy. The Academy is a unique institution in that it is neither a comprehensive high school nor a charter school; rather, it is a school of excellence specializing in mathematics and science. Many of the structures and support systems that would be found in a typical high school manifest themselves very differently at the Academy. In the traditional application of this standard, a high school would have housed within the school itself its guidance counselors, nurses, library and media personnel, and special education staff. At the Academy, all of these support services are present but housed either at the Academy and/or at Worcester Polytechnic Institute (WPI) – its education partner. The Academy has tailored its support services to complement the high skills and abilities of its student body who show great potential in the areas of mathematics and science.

Student support services at the Massachusetts Academy of Math and Science (the Academy) have been developed in response to the unique students' needs and to the goals expressed in the school's mission and expectations for student learning. The affiliation with Worcester Polytechnic Institute (WPI) allows the Academy to avail itself of the extensive library, health, and student support services of its partner institution. The Academy serves about 95 students in both grade 11 and grade 12. All of those students have equal access to the wide variety of resources, programs, and services available to them to assist in achieving the school's expectations for student learning. The very structure and progression of programming at the Academy allow for the development of

independence and self-advocacy on behalf of each student and, at the same time, extensive support and guidance as those students go from grade 11 to grade 12. Within the Academy itself, housed at 85 Prescott Street, the seven faculty members and two administrators work very closely and collaboratively to tend to the students' academic, social, emotional, and physical needs. If a service cannot be provided within the walls of 85 Prescott Street, one can be assured that service will be provided either through the Academy's unique affiliation with WPI or by community resources within the Greater Worcester area. Prior to acceptance into and enrollment at the Academy, both parents and students are clearly informed of the support services available to them as they transition from a traditional setting at their former high schools. Once accepted, a student's records are forwarded to the Academy where they are retained in compliance with state and federal laws. All personnel who interact with Academy students are duly certified and licensed. (self-study, administrators, parents, students)

Guidance Services

Two fully certified career and guidance counselors are on site to provide contracted services (20 hours per week) to the 45-48 members of the junior class in the spring, and about the same number of seniors in the fall. These two counselors assist students in identifying interests and academic needs, guide them in the college selection and application processes, and help them review and analyze standardized tests. In addition to this, each faculty member of the Academy serves as an advisor to these same students – providing personalized attention on a small group basis (6:1). Each member of the junior class has daily contact with his or her advisor. At the grade 12 level, these meetings take place on a weekly basis. It is also important to note that, as needs arise, a

student may have one-to-one advisory sessions. If at any time it is suspected that the student's needs are greater than the services that can be provided by an Academy faculty member, further counseling services are available within the community, at WPI, or through contracted services with a certified psychologist. Both parents and students express great satisfaction with the support afforded them during their two-year stay at the Academy. So the school can continue to tailor these services to their students' needs, and to expand on these services if needed, a system should be in place to gather feedback from graduates of the Academy to determine how effective these services were and the contributions such services made to their success in college. (self-study, teachers, students, administrators)

All members of the junior class take the same course load with common teachers. Based on their performance in those courses, the students then work with Academy faculty members to select WPI courses in which they will enroll throughout their senior year. As a senior, Academy students will have access to WPI counselors and academic advisors and, at the same time, Academy faculty members and administrators monitor them closely. Given the nature of students who apply to and are accepted to the Academy, there is no need for formal special education services. If a student enters the Academy with a pre-existing 504 plan, the Academy takes every step to ensure that is followed, through close collaboration with the sending school and WPI. As a result, Academy students are afforded ample access to guidance support services both on site and through WPI or community service providers. This results in high levels of academic achievement by the study body and excellent preparation for success at competitive colleges and universities upon graduation. (self-study, administrators, teachers)

Health Services

All Academy faculty and administrators are trained and certified in cardiopulmonary resuscitation (CPR) and first aid so they can attend to medical emergencies if the need arises. In addition, if a student is in need of medical assistance beyond what can be provided by the trained Academy faculty, a call to WPI will result in quick medical attention by the WPI First Responder Team. If needed, referrals to community health services can be made. The Academy complies with mandated health screenings such as hearing, vision, and postural. (self-study, administrators, teachers)

Library Information Services

 Faculty and students at the Academy have the very unique opportunity to fully access the WPI Gordon Library and all of its resources to support teaching and learning. All junior students are brought to the Gordon Library early in the school year for an extensive orientation where they are informed of the wide range of resources available as well as direct instruction on how to access these from school or from home. Teachers at the Academy are very deliberate in assigning students work that requires the utilization of these resources, both print and on-line. It is through such access and utilization that courses such as Science Technology Research Engineering and Mathematics (STREAM) and Science and Technical Writing (STW) are so rigorous and sophisticated. Classroom visits and examination of student work make it very clear that students and teachers take full advantage of these resources. Academy students are indeed fortunate to be able to consider the immense resources of the WPI Gordon Library as their own, and, as a result,

their curricula and learning opportunities are greatly enhanced. (student, teachers, WPI staff members)

The manager of instruction and outreach at the WPI Gordon Library is both keenly aware and an enthusiastic supporter of the Academy's curriculum. She has worked with teachers and students on the STREAM projects and has encouraged students in their work through such avenues as patent searches. Teachers can make direct requests to the WPI library personnel for any materials needed for the curriculum and WPI is quick to respond. The relationship between the WPI library personnel and the Academy faculty and student body is grounded in mutual appreciation for the contributions each makes to each other. A wide range of media services is supplied to Academy students through the WPI Academic Technology Center (ACT). As a result, the Academy students and teachers are confident that the Gordon Library staff is both knowledgeable and supportive of their efforts to degrees much higher than those found in regular high schools throughout Massachusetts and New England. (self-study, students, teachers, WPI staff members)

The materials provided by the WPI Gordon Library to the students and teachers at the Academy offer extraordinary opportunities for enhanced teaching and learning. The print and non-print collections are designed to serve the needs of over 4000 undergraduate and graduate students, most of whom are pursuing studies in science technology, engineering, and mathematics. WPI's computer hardware, software, electronic resources, and lab equipment are all available for use by Academy students and teachers. Library personnel work closely with students to meet their academic needs with a comprehensive array of services that even include patent searches. In addition to these

paper resources, students and teachers have access to over 40,000 electronic books and publications as well as 150 sophisticated databases and an on-line chat service that connects students to others in the scientific world. Access to these electronic and network resources is available 24 hours per day seven days a week. The WPI library facilities are open Sunday, 12:00 noon – 1:00 AM; Monday – Wednesday, 8:00 AM – midnight; Thursday, 8:00 AM – 1:00 AM; Friday, 8:00 AM – 9:00 PM; and Saturday, 9:00 AM – 9:00 PM. More students in grade 12 than in grade 11 more readily access many of these outstanding resources. Available for Academy students and used by them are library information services that are not only responsive to their academic needs but also afford them opportunities for exploration and investigation into areas that go well beyond the scope of typical secondary curricula. As a member of the WPI library staff commented, "It is great to get the Academy students here at WPI because they are more skilled in using these resources than other students." Even greater benefit will be realized if these rich resources were fully utilized by all students in both grades and equally by all teachers at the Academy. (self-study, students, teachers, WPI staff members)

The collaboration between WPI and Academy students contributes greatly to fostering independent inquiry. Through their detailed and very scientific work, Academy students often go on to receive regional, state, and national awards for their research work, made possible both by the excellent teaching at the Academy and the access to such fine resources supportive of both teaching and learning. (self-study, teachers, students)

The Academy uses the WPI acceptable use policy (AUP) to safely regulate the use of technologies, the Internet, and other networked services. Teachers may submit

requests for new materials, and outdated materials are purged as necessary. As a result, students and teachers can rely on the availability of current, reliable, and appropriate resources to enhance both teaching and learning. (self-study, teachers, students, WPI staff members)

Special Education Services

As stated previously, given the nature of students who apply to and are accepted into the Academy, there is no need for special education services at this time. No student has been identified as having a learning disability that would require such services. However, there are students who are on a 504 plan and the school works fully to ensure that those needs are met and that the students benefit from their educational experience. Should a student require modifications to a learning plan, such as extended time or English as a Second Language services, those are promptly provided in collaboration with WPI.

COMMENDATIONS

1. The faculty and administrators at the Academy for recognizing that the best way to meet the unique needs of all Academy students is by offering a high-level, student-centered curriculum and true college level courses

2. The equal opportunity afforded in the allocation of resources through a common curriculum for juniors

3. The ongoing support afforded to each student at the Academy by a caring and capable faculty and support staff members

4. The extraordinarily wide-range of materials and services available through the WPI Gordon Library to support teaching and learning

5. The extensive library and media resources and services in place through the collaboration with WPI that directly contributes to having all students become actively engaged in their own education

RECOMMENDATIONS

1. Develop and implement a process to solicit feedback from students, alumni, and parents on the effectiveness of the school's support services and their ability to meet the school's mission

2. Expand opportunities for grade 11 students to directly access the services and resources of the WPI Gordon Library

7	**COMMUNITY RESOURCES FOR LEARNING**

Active community and parent participation, facilities which support school programs and services, and dependable and adequate funding are necessary for the school to achieve its mission and expectations for student learning.

1. The school shall engage parents and families as partners in each student's education and encourage their participation in school programs and parent support groups.

2. The school shall foster productive business/community/higher education partnerships that support student learning.

3. The school site and plant shall support and enhance all aspects of the educational program and the support services for student learning.

4. The physical plant and facilities shall meet all applicable federal and state laws and shall be in compliance with local fire, health, and safety regulations.

5. Equipment shall be adequate, properly maintained, catalogued, and replaced when appropriate.

6. A planned and adequately funded program of building and site management shall ensure the appropriate maintenance, repair, and cleanliness of the school plant.

7. There shall be ongoing planning to address future programs, enrollment changes, staffing, facility, and technology needs as well as capital improvements.

8. The community and the district's governing body shall ensure an adequate and dependable source of revenue to provide and maintain appropriate school programs, personnel, services, facilities, equipment, technological support, materials, and supplies for student learning.

9. Faculty and building administrators shall have active involvement in the budgetary process, including its development and implementation.

CONCLUSIONS

The Massachusetts Academy of Math and Science (the Academy) reaches out to parents to actively engage them as partners in their children's education. There is a very clear and deliberate distinction between how the school involves the parents of junior students as compared to the involvement of parents of senior students. For example, there is a mandatory information session prior to the start of the junior year for parents and their children that explains the expectations and offerings of the Academy and, at the same time, outlines the expectations and obligations of the parents and the families. The Academy offers a Saturday morning "Parents Academy" at the start of the junior year where parents have the opportunity to "attend school" to better learn what a day in the life of an Academy student is like. Here they learn about the various expectations for each course, become better acquainted with their children's teachers and their teaching styles, and can chat with administrators and support staff members to see how the Academy tailors its offerings and routines to best meet the needs of its students. A parent support group is available so adults with children in grade eleven can discuss issues such as transportation and student performance. This same support group helps parents cope with the struggles that may occur during a school year, such as a child who is showing frustration with course workload or impending deadlines for completing assignments. Academy counselors offer a spring meeting where they discuss with parents of junior students college counseling strategies and procedures. The Academy's efforts to actively engage parents as their children transition from a traditional high school to one that targets the students' unique talents and skills in mathematics and science are numerous. As a result, parents feel very connected to

the Academy and are confident that their children are placed in an environment that is both challenging and supportive. (self-study, parents, teachers)

The Academy is also faced with the task of preparing their grade 12 students for college. This requires that Academy staff modify the means by which they engage the parents of the senior students. As the senior students take all of their courses at WPI, they are, in fact, college students. Consequently, Academy staff intentionally decreases such mandatory activities as informational sessions or Parent Academy. Philosophically, the Academy faculty realizes that they are working with emerging adults (their grade 12 students), and they understand that they must foster greater independence in those students to better prepare them for life on college campus full-time. Although mandatory activities decrease as the Academy faculty members work to create independent learners, the teachers and administrators at the Academy still keep a watchful eye on their seniors to monitor their academic performance and their well-being. Consequently, senior students are afforded a realistic college experience with sufficient support and guidance from a caring Academy faculty. Both parents and students openly comment that they feel thoroughly prepared both academically and socially to successfully handle a college environment during their senior year at the Academy. (parents, students, self-study, teachers)

The Academy fosters a higher education partnership that supports student learning that is without equal in the Commonwealth of Massachusetts. In 1993, the legislature passed a bill that established a collaborative venture between the Commonwealth of Massachusetts and WPI to provide a unique educational

experience for students who showed exceptional talent in math and science. The Massachusetts Academy of Math and Science would serve between 80-100 students from throughout the Commonwealth by offering a two-year educational program (grades 11-12) where, by the senior year, all Academy students would be taking a full schedule of science and engineering courses at WPI - making the Academy the only public school in Massachusetts whose students attend fulltime a university as seniors in high school. This innovative educational approach, which has met with great success, as evidenced by the high grade point average of Academy students (3.65 for Academy students compared to a 2.95 for WPI students), could very well serve as a model for other high schools throughout the country to create programs and services for students with special talents. (self-study, website, administrators)

The Academy recognizes that more can and should be done to engage students in meaningful community partnerships that support student learning. The school does benefit from the limited existing partnerships with some WPI and University of Massachusetts medical labs; however, those partnerships are informal and can be subject to change during any given school year. Without a formal and ongoing process to connect Academy students to specific community summer internships in areas such as research labs and engineering, students miss out on more opportunities to apply their knowledge and skills to authentic learning environments. In addition, these expanded opportunities would also better allow the school to deliver that component of its mission that states it is committed to "Lifelong learning by providing the subjects, tools, skills, and strategies for students to actively engage in their own education." (self-study, students, administrators)

Academy students have the opportunity to develop meaningful relationships with a variety of community organizations as part of their required 112 hours of community service. A review of the community service records for students in the Class of 2009 shows many instances where the Academy students give back to the communities that support them through involvement in such causes as volunteering at the Tower Hill Botanical Gardens, providing assistance to younger individuals who attend the Boys and Girls Club in area cities and towns, serving as tutors to students in neighboring elementary schools, or helping residents of the Massachusetts Veterans Shelter to learn computer skills. At the time of the school's NEASC visit, the members of the Class of 2009 had recorded close to 3200 hours of community service in over 35 different service organizations. The Academy students dedicate many hours beyond those required for graduation to meet a wide variety of needs within their communities. (self-study, students, parents, community service records)

The Massachusetts Academy of Math and Science is located at 85 Prescott Street, Worcester, Massachusetts, in a tastefully renovated, turn of the century brick warehouse building that is shared with several physicians' offices, the WPI Extension School, and biotech research firms. The ground-floor level sections that are dedicated primarily to the Academy consists of five classroom spaces, office spaces for each teacher, counselor, and administrator, a meeting room, a faculty dining area, a library / study area, and a common area referred to as the Brickyard. The instructional spaces are adequate in size and come well equipped to support teaching and learning. The facility does not have a cafeteria as students and faculty

members are responsible for bringing their own lunches and snacks. The current

area dedicated for storing and preparing lunches is limited in size and equipment

and detracts from the overall appeal of the facility. The physical plant and facility

meet all applicable state and federal laws and are in full compliance with fire,

health, and safety regulations. Faculty members did note concerns with the existing

HVAC system at the time they prepared the self-study, and WPI contacted the

respective contractors for review and maintenance of that equipment. Since then, it

has been operating without any problem. Across the street are the biotech/life

sciences offices and labs of the Gateway Park initiative, and three blocks away is

the main campus of WPI. Juniors spend the majority of their time at the Academy

building; seniors spend theirs on the WPI campus. The Academy facility is a

comfortable, attractive, and well-equipped building that is supportive of both

teaching and learning. (self-study, students, teachers, administrators)

Up-to-date and ample technology supports teaching and learning at the

Academy. The state-of-the art equipment is directly linked to the computer system

and services of WPI, including the Gordon Library. When necessary, the Academy

uses WPI laboratories and shops for science and engineering classes and projects for

the juniors. Seniors have access to WPI services and equipment just as any WPI

student. WPI, as a nationally ranked engineering college, has exceptional resources.

Academy students enjoy access to WPI college counselors who help with the

transition from a high school to a college setting. The unique and innovative

relationship that exists between the Academy and WPI is beneficial to Academy

students and affords them an enviable connection to college. In addition, it allows

access to a wide array of resources that are not normally available to a typical high school, resulting in significant support for teaching and learning. (self-study, administrators, students)

Equipment that is used by both students and faculty is adequate, maintained, catalogued, and replaced when appropriate. In conversations with students, parents, and teachers, all indicate that they have ready access to supplies and materials needed to support good teaching and learning. (self-study, teachers, students, parents)

Good care and maintenance of the facility at 85 Prescott Street is evident. WPI owns 19% of the facility and contracts with a business to clean and maintain the buildings and grounds. Over $900,000 was invested by WPI to turn the first floor area of this building into classrooms, offices, and common areas. If maintenance concerns arise, such as problems noted earlier with the HVAC system, WPI is quick to contact appropriate personnel to investigate the concerns and remedy any problems to the best of their abilities. The commitment by WPI to maintain a space conducive to good teaching and learning is ongoing and consistent. (self-study, administrators, teachers)

The Academy has plans to continue to meet its programmatic, student demographic, staffing, and technology needs. At the conclusion of each school year, the faculty and administrators of the Academy meet to discuss how effective the current school year was based on student achievement, and to plan for the upcoming year. Over the past several years, the school has enjoyed a stable

population of approximately 45-48 students in each grade. This allows for consistency in programming, staffing, and equipment needs. Technology plays a critical role in the delivery of the curriculum at the Academy. It also plays a critical role in bringing the resources available at WPI into the Academy. The availability of computers at the Academy is more than sufficient. The availability of state of the art technology hardware and software enables the school to deliver on its mission to "address the changing needs of the technologically advanced community of the 21st century." (self-study, teachers, students, administrators)

Since its inception in 1993, the Academy has successfully managed to obtain funding from the Massachusetts State Legislature. As stated in its self-study, this is attributable to the ongoing sense that what the Academy is doing is important for the Commonwealth, the knowledge that the Academy is meeting or exceeding the mission established in the enactment legislation, and the advocacy efforts of the Academy's director to inform state legislators that the work at the Academy is proving to be very successful. It is obvious that with the current state of the economy in the nation, programs such as this could be subject to significant reductions in funding. The Academy has seen budget reductions of anywhere from $50,000 to $100,000, but faculty and administrators have worked very closely together to protect the programs and services of the Academy, thus allowing it to continue to deliver on its mission. (self-study, administrators, teachers)

Because the faculty at the Academy is so limited in number, because the principal and director firmly believe in and are committed to shared-decision-making, and because the fiscal agent of the Academy – WPI – allows its

professional staff great latitude in its operations – all members of the Academy's faculty have direct say in the budget development process. It is at weekly faculty meetings that teachers make known their needs, such as increased media equipment, and it then becomes the responsibility of the administrators to allocate funds to meet the needs. It is through such collaboration and with a firm commitment by all to provide whatever is needed to help students reach their potential that the Academy enjoys continued success. (self-study, teachers, administrators)

COMMENDATIONS

1. The ongoing efforts to engage parents as partners in their children's education such as Parents Academy and parent support groups

2. The deliberate supportive structures in place at the junior and senior year that move to create a sense of independence in Academy students that will prepare them academically and socially for college

3. The symbiotic partnering relationship between the Academy and WPI that creates a unique learning experience for its students

4. The development of community partnerships between the Academy and area service organizations that allow students to give back to communities who support them

5. The numerous technology and library resources available to Academy students through the WPI partnership

6. The commitment by WPI to develop and maintain a facility that is conducive to outstanding teaching and learning

7. The collaborative and focused efforts of all faculty and support staff members at the Academy to provide an outstanding educational experience for its students

RECOMMENDATIONS

1. Develop and implement a formal process for increasing and sustaining the opportunities for students to engage in meaningful community partnerships that support student learning

2. Examine the suitability of the existing kitchen area used by students and faculty to prepare lunches to ensure that such spaces add to, not detract from, the appeal of the facility and meet students' needs

3. Ensure that all measures have been taken to ensure that the facility's HVAC system operates effectively, efficiently, and safely

4. Continue and expand the efforts to ensure sufficient funding to enable the school to deliver on its legislative charges to maintain the school of excellence status, provide professional development at the Academy to promote excellence in teaching in the areas of math and science

FOLLOW-UP RESPONSIBILITIES

This comprehensive evaluation report reflects the findings of the school's self-assessment and those of the visiting committee. It provides a blueprint for the faculty, administration, and other officials to use to improve the quality of programs and services for the students in the Massachusetts Academy of Math and Science. The faculty and other concerned individuals should also be apprised by the building administration yearly of progress made addressing visiting committee recommendations.

Since it is in the best interest of the students that the citizens served by the Academy become aware of the strengths and limitations of the school and suggested recommendations for improvement, the Commission requires that the evaluation report be made public in accordance with the Commission's Policy on Distribution, Use, and Scope of the Visiting Committee Report.

A school's continued accreditation is based on satisfactory progress implementing valid recommendations of the visiting committee and others identified by the Commission as it monitors the school's progress and changes which occur at the school throughout the decennial cycle. To monitor the school's progress in the Follow-Up Program, the Commission requires that the principal of the Massachusetts Academy of Math and Science submit routine Two- and Five-Year Progress Reports documenting the current status of all evaluation report recommendations, with particular detail provided for any recommendation which may have been rejected or those items on which no action has been taken. In addition, responses must be detailed on all recommendations highlighted by the Commission in its notification letters to the school. School officials are expected to have completed or be in the final stages of completion of all valid visiting committee recommendations by the time the Five-Year Progress Report is submitted.

The Commission may request additional Special Progress Reports if one or more of the Standards are not met in a satisfactory manner or if additional information is needed on matters relating to evaluation report recommendations or substantive changes in the school.

To ensure that it has current information about the school, the Commission has an established Policy on Substantive Change requiring that principals of member schools report to the Commission within sixty days (60) of occurrence of any substantive change which negatively impacts the school's adherence to the Commission's Standards for Accreditation. The report of substantive changes must describe the change itself and detail any impact which the change has had on the school's ability to meet CPSS Standards. The Commission's Substantive Change Policy is included in the Appendix on page 108. All other substantive changes should be included in the Two- and Five-Year Progress Reports and/or the Annual Report which is required of each member school to ensure that the Commission office has current statistical data on the school.

The Commission urges school officials to establish a formal follow-up program at once to review and implement all findings of the self-study and valid recommendations identified in the evaluation report. An outline of the Follow-Up Program is available in the Commission's *Accreditation Handbook* which was given to the school at the onset of the self-study. Additional direction regarding suggested procedures and reporting requirements is provided at Follow-Up Seminars offered by Commission staff following the on-site visit.

Appendix A
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Appendix B

NEW ENGLAND ASSOCIATION OF SCHOOLS AND COLLEGES
Commission on Public Secondary Schools

SUBSTANTIVE CHANGE POLICY

Principals of member schools must report to the Commission within sixty (60) days of occurrence of any substantive change in the school which has a *negative impact* on the school's ability to meet any of the Commission's Standards for Accreditation. The report of a substantive change must describe the change itself as well as detail the impact on the school's ability to meet the Standards. The following are potential areas where there might be negative substantive changes which must be reported:

- Elimination of fine arts, practical arts, and student activities

- Diminished upkeep and maintenance of facilities

- Significantly decreased funding

- Cuts in the level of administrative and supervisory staffing

- Cuts in the number of teachers and/or guidance counselors

- Cuts in the number of support staff

- Decreases in student services

- Cuts in the educational media staffing

- Increases in student enrollment that cannot be accommodated

- Changes in the student population that warrant program or staffing modification(s) that cannot be accommodated; e.g., the number of special needs students or vocational students or students with limited English proficiency

- Identification by the state as an underperforming school

- Takeover by the state

- Inordinate user fees