A Descriptive Review of the Maryland State Department of Education's (MSDE) Science, Technology, Engineering, and Mathematics (STEM) Education Initiative Grants

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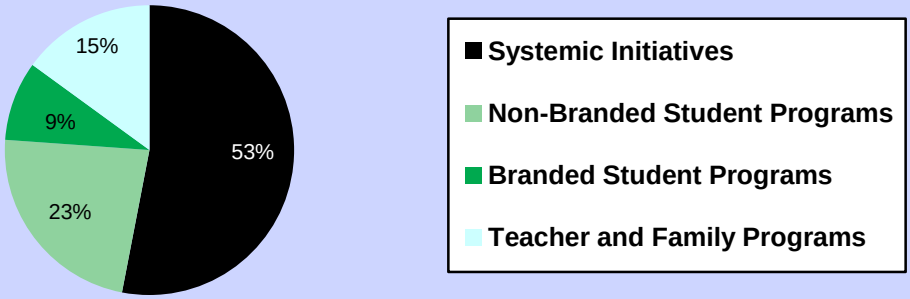
Summary

REL Mid-Atlantic conducted a descriptive review of grant applications that were approved for Maryland school systems during three cycles of the Maryland State Department of Education (MSDE) Science, Technology, Engineering, and Mathematics (STEM) Education Initiative Grants (Grants) to identify program characteristics and practices across school systems and grant cycles. From Fiscal Year (FY) 2007 to FY2009, MSDE invested $6,027,563 across the 24 Maryland school systems to improve STEM education statewide. Funds were allocated toward systemic initiatives, non-branded student programs, branded student programs, and teacher and family programs (Figure S-1).

Figure S-1.
Proportion of Grant Funds Allocated to Each Category of Program across All Grant Cycles, Fiscal Years 2007–2009



Source: Authors' analysis of information gathered from grant applications

The product of this review includes key findings associated with each of the three questions that guided the review:

What systemic initiatives[1] have been funded by the Grants?

- Most school systems partnered with four-year institutions of higher education (83%), while 42 percent partnered with community colleges or technical schools, to provide activities for students (e.g., dual enrollment courses, summer enrichment opportunities, research experiences, competitions), teachers (e.g., preparation, professional development, mentorships) and families (e.g., career-infused STEM activities). Science-related businesses and Federal government agencies provided job shadowing and internships for students and teachers, thus enhancing their education with STEM research expertise and career guidance.
- The most frequently cited goals as established by Maryland school systems to enhance STEM education in their respective schools were to improve students' college- and career-readiness (79%), to improve STEM curriculum (75%), and to increase teacher professional development activities (67%).
- Over half of all funds (53%, or $3,195,576) allocated to school systems through the Grants were categorized as going toward systemic initiatives. Technology and equipment purchased by school systems had the highest price tag of any of the categories, receiving allocations of about $1.5 million, or 24 percent of all grant funds. School systems allocated 4 percent of grant funds to High School Academies and 4 percent of grant funds to STEM magnet schools.

[1] Systemic initiatives were defined for this review as activities, equipment, or services that are purchased to enhance the overall capacity of the school systems' STEM education initiatives.

What STEM programs and activities (for students, teachers, and families) have been funded, annually and longitudinally, by the Grants?

- School systems allocated 23 percent of total grant funding toward five types of non-branded student programs, including STEM courses (10%) and STEM programs (8%). About one-quarter of the school systems allocated funds for STEM summer programs, representing 3 percent of total grant funds. Of the 11 branded student programs identified across grant applications, 4 school systems allocated 5 percent of total grant funds toward Project Lead the Way.
- Teacher professional development programs were incorporated by 83 percent of the school systems, and 14 percent of the total grant funds were allocated to teacher professional development programs. Only 1 percent of total grant funds were allocated for STEM family programs.

What are the outcome measures used by school systems to assess the effectiveness of activities funded by the Grants?

It is still early in the latest grant cycle and the outcome data were not consistently available across school systems to know whether outcomes were achieved.[2] However, reviewers were able to collect information on planned outcome measures and found that 36 of the 50 grant applications listed a variety of outcome measures that school systems were using to assess the effectiveness of their Grants.[3]

- Of the short-term outcome measures, 75 percent of school systems were measuring student participation in grant programs during at least one grant cycle, while 42 percent were measuring teacher participation in professional development. In addition, 21 percent of school systems were measuring community partner involvement in grant activities, and 17 percent indicated they were measuring the availability of STEM programming.
- For the medium-term outcomes that were identified, 42 percent of the school systems included measures of student interest in STEM, 29 percent included measures of teacher knowledge and understanding of STEM-based learning, 17 percent included measures of student school attendance, and 13 percent included measures of student awareness of STEM programs.
- A majority of the school systems planned to measure student achievement as an outcome of their Grants. Overall, 67 percent of the school systems included measures of student achievement, while 8 percent planned to measure graduation rates and college preparation and readiness.

This report is limited to the review of MSDE STEM Education Initiative Grants, and the content is based solely on information gathered through the review of the grant applications. This analysis is not designed to be a comprehensive review of all STEM initiatives at the district or state level in Maryland.

[2] The FY2009 grant cycle runs through December 30, 2009 and final evaluation reports for these Grants are forthcoming, while school systems receiving Grants in FY2007 and FY2008 did not report consistent data on outcome measures.

[3] The remaining 14 grant applications did not include any outcome measures because they were planning grants and not implementation grants.

Technical Assistance Brief

Why This Brief?

The Maryland State Department of Education (MSDE) expressed a need for a review of their Science, Technology, Engineering, and Mathematics (STEM) Education Initiative Grants (herein called Grants) to assist the MSDE Cross Divisional STEM Coordinating Committee in assessing the current state of the Grants. Specific purposes of this review were to: (a) synthesize information across school systems and across three grant cycles to identify program characteristics and practices developed by Maryland school systems in projects funded through the Grants, and (b) provide information to MSDE as they prepare subsequent Requests for Proposals (RFPs) and refine the grantee reporting requirements.

REL Mid-Atlantic conducted a descriptive review of the grant applications that were approved for Maryland school systems during the FY2007, FY2008, and FY2009 grant cycles.[4] The approach to the review of the grant applications was designed to identify program characteristics in the text that answer the following questions:

- What systemic initiatives have been funded by the Grants?
- What STEM programs and activities (for students, teachers, and families) have been funded, annually and longitudinally, by the Grants?
- What are the outcome measures used by school systems to assess the effectiveness of activities funded by the Grants?

[4] In addition, four applications submitted and funded by MSDE to other organizations were treated separately.

First, this brief presents a short description of the Grants and an overview of grant funds allocated to date. Next, findings are presented to answer each of the three questions posed for this review to describe systemic initiatives, programs and activities, and outcome measures. Finally, limitations that should be considered are discussed.

Study Methods

MSDE provided REL Mid-Atlantic staff with copies of the 50 STEM Education Initiative Grants applications from school systems that received funding across three grant cycles (FY2007, FY2008, and FY2009). REL Mid-Atlantic staff used these documents as the basis for a descriptive review of the Grants. These data were supplemented by some related information from the MSDE STEM website and from related documents provided by MSDE.

A review protocol was designed to extract data from each of the grant applications across all grant cycles as reviewers read each application. The review protocol was organized by three major categories, including systemic initiatives, STEM programs and activities, and outcome measures.

Reviewers coded the grant applications to extract information about the systemic initiatives planned and implemented by school systems, including:

- Types of organizations with which the school systems developed partnerships, and the roles of these organizations in STEM activities;
- Goals established by the school systems to enhance STEM education in their respective schools;

- Populations (schools, students, teachers/staff members) served by STEM Education Initiative Grants; and
- Allocated funds for systemic initiatives, including High School Academies, STEM magnet schools, STEM curriculum development, technology and equipment, project staff/consultant salaries/stipends, planning committee/taskforce collaboration, community partner involvement, presentations/ marketing/communications, program evaluation, and project administration.

Reviewers also coded the grant applications for information about programs and activities:

- Student programs and activities offered, including branded student programs implemented as part of the Grants;
- Teacher professional development programs and activities offered; and
- Family programs and activities offered.

Finally, reviewers coded the grant applications to extract information about the types of outcome measures planned by school systems, organized in terms of when these outcomes might be accomplished:

- Short-term (immediate) outcome measures, including availability of STEM programming, community partner involvement, student participation in grant programs and teacher participation in professional development;
- Medium-term (intermediate) outcome measures, like student awareness of and interest in STEM programs, student school attendance rates, and teacher knowledge and understanding of STEM-based learning; and
- Long-term (final) outcome measures, such as, student achievement, graduation rates, and college preparation and readiness.

Data were entered into a database and staff conducted a descriptive analysis of the data across all grant cycles using statistical tabulations and narrative review techniques to synthesize information across all 24 Maryland school systems.

About the MSDE STEM Education Initiative Grants

Maryland is committed to STEM education through various programs and opportunities for students and teachers intended to increase their participation in preparing for careers and advanced studies in STEM fields (MSDE, 2009; O'Malley, 2009). The Governor's Commission on Quality Education in Maryland identified STEM fields as "important priorities for Maryland's continued economic preeminence" (MSDE, 2009). According to their mission and vision statements, "Maryland's STEM education prepares and inspires learners of all ages to contribute to the advancement of the global community. Maryland's vision is to be a leader in STEM education, preparing and inspiring generations of learners to meet the challenges of the global society through innovation, collaboration, and creative problem solving" (MSDE, 2009).

BOX 1

Maryland Superintendent's Statement About STEM Education

"Science, Technology, Engineering, and Mathematics (STEM) is the future for our students. Not only is Maryland in the thick of the nation's economy-driving technologies of aerospace, defense, and systems engineering, computer software and network engineering, and bioinformatics and biotech but also the nation's biggest beneficiary of Base Realignment And Closure (BRAC). The Department is committed to helping our schools prepare globally competitive graduates with the skills necessary for tomorrow's world and the resulting work environment."

— Dr. Nancy Grasmick, Maryland State Superintendent for Education
Source: http://www.marylandpublicschools.org/MSDE/programs/stem/stem_important

The MSDE STEM Education Initiative Grants is a competitive grant program designed to provide state funding to support the implementation of STEM education initiatives within the 24 Maryland school systems.

The MSDE STEM Education Initiative Grants began when $1,885,000 was initially awarded to ten school systems to plan and implement STEM projects and $300,000 to Johns Hopkins University to support new STEM academies throughout Maryland in FY2007. So far, the Grants have continued for four grant cycles (through FY2010, but only the grant applications from the first three grant cycles were reviewed) in amounts ranging from $5,000 to $1,300,000 awarded to school systems, and each school system has received at least one grant. Overall, 7 of the 24 school systems have received a grant each year across the four grant cycles, while 12 school systems have received three Grants in four cycles, and 5 have received two Grants in four cycles. On the whole, 74 Grants have been awarded to Maryland school systems across the four cycles.

BOX 2

About the Governor's STEM Academies

The Governor's STEM Academies are designed "to target the untapped potential of Maryland's students who traditionally have not seen the benefits of studying rigorous mathematics and science in order to pursue careers in these fields." The Governor's STEM Academies are meant to be "highly specialized schools staffed by teachers working with scientists, engineers, and mathematicians from universities and businesses" and also includes partnerships among the Governor's Office, MSDE, local school systems, higher education institutions, and the business, mathematics, science, and engineering communities. The Governor's STEM Academies offer a unique and rigorous course of study to include student research, exposure to the professional STEM communities, and opportunities to develop leadership skills. The curriculum provides a foundation for the knowledge and the advanced skills required for college success and future career opportunities in STEM fields. These innovative programs afford students access to advanced equipment and technology along with regular interactions with practicing scientists and mathematicians. Maryland's goal is "to create a consortium of Governor's STEM Academies throughout the State of Maryland, which will prepare students in STEM subject areas to compete in the global economy as scientists, technicians, engineers, and mathematicians" and to do this by building a pipeline of programs through which students can prepare for this rigorous work. Table A-2 in Appendix A lists the individual Maryland school systems' mission, vision, and goals for STEM education.

TABLE 1

Funding Amounts and Number of Grants Awarded to Maryland School Systems, Fiscal Years 2007-2010

Fiscal Year	Total Amount of Grant Awards	Number of Grants Awarded	Minimum Grant Amount	Maximum Grant Amount	Average Grant Amount
FY2007	$1,885,000	10	$20,000	$1,300,000	$188,500
FY2008	$1,909,294	18	$10,000	$3,000	$106,072
FY2009	$2,233,269	22	$5,000	$277,500	$101,512
FY2007–FY2009	**$6,027,563**	**50**	$5,000	$1,300,000	**$120,551**
FY2010	$1,728,988	24	$20,000	$119,115	$72,041
FY2007–FY2010	**$7,756,551**	**74**	$5,000	$1,300,000	**$104,818**

Note: While FY2010 awards and amounts have been included for reference, only grant applications FY2007, FY2008, and FY2009 were reviewed.
Source: Authors' analysis of grant applications, grant reports, and other program information provided by MSDE.

During the FY2007, FY2008, and FY2009 grant cycles, which are the focus of this report, MSDE funded 50 Grants totaling $6,027,563 across the 24 Maryland school systems. The average amount of the Grants awarded during these three years was $120,551. An additional $1,728,988 was awarded across all 24 school systems in FY2010, with an average amount of $72,041. School system participation has steadily increased from 10 in FY2007 to all 24 districts in FY2010. The funding amount, number of Maryland school systems receiving Grants, range of grant award amounts, and the average grant award amount across these four grant cycles are shown in Table 1.

A more detailed listing is provided in Appendix A, Table A-1, to show specific grant funding by school system[5] for each of the grant cycles. Priorities recognized by MSDE in their award decisions, as indicated in the Grants requests for proposals, included: (a) developing Governor's STEM Academies for high school students, (b) developing STEM programs for students in elementary and middle school grades to build the pipeline of STEM education, (c) incorporating long-term sustainability plans, and (d) providing trans-disciplinary professional development for teachers.

Findings

Findings from the descriptive statistical analyses and narrative review are presented here. Information from the first three cycles of the Grants was synthesized to identify program characteristics and practices developed by Maryland school systems in projects funded through the Grants. When appropriate, the findings are also presented by grant cycle (FY2007, FY2008, and FY2009) to identify any patterns over time. Findings are organized by the three major categories, including systemic initiatives, STEM programs and activities, and outcome measures.

[5] Special circumstances led to the provision of four Grants to universities or specific departments within school systems, and these are listed separately from the 24 Maryland school systems.

What systemic initiatives have been funded by the MSDE STEM Education Initiative Grants?

School systems most often partnered with four-year institutions of higher education (83%), and the most common goals were to improve students' college and career readiness (79%), to improve STEM curriculums (75%), and to increase teacher professional development activities (67%). The school districts tended to serve students in grades 6 through 12 more so than students in elementary school grades. The largest percentage of all grant funds (24%) was allocated to the purchase of new technologies and equipment.

Types and Roles of Partner Organizations

School systems established partnerships with various types of organizations in their community to develop their respective STEM education initiatives. These organizations included institutions of higher education, businesses, government agencies, non-profits, and individual scientists or engineers. Representatives from partner organizations served on STEM advisory groups or committees to help school systems further develop their STEM programs overall. A majority of the school systems partnered with a four-year college or university (83%), while 42 percent partnered with community colleges or technical schools (Table 2).

Institutions of higher education that partnered with school systems collaborated on activities that included dual enrollment courses, summer enrichment opportunities, and research experiences for students; preparation and professional development opportunities for STEM teachers; STEM-focused career days and competitions; career-infused STEM activities for STEM magnet school students and their families; and mentorships for students and teachers.

TABLE 2

Number and Percentage of School Systems Planning to Partner with Various Types of Organizations for the Grants, Fiscal Years 2007–2009

Types of Organizations	FY07 Grants (*n* = 10)		FY08 Grants (*n* = 18)		FY09 Grants (*n* = 22)		All School Systems Across All Grant Cycles (*N*=24)	
	n	%	*n*	%	*n*	%	*n*	%
Colleges or Universities (Four-Year)	4	40%	15	83%	16	73%	20	83%
Science-related Businesses	4	40%	11	61%	8	36%	15	63%
Federal Government Agencies	2	20%	7	39%	8	36%	12	50%
Individual Scientists/Engineers	0	0%	6	33%	7	32%	11	46%
Other Organizations	4	40%	8	44%	3	14%	11	46%
Community Colleges/ Technical Schools	0	0%	6	33%	9	41%	10	42%
Local Government Agencies	0	0%	2	11%	8	36%	10	42%
Other Businesses	1	10%	4	22%	8	36%	8	33%
Science-related Non-Profits	1	10%	2	11%	4	18%	6	25%
Other Non-Profits	0	0%	2	11%	3	14%	4	17%
State Government Agencies	1	10%	0	0%	2	9%	3	13%

Note: School systems could receive multiple grants across grant cycles; therefore, the last column is not a total of the three grant cycles but is instead a synthesis of all grant cycles for the 24 school systems.
Source: Authors' analysis of information gathered from grant applications.

In addition, higher education partners provided access to laboratories and equipment, hosted summer camps and competitions, and provided speakers for various STEM-focused events.

Sixty-three percent of school systems partnered with science-related businesses for job shadowing and internships/mentorships. Half of the school systems partnered with Federal government agencies, while 42 percent partnered with local government agencies. Given that the Federal government agencies provide many employment opportunities throughout Maryland and are associated with research, these agencies provided services similar to the business and higher education partners. Forty-six percent of the school systems partnered with individual scientists and/or engineers who served as guest speakers and provided job shadowing experiences for students and teachers.

Goals to Enhance STEM Education

School systems established various goals, objectives, and milestones for their respective Grants-funded programs and activities to enhance STEM education in their local areas. The top three goals across all grant cycles and among all school systems were to improve students' college- and career-readiness, to improve STEM curriculum, and to increase teacher professional development activities (Table 3).

TABLE 3

Number and Percentage of School Systems Establishing Various Goals, Fiscal Years 2007–2009

	FY07 Grants (*n* = 10)		FY08 Grants (*n* = 18)		FY09 Grants (*n* = 22)		All School Systems Across All Grant Cycles (*N*=24)	
Goals	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**
To improve students' college- and career-readiness	5	50%	11	61%	13	59%	19	79%
To improve STEM curriculum	5	50%	9	50%	13	59%	18	75%
To increase teacher professional development activities	5	50%	12	67%	11	50%	16	67%
To increase/improve partnerships with businesses	4	40%	11	61%	11	50%	15	63%
To improve programs for elementary and middle school students to create a pipeline for high school academies	2	20%	7	39%	12	55%	15	63%
To increase student achievement	3	30%	6	33%	8	36%	13	54%
To increase enrollment in STEM programs	2	20%	8	44%	8	36%	12	50%
To increase/improve partnerships with community	3	30%	8	44%	6	27%	12	50%
To increase/improve instructional computer technology	3	30%	4	22%	8	36%	11	46%
To improve visibility of STEM initiatives	1	10%	7	39%	4	18%	9	38%
To increase student access to STEM programs/activities	1	10%	6	33%	4	18%	9	38%
To expand efforts to reach specific groups of students	1	10%	2	11%	7	32%	9	38%
To development/add magnet schools	4	40%	2	11%	3	14%	6	25%
To expand STEM co-curricular programs	0	0%	1	6%	2	9%	3	13%
Other	3	30%	6	33%	8	36%	13	54%

Note: School systems could receive multiple grants across grant cycles; therefore, the last column is not a total of the three grant cycles but is instead a synthesis of all grant cycles for the 24 school systems.
Source: Authors' analysis of information gathered from grant applications.

Goals cited in at least half of the school systems' applications at least once across the three grant cycles were to increase or improve partnerships with businesses (63%), to improve programs for elementary and middle school students to create a pipeline for high school academies (63%), to increase student achievement (54%), to increase enrollment in STEM programs (50%), and to increase or improve partnerships with the community (50%).

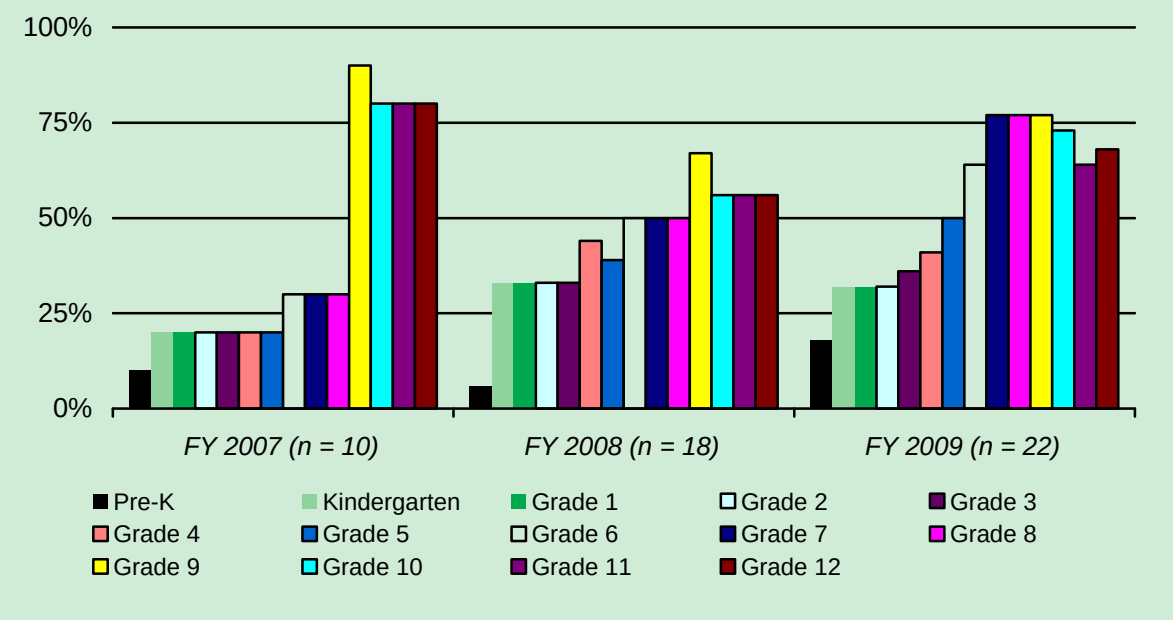
Populations Served by STEM Education Initiative Grants

Data extracted from the grant applications describing the populations served by the Grants were not consistent across school systems. Some applications stated that school systems would target all students throughout the district, while others were more specific. Examples of more targeted populations of students include: (a) students in a specific grade or grade range, (b) students at a specific school, (c) students enrolled in a specific course or program, (d) students in a specific geographic region of the school system, or (e) students with specific demographic characteristics.

The programs targeted a wide range of students in various grade levels. School systems reporting this information tended to serve students in Grade 6 through Grade 12 more so than students in elementary school grades. As shown in Figure 1, during each grant cycle, more Grants were serving middle school and high school students than they were elementary school students. Grade 9 was the most commonly served grade across years: overall 87 percent of the school systems served students in Grade 9.

FIGURE 1

Percentage of Grants Serving Each Grade Level of Students (Pre-K-12) Each Year, Fiscal Years 2007–2009



Source: Authors' analysis of information gathered from grant applications.

Based on available data provided in the grant applications, school systems indicated a wide range in the number of students targeted, with the lowest number of students being 38 to a program that targeted 9,439 students in the entire school system. There was not enough information provided across school systems to determine the number of students served by the Grants.

Inconsistent information was provided in the grant applications regarding the number of teachers and other school staff members targeted to be served by the Grants-funded programs and activities. Despite a focus on teacher professional development, only 18 of the 50 grant applications specifically included plans for providing services to teachers through the Grants.

Allocated Funds for Systemic Initiatives

Over half of all funds allocated to school systems through the Grants (53%) were categorized as going toward systemic initiatives (Table 4). Systemic initiatives are defined for this review as activities, equipment, or services that are purchased to enhance the overall capacity of the school systems' STEM education initiatives. Twenty-four percent of all funds from the Grants during these first three years were allocated to purchase technology and equipment to support school systems' STEM education initiatives. Technology and equipment includes computer hardware and other educational technology, as well as software and licenses needed to support various programs.

TABLE 4

Number and Percentage of School Systems Allocating Funds Toward Systemic Initiatives, Fiscal Years 2007-2009

	All School Systems Across All Grant Cycles (*N* 24)		Funds Allocated To Systemic Initiatives			
Systemic Initiatives	*n*	%	Min	Max	Total Amount	% of Total Grant Funds
Technology and Equipment	15	63%	$1,538	$683,198	$1,449,813	24%
STEM Curriculum Development	17	71%	$850	$125,804	$488,512	8%
Project Staff/Consultant Salaries/Stipends	9	38%	$ 1,980	$145,966	$388,468	6%
High School Academies	7	29%	$2,940	$101,785	$263,805	4%
STEM Magnet Schools	3	13%	$69,397	$100,000	$245,943	4%
Presentations/Marketing/ Communications	10	42%	$2,700	$54,732	$150,378	2%
Project Administration	19	79%	$900	$15,014	$92,521	2%
Planning Committee/Taskforce Collaboration	7	29%	$900	$19,260	$44,556	1%
Program Evaluation	6	25%	$270	$25,530	$56,080	1%
Community Partner Involvement	2	8%	$3,000	$12,500	$15,500	<1%
TOTAL SYSTEMIC INITIATIVES					**$ 3,195,576**	**53%**

Source: Authors' analysis of information gathered from grant applications.

Another 8 percent of total grant funds were allocated for STEM curriculum development, and over half of the Grants (56%) allocated funds for this task. Project staff and consultant salaries and stipends that could not be attributed to a specific program made up 6 percent of total grant funds. These included things like salaries for STEM project coordinators and science consultants. Four percent of the total grant funds were allocated specifically for High School Academies, and another 4 percent of funds were allocated for STEM magnet schools. The total amount of grant funds allocated to systemic initiatives listed by school system is shown in Table A-3 in Appendix A.

What STEM programs and activities (for students, teachers, and families) have been funded, annually and longitudinally, by the Grants?

Numerous branded (i.e., commercially available) and non-branded (i.e., developed by the district or not specifically described) student programs have been funded, accounting for approximately 32 percent of total grant funding across fiscal years 2007-2009. In addition 14 percent of total grant funds were allocated toward teacher professional development.

Allocated Funds for Non-Branded Student Programs

School systems allocated 23 percent of total grant funding toward five types of non-branded student programs (Table 5) across the three grant cycles. Overall, 10 percent of grant funds were allocated to STEM courses, and 8 percent were allocated to student STEM programs. Twenty-nine percent of the school systems allocated funds for STEM summer programs, representing 3 percent of total grant funds. Table A-4 in Appendix A shows the total amount of grant funds allocated to student programs listed by school system.

TABLE 5

Number and Percentage of School Systems Allocating Funds Toward Non-Branded Student Programs, Fiscal Years 2007-2009

Non-Branded Student Programs	All School Systems Across All Grant Cycles (*N* 24)		Funds Allocated To Non-Branded Student Programs			
	n	%	Min	Max	Total Amount	% of Total Grant Funds
STEM Courses	11	46%	$5,836	$153,394	$584,249	10%
STEM Programs	16	67%	$4,326	$170,011	$508,732	8%
STEM Summer Programs	7	29%	$3,024	$58,194	$176,616	3%
Job Shadowing & Mentorships/Internships	6	25%	$120	$53,080	$80,972	1%
STEM Clubs	1	4%	$4,515	$4,515	$4,515	<1%
TOTAL NON-BRANDED STUDENT PROGRAMS					**$ 1,355,084**	**23%**

Source: Authors' analysis of information gathered from grant applications.

TABLE 6

Number and Percentage of School Systems Allocating Funds Toward Branded Student Programs, Fiscal Years 2007-2009

Branded Student Programs	All School Systems Across All Grant Cycles (*N* 24)		Funds Allocated To Branded Student Programs			
	n	%	Min	Max	Total Amount	% of Total Grant Funds
Project Lead the Way	4	17%	$13,572	$154,050	$292,866	5%
VEX Robotics	2	8%	$10,488	$122,148	$132,636	2%
FIRST Robotics	4	17%	$834	$63,753	$82,327	1%
Junior FIRST LEGO League	3	13%	$258	$4,200	$5,291	<1%
FIRST LEGO League	3	13%	$833	$4,520	$6,723	<1%
LEGO Tech Challenge	1	4%	$4,035	$4,035	$4,035	<1%
Destination Imagination	1	4%	$2,500	$2,500	$2,500	<1%
SeaPerch Underwater Robotics Club	1	4%	$4,313	$4,313	$4,313	<1%
Canon Envirothon	1	4%	$4,263	$4,263	$4,263	<1%
StarBase Atlantis	1	4%	$25,000	$25,000	$25,000	<1%
Team America Rocketry Challenge	1	4%	$8,400	$8,400	$8,400	<1%
TOTAL BRANDED STUDENT PROGRAMS					**$ 568,354**	**9%**

Source: Authors' analysis of information gathered from grant applications.

Allocated Funds for Branded Student Programs

The eleven branded student programs toward which school systems allocated grant funds are listed in Table 6. Branded student programs were identified separately from unbranded programs listed in Table 5 when this more specific information was provided in the grant applications.

School systems allocated 5 percent of total grant funds toward Project Lead the Way, a program specifically mentioned in the Grants RFP. (The total amount of grant funds allocated to branded student programs listed by school system is shown in Table A-5 of Appendix A.)

Allocated Funds for Teacher and Family Programs

Teacher professional development programs were incorporated in 83 percent of Grants, and 14 percent of the total grant funds were allocated to teacher professional development programs (Table 7).

Only 1 percent of total grant funds were allocated for STEM family programs. The total amount of grant funds allocated to these programs listed by school system is shown in Table A-6 of Appendix A.

TABLE 7

Number and Percentage of School Systems Allocating Funds Toward Teacher and Family Programs, Fiscal Years 2007-2009

Teacher and Family Programs	All School Systems Across All Grant Cycles (*N* 24)		Funds Allocated Toward Teacher and Family Programs			
	n	%	Min	Max	Total Amount	% of Total Grant Funds
Teacher Professional Development	20	83%	$167	$218,838	$ 861,982	14%
STEM Family Programs	5	21%	$1,467	$14,261	$ 45,071	1%
TOTAL TEACHER AND FAMILY PROGRAMS					**$ 907,053**	**15%**

Source: Authors' analysis of information gathered from grant applications.

What are the outcome measures used by school systems to assess the effectiveness of activities funded by the Grants?

Seven of the 10 FY2007 grant applications and 7 of the 18 FY2008 grant applications (all of which were submitted as planning grants rather than implementation grants) had no mention of evaluation or evaluation measures. The remaining 36 grant applications listed a variety of outcome measures that school systems were using to assess the effectiveness of their Grants, which were are a required component of the grant applications. While school systems did not consistently organize their outcome measures based on how soon they expect to see changes, we organized them into three broad categories: short-term outcomes, medium-term outcomes, and long-term outcomes (see Appendix Table A-7). These are terms often used in evaluations to organize outcomes when developing program evaluation logic models through which a program's inputs, outputs, and outcomes are defined. For example, Taylor-Powell and Henert (2008) describe outcomes as "fall[ing] along a continuum from immediate (initial; short-term) to intermediate (medium-term) to final outcomes (long-term), often synonymous with impact" (p. 4).

Short-term Outcomes

Four outcome measures were coded as short-term outcomes (i.e., availability of programming, community involvement, student participation, and teacher participation in professional development). Overall, 75 percent of school systems indicated that they were measuring student participation in grant programs during at least one grant cycle, while 42 percent were measuring teacher participation in professional development. In addition, 21 percent were measuring community partner involvement in grant activities, and 17 percent were measuring the availability of STEM programming.

Medium-term Outcomes

The medium-term outcomes identified in the grant applications across grant cycles include student awareness of STEM programs and interest in STEM fields, attendance rates, and teacher knowledge of STEM. Forty-two percent of the school systems included measures of student interest in STEM, 29 percent included measures of teacher knowledge and understanding of STEM-based learning, 17 percent included measures of student school attendance, and 13 percent included measures of student awareness of STEM programs.

Long-term Outcomes

The long-term outcomes identified in the grant applications across grant cycles include student achievement, college preparation and readiness, and graduation rates. Sixty-seven percent of the school systems included measures of student achievement, 8 percent for graduation rates, and 8 percent measured college preparation and readiness.

Of the 10 multi-award school systems who had defined outcomes, 4 of the school systems were measuring the same outcomes from one year to the next, 4 school systems added at least one outcome measure from one year to the next, and 2 removed at least one outcome measure across grant periods from one year to the next.

Limitations

This report is limited to the review of MSDE STEM Education Initiative Grants, and the content is based solely on information gathered through the grant applications from each of the Maryland school systems. This analysis is not designed to be a comprehensive review of all STEM initiatives at the state level in Maryland.

In addition, since this is a descriptive review, findings are limited by the authors' analysis of the data collected through the review and extraction process. For example, data were organized into narrow categories for the purpose of aggregating narrative data, and in this process, it is possible for some of the detail of each individual grant and the work of individual school systems to get lost.

Not all school systems included the same information or level of detail in the narrative sections of the grant applications, which had page limitations. As a result, some details may have been missing from the grant applications and not captured by the coding process used for this review.

Although each Maryland school system has received at least one grant over the course of the three grant cycles covered by this review, there is not sufficient longitudinal data using consistent measures to draw conclusions about the actual influence of the STEM Education Initiative Grants on planned outcomes for school systems collectively.

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Appendix A
MSDE STEM Education Initiative Grant Awards

TABLE A-1

MSDE STEM Education Initiative Grant Award Amounts by Maryland School System, Fiscal Years 2007–2010

School System	FY2007 Grant Award Amount	FY2008 Grant Award Amount	FY2009 Grant Award Amount	FY2010 Grant Award Amount	Total Grant Award Amount to Date
Allegany County	$ 150,000	$ 150,000	$ 100,000	$ 75,000	$ 475,000
Anne Arundel County	$ 40,000	$ 230,000	$ 174,789	$ 100,000	$ 544,789
Baltimore City	-	$ 149,400	$ 99,900	$ 20,000	$ 269,300
Baltimore County	$ 1,300,000	$ 35,000	$ 46,496	$ 20,000	$ 1,401,496
Calvert County	-	-	$ 98,607	$ 100,000	$ 198,607
Caroline County	-	$ 10,000	$ 100,000	$ 100,000	$ 210,000
Carroll County	$ 25,000	$ 150,000	$ 100,000	$ 119,115	$ 394,115
Cecil County	$ 20,000	$ 143,263	$ 96,844	$ 50,000	$ 310,107
Charles County	-	$ 41,631	$ 100,000	$ 100,000	$ 241,631
Dorchester County	-	$ 10,000	$ 100,000	$ 50,000	$ 160,000
Frederick County	-	-	$ 100,000	$ 100,000	$ 200,000
Garrett County	-	$ 10,000	$ 40,000	$ 75,000	$ 125,000
Harford County	$ 125,000	-	$ 277,500	$ 100,000	$ 502,500
Howard County	-	$ 150,000	$ 100,000	$ 100,000	$ 350,000
Kent County	-	$ 10,000	$ 100,000	$ 50,000	$ 160,000
Montgomery County	$ 100,000	-	-	$ 20,000	$ 120,000
Prince George's County	$ 75,000	$ 150,000	-	$ 20,000	$ 245,000
Queen Anne's County	-	$ 150,000	$ 100,000	$ 100,000	$ 350,000
Somerset County	-	-	$ 5,000	$ 30,000	$ 35,000
St. Mary's County	$ 25,000	$ 350,000	$ 100,000	$ 100,000	$ 575,000
Talbot County	-	-	$ 100,000	$ 50,000	$ 150,000
Washington County	$ 25,000	$ 150,000	$ 100,000	$ 100,000	$ 375,000
Wicomico County	-	$ 10,000	$ 94,133	$ 99,873	$ 204,006
Worcester County	-	$ 10,000	$ 100,000	$ 50,000	$ 160,000
TOTAL All School Systems	**$ 1,885,000**	**$ 1,909,294**	**$ 2,233,269**	**$ 1,728,988**	**$ 7,756,551**

(CONTINUED)

TABLE A-1

MSDE STEM Education Initiative Grant Award Amounts by Maryland School System, Fiscal Years 2007–2010

School System	FY2007 Grant Award Amount	FY2008 Grant Award Amount	FY2009 Grant Award Amount	FY2010 Grant Award Amount	Total Grant Award Amount to Date
Baltimore Area Alliance	-	-	$ 7,865	-	$ 7,865
GT Howard	-	-	$ 12,334	-	$ 12,334
John's Hopkins University	$ 300,000	$ 12,337	-	-	$ 312,337
TOTAL All Auxiliary Grants	**$ 300,000**	**$ 12,337**	**$ 20,199**	**$0**	**$ 332,536**

NOTE: Grant award amounts are the initial amounts allocated to school systems and do not always equal the amount spent. The three auxiliary grants listed separately were awarded to other organizations to support the overall initiative and were not included in the calculation of grant funds allocated to school systems. Furthermore, while FY2010 awards and amounts have been included for reference, only grant applications from FY2007, FY2008, and FY2009 were reviewed.
Source: Authors' analysis of grant applications, interim and final progress reports, and other program information provided by MSDE.

TABLE A-2

Maryland School Systems' Most Recent Mission, Vision, and Goals for STEM Education

School System	STEM Mission, Vision, and Goals
Allegany County	• Make every K-12 student in ACPS aware and excited about the broad spectrum of STEM careers as viable and attainable career options by: ▪ Providing career awareness opportunities at the elementary school level, ▪ Providing career exploration opportunities at the middle school level, and ▪ Providing academic academies in STEM career areas at the high school level.
Anne Arundel County	• Offer suites of STEM academic and co-curricular offerings for preK-12 students during the academic year and summer months to enrich and enhance learning, build STEM career awareness and engage students in challenging STEM-related projects and events. • Expanding the preK-12 learning environment for youth to substantially increase the numbers of young people who see real value and reward in studying and working in STEM discipline areas. • Offer a new STEM Magnet High School at North County High School as an educational choice for students interested in rigorous and relevant studies in the STEM disciplines, which is: ▪ designed to engage students in Grades 9-12 in an exciting project-based, technology-rich learning environment where expectations are high and student success expected; and ▪ driven by a global vision, 21st century technology and communication skills, solid STEM coursework foundations, collaborative problem solving, research and internship opportunities, project-based learning, self-direction, and social responsibility.
Baltimore City	• Graduate all students with the necessary STEM competencies that are needed to become part of the global work force of problem solvers and innovators. • Offer a variety of opportunities for students, ranging from STEM magnet schools at the middle and high school level, to 13 different career and technology programs at 11 of the high schools, to a variety of educational opportunities through after school clubs of Robotics, MESA, and Engineering.

(CONTINUED)

TABLE A-2

Maryland School Systems' Most Recent Mission, Vision, and Goals for STEM Education

School System	STEM Mission, Vision, and Goals
Baltimore County	• Encourage all students to apply the knowledge, skills, values, and behaviors learned through participation in a rigorous STEM-based education in order to realize their maximum potential as citizens and become more productive individuals in the global economy, thus keeping the United States high in global competitiveness. • Provide environments that foster high standards for academics, relationships, and goal setting through a rigorous STEM-based culture.
Calvert County	• Engage all students in a rigorous integrated PK-12 STEM based education that substantially increases the numbers of youth who: ▪ recognize a real value and reward in studying STEM, ▪ believe STEM careers are viable and attainable career options, and ▪ use their experiences to realize their maximum potential in a competitive global marketplace.
Caroline County	• Graduate a larger, more diverse population with experiences in rigorous instruction in STEM throughout their K-12 education that result in increased participation in STEM-related career majors.
Carroll County	• Integrate the content, processes, skills, and language of STEM through authentic, problem-based curricular experiences. • Prepare all students to pursue STEM-related courses in order to be contributing members of the 21st century global community.
Cecil County	• Provide a challenging program of study for students planning to enter prestigious colleges to prepare for STEM careers in an ever-changing and highly technical global society. • Offer to students accepted into the program a rigorous, accelerated curriculum beyond the regular high school curriculum, rich in lab and work-based experiences, with core courses taught at the honors or AP level. • Provide opportunities for all students to take dual-credit courses during at least half of their senior year at Cecil College.
Charles County	• Develop a high-quality, comprehensive STEM program and curricula for use by teachers that will prepare students for STEM-related careers. • Attract and prepare students at all educational levels to pursue course work in STEM areas. • Attract students to pursue STEM postsecondary degrees (two-year through Ph.D.). • Provide growth and research opportunities for both students and teachers in STEM fields. • Expand the capacity of the school system to promote STEM.
Dorchester County	• Provide an advanced opportunity for high school students to study in depth in the STEM content areas while working with local scientists and engineers in these fields. • Encourage academic excellence as well as the pursuit of careers in the STEM areas. • Design the STEM Academy to include both comprehensive high schools in the district, Cambridge-South Dorchester High School and North Dorchester High School. • Provide experiences for elementary and middle school students to ensure that more students will be prepared for accelerated classes and the rigor of the STEM Academy in high school.
Frederick County	• Provide STEM experiences for all students while facilitating an ever-increasing number of highly motivated students with strategically defined opportunities to prepare them for STEM careers. • Carry out five goals by using existing and evolving curricula, business and community partnerships, and STEM-focused instruction to provide students with K-12 learning experiences that build incrementally from awareness, through exploration, to preparation.

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TABLE A-2

Maryland School Systems' Most Recent Mission, Vision, and Goals for STEM Education

School System	STEM Mission, Vision, and Goals
Garrett County	• Be known as a school system with exceptional, innovative, and progressive, STEM education. • Make it the rule, instead of the exception, for every student, every year, to experience high-quality teaching of core STEM concepts. • Improve the STEM achievement of all students at all grade levels in four partner schools by engaging them in deep and authentic science, mathematics, and engineering instructional experiences beginning in the middle grades. • Improve in-service mathematics and science professional learning. Finally, the initiative seeks to improve bridges of collaboration between K-12 and post-secondary institutions in the service of science, technology, engineering, and mathematics education for all.
Harford County	• Provide rich opportunities in the STEM content areas in grades K-12. • Initiate three high school magnet programs that offer focused and accelerated curricula in STEM areas. • Work with many business partners to maximize the cooperation between classrooms and communities concerning STEM education and career awareness. • Increase student participation in STEM courses of study at the post-secondary level. • Prepare students to take full advantage of the many local employment opportunities.
Howard County	• Offer a broad array of STEM opportunities for students. • Expand STEM-related K-12 enrichment, career, and academic advancement opportunities through partnerships with collaborators in the private and public sectors in order to increase the numbers and diversity of students interested in, involved in, and committed to STEM-related content areas, programs, post-secondary education, and careers. • Extend and enrich curricula and learning experiences for students in K-12 programs such as: Project Lead the Way, CTE Academies, Mathematics, Science and Technology Research, MESA and after school STEM clubs. • Recruit and retain highly qualified teachers. • Develop dynamic community partnerships. • Provide meaningful career development, internships, and work experiences.
Kent County	• Help students gain the skills they need to succeed in a world shaped by scientific advances and new technologies. • Commit to a vision of education in STEM • Build strong skills in STEM areas. • Increase student commitment to careers, advanced education, and research in STEM-related fields. • Enhance students' opportunities to learn in new and exciting ways through the use of advanced technology and by building partnerships with local employers and institutions of higher learning. • Offer a comprehensive, problem-based, and project-based curriculum through STEM Academies.
Montgomery County	• Provide opportunities for all students to achieve full STEM literacy through seamlessly integrated instruction that is project-based, problem-based, and standards-based. • Develop STEM literate students who are critical thinkers and able to solve non-routine problems in a globally competitive society.
Prince George's County	• Develop cohorts of students equipped to pursue studies in STEM fields. • Target groups of teachers and students at the elementary, middle, and high school levels. • Target a sample of schools at all levels (Oxon Hill Science and Technology High School, Oxon Hill Middle School, and Oxon Hill Elementary Schools) to create a greater pipeline of students prepared to take more rigorous STEM courses.

(CONTINUED)

TABLE A-2

Maryland School Systems' Most Recent Mission, Vision, and Goals for STEM Education

School System	STEM Mission, Vision, and Goals
Queen Anne's County	• Provide a quality STEM environment by educating, encouraging, and empowering all students to become productive, scientifically, and technologically literate as well as contributing citizens in a diverse and changing world.
Somerset County	• Develop a 21st century workforce capable of competing in the global economy to help reduce poverty. • Develop opportunities for students who are capable of working in the high tech engineering world. • Provide engaging engineering type activities in early grades to capture student focus and motivate them to take rigorous math and science courses leading to STEM careers.
St. Mary's County	• Provide a continuous pathway of education through opportunity that creates STEM-literate graduates ready to accept the challenges of advanced education and the needs of tomorrow's workforce.
Talbot County	• Provide opportunities for each student to learn, grow, and succeed in STEM fields since today's students are 21st century learners who must compete in an increasingly technological global economy. • Prepare students to work using technology. • Prepare students for advanced careers in STEM fields. • Motivate more students to take upper level STEM courses, particularly AP math and sciences and pre-engineering. • Build a pipeline of students prepared for rigorous STEM coursework by targeting overall success as well as focusing on underrepresented populations.
Washington County	• Have all students participate in STEM programs as an integrated component of their K-16 educational experience. • Provide opportunities for students to select more in-depth and targeted involvement through an expanded K-16 continuum of STEM choices inclusive of magnets, academies, and whole-school programs. • Provide enhanced and enriched programs for all students, including STEM magnet programs. • Provide students opportunities to master rigorous curriculum and content standards in STEM courses through integrated, problem-based, inquiry activities that foster critical thinking and provide authentic learning experiences. • Assess student performance and achievement through data collected from local and state assessments, as well as graduation information and student work.
Wicomico County	• Provide K-12 instruction that is relevant and rigorous. • Increase student awareness of STEM careers and educational opportunities, as well as practical and real-world connections to STEM concepts. • Provide opportunities for students to interact with business and community leaders in STEM-related fields.
Worcester County	• Encourage students, especially students in groups underrepresented in the STEM fields, to take rigorous STEM courses in high school to prepare them for postsecondary education in STEM areas of study. • Increase the capacity of the school system to offer such courses at the new Worcester Technical High School.

Source: Authors' analysis and summary of the most recent information provided in STEM Education Initiative grant applications and on the MSDE website (http://www.marylandpublicschools.org/MSDE/programs/stem/stem_links)

TABLE A-3

Amount of Grant Funds Allocated to Systemic Initiatives by School System, Fiscal Years 2007–2009

School System	Fiscal Year 07	08	09	# of Grants	High School Academies	STEM Magnet Schools	STEM Curriculum Development	Technology and Equipment	Project Staff/ Consultant Salaries/ Stipends	Planning Committee/ Taskforce	Community Partner Involvement	Presentations/ Marketing /Communication	Evaluation	Administration	TOTAL
Allegany County	•	•	•	3	$ 11,797	-	$ 24,338	$ 25,782	$ 145,966	$ 1,565	$ 12,500	-	$ 10,677	$ 10,193	**$ 242,818**
Anne Arundel County	•	•	•	3	-	$ 76,546	$ 25,944	$ 126,969	-	-	$ 3,000	$ 2,700	$ 25,530	$ 4,928	**$ 265,617**
Baltimore City		•	•	2	-	-	-	$ 30,703	$ 9,900	-	-	-	-	$ 2,796	**$ 43,399**
Baltimore County	•	•	•	3	$ 101,785	-	$ 125,804	$ 683,198	-	-	-	$ 10,461	$ 6,496	$ 15,014	**$ 942,758**
Calvert County			•	1	$ 2,940	-	$ 16,140	-	$ 26,780	-	-	-	-	-	**$ 45,860**
Caroline County		•	•	2	-	-	-	$ 46,873	-	-	-	$ 4,710	-	$ 2,000	**$ 53,583**
Carroll County	•	•	•	3	-	-	$ 78,771	$ 21,397	-	-	-	-	-	$ 12,337	**$ 112,505**
Cecil County	•	•	•	3	-	-	$ 55,242	$ 94,180	-	-	-	$ 10,800	-	$ 3,099	**$ 163,321**
Charles County		•	•	2	-	-	$ 24,341	-	-	-	-	$ 6,296	-	-	**$ 30,637**
Dorchester County		•	•	2	$ 6,931	-	$ 4,929	$ 41,990	-	$ 900	-	-	$ 270	$ 1,136	**$ 56,156**
Frederick County			•	1	-	-	-	-	-	-	-	-	-	$ 1,961	**$ 1,961**
Garrett County		•	•	2	-	-	$ 850	-	-	$ 10,000	-	-	-	$ 900	**$ 11,750**
Harford County	•		•	2	-	-	$ 11,388	$ 198,704	$ 41,695	-	-	-	-	$ 2,466	**$ 254,253**
Howard County		•	•	2	-	-	-	-	$ 10,000	-	-	-	-	$ 4,902	**$ 14,902**

(CONTINUED)

TABLE A-3

Amount of Grant Funds Allocated to Systemic Initiatives by School System, Fiscal Years 2007–2009

School System	Fiscal Year 07	Fiscal Year 08	Fiscal Year 09	# of Grants	Systemic Initiatives: High School Academies	STEM Magnet Schools	STEM Curriculum Development	Technology and Equipment	Project Staff/ Consultant Salaries/ Stipends	Planning Committee/ Taskforce	Community Partner Involvement	Presentations/ Marketing /Communication	Evaluation	Administration	TOTAL
Kent County		•	•	2	$ 24,265		$ 7,444	$ 1,538	$ 1,980			$ 54,732		$ 2,913	**$ 92,872**
Montgomery County	•			1	-	$ 100,000	-	-	-	-	-		-	-	**$ 100,000**
Prince George's County	•	•		2	-	-	$ 32,000	$ 2,151	-	$ 19,260	-	$ 37,564	-	$ 4,370	**$ 95,345**
Queen Anne's County		•	•	2	-	-	$ 55,880	$ 76,107	-	$ 4,986	-		-	$ 4,968	**$ 141,941**
Somerset County			•	1	-	-	-	-	-	-	-	$ 5,000	-	-	**$ 5,000**
St. Mary's County	•	•	•	3	$ 100,212	-	$ 1,250	$ 30,460	$ 104,170	-	-		$ 12,233	$ 9,146	**$ 257,471**
Talbot County			•	1	-	-	$ 1,722	$ 36,794	$ 18,000	-	-		-	$ 2,000	**$ 58,516**
Washington County	•	•	•	3	-	$ 69,397	$ 20,263	$ 32,967	-	-	-		-	$ 4,746	**$ 127,373**
Wicomico County		•	•	2	$ 15,875	-	$ 2,206	-	$ 29,977	$ 3,647	-	$ 10,760	$ 2,370	$ 2,646	**$ 67,481**
Worcester County		•	•	2	-	-	-	-	-	$ 4,198	-	$ 7,355	-	-	**$ 11,553**
All School Systems	10	18	22	50	$263,805	$ 245,943	$ 488,512	$1,449,813	$ 388,468	$ 44,556	$15,500	$ 150,378	$ 57,576	$ 92,521	$ 3,197,072
% of Total Funds					4%	4%	8%	24%	6%	1%	0.3%	2%	1%	2%	53%

Note: Percent of total funds is the percentage of all funds, including funds allocated to: systemic initiatives, non-branded student programs, branded student programs, and teacher and family programs.
Source: Authors' analysis of information gathered from grant applications.

TABLE A-4

Amount of Grant Funds Allocated to Non-Branded Student Programs by School System, Fiscal Years 2007–2009

School System	Fiscal Year 07	Fiscal Year 08	Fiscal Year 09	# of Grants	Non-Branded Student Programs: STEM Programs	STEM Clubs	STEM Summer Programs	STEM Courses	Job Shadowing and Mentorships/ Internships	TOTAL
Allegany County	•	•	•	3	$ 13,621	-	$ 58,194	-	$ 53,080	**$ 124,895**
Anne Arundel County	•	•	•	3	$ 6,700	-	$ 33,518	$ 8,519	$ 16,398	**$ 65,135**
Baltimore City		•	•	2	-	-	-	-	-	**$ 0**
Baltimore County	•	•	•	3	-	-	-	$ 65,730	$ 120	**$ 65,850**
Calvert County			•	1	-	-	$ 3,024	-	-	**$ 3,024**
Caroline County		•	•	2	$ 5,290	-	-	$ 36,230	-	**$ 41,520**
Carroll County	•	•	•	3	$ 7,577	-	-	$ 98,186	-	**$ 105,763**
Cecil County	•	•	•	3	$ 7,108	-	$ 16,978	$ 44,000	$ 3,000	**$ 71,086**
Charles County		•	•	2	$ 64,701	$ 4,515	-	-	-	**$ 69,216**
Dorchester County		•	•	2	$ 8,087	-	-	$ 17,708	$ 8,136	**$ 33,931**
Frederick County			•	1	$ 79,355	-	$ 18,684	-	-	**$ 98,039**
Garrett County		•	•	2	$ 35,750	-	-	-	-	**$ 35,750**
Harford County	•		•	2	$ 13,396	-	-	$ 80,896	-	**$ 94,292**
Howard County		•	•	2	$ 170,011	-	-	-	-	**$ 170,011**

(CONTINUED)

TABLE A-4

Amount of Grant Funds Allocated to Non-Branded Student Programs by School System, Fiscal Years 2007–2009

School System	Fiscal Year 07	08	09	# of Grants	Non-Branded Student Programs: STEM Programs	STEM Clubs	STEM Summer Programs	STEM Courses	Job Shadowing and Mentorships/ Internships	TOTAL
Kent County		•	•	2	$ 4,658	-	-	$ 5,836	-	**$ 10,494**
Montgomery County	•			1	-	-	-	-	-	**$ 0**
Prince George's County	•	•		2	$ 33,500	-	-	$ 34,850	-	**$ 68,350**
Queen Anne's County		•	•	2	-	-	$ 39,218	-	-	**$ 39,218**
Somerset County			•	1	-	-	-	-	-	**$ 0**
St. Mary's County	•	•	•	3	$ 31,000	-	-	$ 153,394	-	**$ 184,394**
Talbot County			•	1	-	-	-	$ 38,900	-	**$ 38,900**
Washington County	•	•	•	3	-	-	-	-	$ 238	**$ 238**
Wicomico County		•	•	2	$ 23,652	-	$ 7,000	-	-	**$ 30,652**
Worcester County		•	•	2	$ 4,326	-	-	-	-	**$ 4,326**
All School Systems	10	18	22	50	$ 508,732	$ 4,515	$ 176,616	$ 584,249	$ 80,972	**$ 1,355,084**
% of Total Funds					8%	0.1%	3%	10%	1%	**23%**

Note: Percent of total funds is the percentage of all funds, including funds allocated to: systemic initiatives, non-branded student programs, branded student programs, and teacher and family programs.
Source: Authors' analysis of information gathered from grant applications.

TABLE A-5

Amount of Grant Funds Allocated to Branded Student Programs by School System, Fiscal Years 2007–2009

School System	Fiscal Year 07	08	09	# of Grants	Branded Student Programs: Project Lead the Way	FIRST Robotics (HS)	Junior FIRST LEGO League (MS)	FIRST LEGO League (ES)	LEGO Tech Challenge	Destination Imagination	SeaPerch Underwater Robotics Club	VEX Robotics	Canon Envirothon	StarBase Atlantis	Team America Rocketry Challenge	TOTAL
Allegany County	•	•	•	3	-	-	-	-	-	-	-	-	-			**$ 0**
Anne Arundel County	•	•	•	3	$ 31,290	$ 12,000	-	-	-	$ 2,500	$ 4,313	-	-	-	-	**$ 50,103**
Baltimore City		•	•	2	-	$ 63,753	-	-	-	-	-	$ 122,148	-	-	-	**$ 185,901**
Baltimore County	•	•	•	3	$ 154,050	-	-	-	-	-	-	-	-	-	-	**$ 154,050**
Calvert County			•	1	-	-	$ 258	$ 1,370	$ 4,035	-	-	-	-	$ 25,000	-	**$ 30,663**
Caroline County		•	•	2	-	-	-	-	-	-	-	-	-	-	-	**$ 0**
Carroll County	•	•	•	3	-	-	-	-	-	-	-	-	$ 4,263	-	-	**$ 4,263**
Cecil County	•	•	•	3	-	$ 5,740	-	-	-	-	-	-	-	-	-	**$ 5,740**
Charles County		•	•	2	-	-	$ 4,200	$ 4,520	-	-	-	$ 10,488	-	-	$ 8,400	**$ 27,608**
Dorchester County		•	•	2	-	-	-	-	-	-	-	-	-	-	-	**$ 0**
Frederick County			•	1	-	-	-	-	-	-	-	-	-	-	-	**$ 0**
Garrett County		•	•	2	-	$ 834	$ 833	$ 833	-	-	-	-	-	-	-	**$ 2,500**
Harford County	•		•	2	-	-	-	-	-	-	-	-	-	-	-	**$ 0**
Howard County		•	•	2	-	-	-	-	-	-	-	-	-	-	-	**$ 0**
Kent County		•	•	2	-	-	-	-	-	-	-	-	-	-	-	**$ 0**
Montgomery County	•			1	-	-	-	-	-	-	-	-	-	-	-	**$ 0**

(CONTINUED)

TABLE A-5

Amount of Grant Funds Allocated to Branded Student Programs by School System, Fiscal Years 2007–2009

School System	Fiscal Year 07	08	09	# of Grants	Branded Student Programs: Project Lead the Way	FIRST Robotics (HS)	Junior FIRST LEGO League (MS)	FIRST LEGO League (ES)	LEGO Tech Challenge	Destination Imagination	SeaPerch Underwater Robotics Club	VEX Robotics	Canon Envirothon	StarBase Atlantis	Team America Rocketry Challenge	TOTAL
Prince George's County	•	•		2	$ 13,572	-	-	-	-	-	-	-	-	-	-	**$ 13,572**
Queen Anne's County		•	•	2	-	-	-	-	-	-	-	-	-	-	-	**$ 0**
Somerset County			•	1	-	-	-	-	-	-	-	-	-	-	-	**$ 0**
St. Mary's County	•	•	•	3	-	-	-	-	-	-	-	-	-	-	-	**$ 0**
Talbot County			•	1	-	-	-	-	-	-	-	-	-	-	-	**$ 0**
Washington County	•	•	•	3	-	-	-	-	-	-	-	-	-	-	-	**$ 0**
Wicomico County		•	•	2	-	-	-	-	-	-	-	-	-	-	-	**$ 0**
Worcester County		•	•	2	$ 93,954	-	-	-	-	-	-	-	-	-	-	**$ 93,954**
All School Systems	10	18	22	50	$ 292,866	$ 82,327	$ 5,291	$ 6,723	$ 4,035	$ 2,500	$ 4,313	$ 132,636	$ 4,263	$ 25,000	$ 8,400	**$ 568,354**
% of Total Funds					5%	1%	0.1%	0.1%	0.1%	0.04%	0.1%	2.2%	0.1%	0.4%	0.1%	**9%**

Note: Percent of total funds is the percentage of all funds, including funds allocated to: systemic initiatives, non-branded student programs, branded student programs, and teacher and family programs.
Source: Authors' analysis of information gathered from grant applications.

TABLE A-6

Amount of Grant Funds Allocated to Teacher and Family Programs by School System, Fiscal Years 2007–2009

School System	Fiscal Year			# of Grants	Teacher and Family Programs		TOTAL
	07	08	09		Teacher Professional Development	STEM Family Programs	
Allegany County	•	•	•	3	$ 20,365	$ 11,922	**$ 32,287**
Anne Arundel County	•	•	•	3	$ 60,734	$ 3,200	**$ 63,934**
Baltimore City		•	•	2	$ 20,000	-	**$ 20,000**
Baltimore County	•	•	•	3	$ 218,838	-	**$ 218,838**
Calvert County			•	1	$ 19,060	-	**$ 19,060**
Caroline County		•	•	2	$ 14,897	-	**$ 14,897**
Carroll County	•	•	•	3	$ 38,248	$ 14,221	**$ 52,469**
Cecil County	•	•	•	3	$ 19,960	-	**$ 19,960**
Charles County		•	•	2	$ 12,703	$ 1,467	**$ 14,170**
Dorchester County		•	•	2	$ 19,913	-	**$ 19,913**
Frederick County			•	1	-	-	**$ 0**
Garrett County		•	•	2	-	-	**$ 0**
Harford County	•		•	2	$ 53,955	-	**$ 53,955**
Howard County		•	•	2	$ 65,087	-	**$ 65,087**
Kent County		•	•	2	$ 6,634	-	**$ 6,634**
Montgomery County	•			1	-	-	**$ 0**
Prince George's County	•	•		2	$ 33,472	$ 14,261	**$ 47,733**
Queen Anne's County		•	•	2	$ 68,841	-	**$ 68,841**
Somerset County			•	1	-	-	**$ 0**
St. Mary's County	•	•	•	3	$ 33,135	-	**$ 33,135**
Talbot County			•	1	$ 2,584	-	**$ 2,584**
Washington County	•	•	•	3	$ 147,389	-	**$ 147,389**
Wicomico County		•	•	2	$ 6,000	-	**$ 6,000**
Worcester County		•	•	2	$ 167	-	**$ 167**
All School Systems	10	18	22	50	$ 861,982	$ 45,071	**$ 907,053**
% of Total Funds					14%	1%	**15%**

TABLE A-7

Outcomes Identified in Grant Applications by School System, Fiscal Years 2007-2009

School System	Fiscal Year			Short-term Outcomes				Medium-term Outcomes				Long-term Outcomes		
	07	08	09	Availability of STEM Programming	Community Partner Involvement	Student Participation in Grant Programs	Teacher Participation in Professional Development	Student Awareness of STEM Programs	Student Interest in STEM Fields	Student School Attendance Rates	Teacher Knowledge/ Understanding of STEM-based Learning	Student Achievement	College Preparation and Readiness	Graduation Rates
Allegany County	•	•	•			•	•		•	•				•
Anne Arundel County	•	•	•								•	•		
Baltimore City		•	•			•			•	•	•	•		
Baltimore County	•	•	•									•		
Calvert County			•		•						•	•		
Caroline County		•	•			•		•	•		•	•		
Carroll County	•	•	•			•			•	•	•	•		
Cecil County	•	•	•			•			•			•		
Charles County		•	•			•								
Dorchester County		•	•	•		•	•		•			•		
Frederick County			•	•	•	•					•			
Garrett County		•	•			•	•		•			•		•
Harford County	•		•			•	•		•			•		
Howard County		•	•		•	•	•	•						
Kent County		•	•			•	•					•	•	
Montgomery County	•													
Prince George's County	•	•					•	•						
Queen Anne's County		•	•			•	•					•	•	
Somerset County			•											
St. Mary's County	•	•	•	•	•	•					•	•		
Talbot County			•			•			•			•		
Washington County	•	•	•	•	•	•	•			•		•		
Wicomico County		•	•			•			•					
Worcester County		•	•			•	•					•		
TOTAL # of Grantees	10	18	22	4	5	18	10	3	10	4	7	16	2	2
TOTAL % of All School Systems Across All Grant Cycles (*N*=24)				17%	21%	75%	42%	13%	42%	17%	29%	67%	8%	8%

Source: Authors' analysis of information gathered from grant applications.