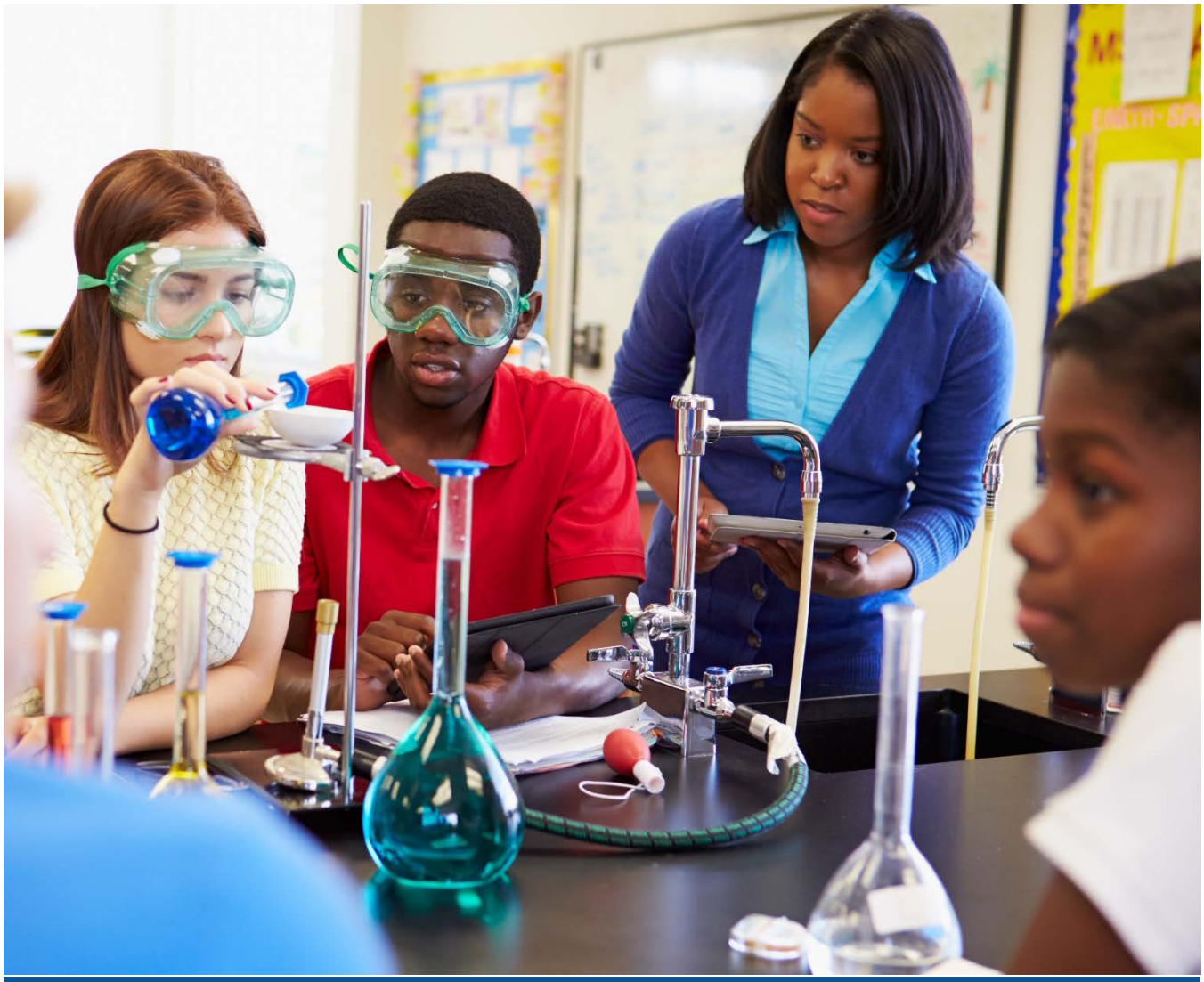


MiSTEM Advisory Council

Report #3

April 1, 2018

Introduction

The MiSTEM Advisory Council is a volunteer group of business, higher education, K-12 education, and philanthropic leaders, assembled by the Michigan Legislature to help make Michigan a world leader in STEM education. There are 11 voting members appointed by the Governor and 4 non-voting legislative appointees. A complete list of the members as of April 1 can be found in Appendix A.

As an advisory group the Council has three specific functions:

1. Review and make recommendations to the governor, the legislature, and the department concerning changes to the statewide strategy adopted by the council for delivering STEM education-related opportunities to pupils;
2. make specific funding recommendations for the funds allocated under Sec. 99s (3) of the 2017 School Aid Act by December 15 of each fiscal year (MiSTEM Advisory Council Grant)[1];
3. Work with the executive director of the MiSTEM network funded under section 99r to implement the statewide STEM strategy adopted by the MiSTEM advisory council.

A Vision for STEM in Michigan

Michigan was once the center of the world for innovation and technological advancement, and it can be again. In addition, Michigan was a pioneer in advancing the nation's, if not the world's, environmental sustainability. To ensure Michigan's place as a beacon of future growth and prosperity we must not only recognize what has made Michigan great but also seize upon new opportunities to confront the challenges of today and tomorrow. The MiSTEM Advisory Council believes that Michigan can again create the talent that leads the world in the development of 21st century mobility technology and addresses the world's climate, energy, and resource challenges.

The MiSTEM Advisory Council uses the definition of STEM developed by the Math/Science Center Network(MMSCN):" …an acronym for the fields of study and careers in the disciplines of science, technology, engineering, and mathematics, and may include the integration of any and all of the disciplines." The MMSCN further identifies a STEM literate individual as "able to apply their understanding of how the world works within and across the four interrelated STEM disciplines to improve social, economic, and environmental conditions.

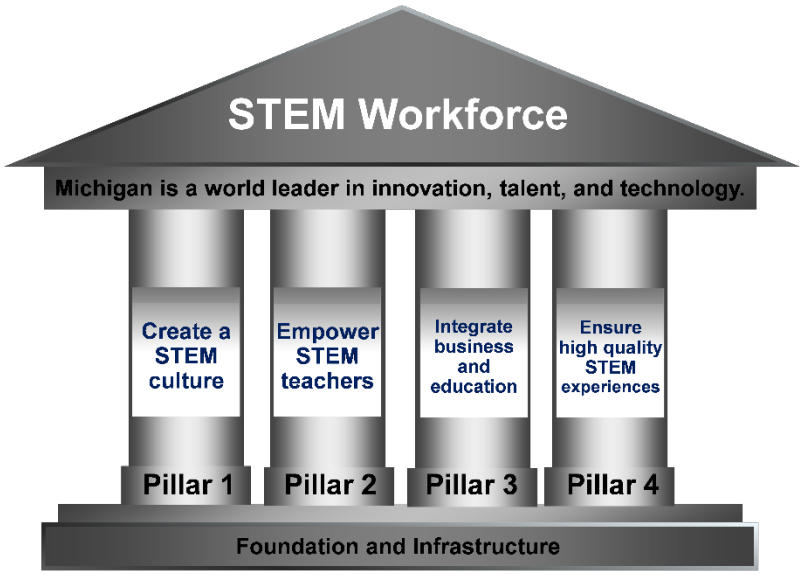
Goals of this report

This is the third report issued by the MiSTEM Advisory Council. The first report was issued in March 2016 and was completed in about 45 days after the council was fully assembled. The second report, issued December 2016, had a little over seven months to reconsider

[1] For more information on this grant program and the projects funded see Appendix E.

the work assembled and look deeper into key issues. In that report four pillars supporting a cohesive approach to STEM in the state were identified:

1. Michigan must create a robust culture of STEM.
2. The educator pipeline must be strengthened.
3. Business and educators must be integrated.
4. Michigan must ensure quality STEM experiences.



In addition to these four pillars, the Council made recommendations to guide the implementation of each of the pillars including considerations for necessary infrastructure and resources.

In this report, the Council maintains a focus on supporting the original 4 pillars outlined in the previous report. Recommendations from last year's report are confirmed or modified, with some additional recommendations reflecting evolving perspectives and policies.

Recommendations

Pillar 1: Create a STEM Culture

Given the centrality of science and technology in both the history of Michigan and the nature of the challenges now facing the state and the world, it is imperative to embrace a robust, extensive and inclusive STEM culture. By doing so we can inspire, inform and mobilize our citizenry toward economic and educational success. STEM culture is important if we are to inspire our youth to develop a passion and understanding for STEM education and career pathways. We should strive to have our students and their families understand what it means to follow a STEM pathway and the steps that lead to a successful STEM career. This includes fueling students' desire to seek STEM experiences both inside and outside of school and helping all students acquire both the disposition to

see STEM as an accessible career trajectory and the skill and knowledge foundation that adequately prepares them to continue to higher education and/or a career in STEM.

2017 Recommendation #1:

Support a state funded, coordinated educational campaign to build STEM awareness, and communicate needs and opportunities for all stakeholders.

- Promote a message that all students need to be competent in STEM thinking and understanding.
- Develop and implement a multi-level communication campaign (similar to the Pure Michigan campaign) with specific messaging for teachers, businesses, parents & students.
- Establish and fund a central website through the MiSTEM Network[2].
- Partner with Michigan businesses to showcase talent needs that connect to specific STEM career opportunities.
- Develop a strong brand for STEM by modeling the campaign after the successfully branded Pure Michigan campaign (e.g. Pure MiSTEM).
- Highlight STEM events that integrate business/industry with teacher and parent training. Support the campaign with regional/grass roots events that provide a visual awareness of STEM (e.g. MiSTEM booths at local career fairs or parent nights).
- Solicit parent involvement in STEM by engaging them in practical applications with students.
- Promote the Michigan Department of Education's (MDE) Top 10 in 10 Strategy 2.6 c: Develop a P-12 system wherein every student in Michigan is able to engage in integrated STEM…programming, with certification for [STEM] competencies to be included on their high school diploma/transcript.

Pillar 2: Empower STEM Teachers

All teachers should have support for their work with students, including resources. Support comes from opportunities such as networking with STEM organizations and other STEM teachers. This would allow teachers better access to externships, professional development opportunities, STEM projects, philanthropic funding, and any other resource in their region or the state.

2017 Recommendation #2:

Empower STEM teachers by offering incentives for STEM teachers to enter and remain in the education system.

- Encourage MDE to allow for more flexibility in STEM teacher certification (e.g. flexibility in placement of teachers in the classroom).
- Develop and promote policies for alternative paths toward teacher certification in STEM, including the use of micro-credentials as a form of endorsement.

[2] More information on the MiSTEM Network can be found in Appendix B

- Support the implementation of models that leverage teachers with STEM subject expertise in elementary grades (e.g. team teaching; and cross-curricular, project-based learning).
- Offer incentives (e.g. differential pay; coaching and facilitating opportunities) to encourage math/science teachers to remain in teaching positions as opposed to pursuing other higher paying opportunities outside the educational system.
- Provide hands-on practical applications and props/tools/equipment that support STEM teaching.
- Encourage more business and teacher experiential engagement like internships or job shadowing; and tax incentives for companies who provide these experiences.
- Engage Michigan universities receiving state funds to participate in STEM teacher recruitment, training, and retention.
- Develop a Master STEM teacher ecosystem that supports sharing of ideas within regions and across the state to build STEM capital within the state (e.g. coaching; partnerships with industry experts.)
- Encourage regional public-private partnerships to support problem-, phenomena- and competency-based teaching and learning, including teacher training and classroom resources.
- Encourage use of state and local ESSA funds to support STEM teaching and learning.
- Encourage and support the MiSTEM Network to implement professional development experiences using programs in the STEMworks database.

Pillar 3: Integrate Business and Education

Business and education integration through STEM can offer a model for understanding the challenges facing students, educators and employers and how to work together to find solutions. When schools and businesses collaborate, students and the community benefit.

The development of the MiSTEM regional network provides a framework and support for local, regional and statewide integration.

2017 Recommendation #3:

Implement a proven, outcome-based model for regional collaboration that integrates all STEM stakeholders (business and education).

- Form collaborations with all business and educational stakeholders including the Michigan Chamber of Commerce, Michigan Economic Development Corporation, Michigan Department of Education, Business Leaders for Michigan, Higher Education, Business, and K-12 school systems, etc.
- Share learnings and best practices as the MiSTEM Regions are established (e.g. Talent 2025, Great Lakes Bay Regional Alliance, etc.).
- The MiSTEM directors are to lead the efforts for the business-education collaborations within their regions and make this a key part of their regional strategic plans.
- Encourage businesses to provide opportunities for industry-based experiential learning opportunities for students and teachers (e.g. internships, apprenticeships).

- Develop policies that support these learning opportunities to be visible on student transcripts and teacher certifications (i.e. micro-credentials).

Pillar 4: Ensure High Quality STEM Experiences

High-quality programs:

- are hands-on, problem-based, authentic, engaging and experiential;
- are aligned to the Michigan Science and Mathematics Standards;
- go beyond content knowledge and teach life skills like communication, teamwork, leadership, critical thinking and gracious professionalism;
- utilize industry partners;
- create value for educators, students, and businesses; and
- provide an atmosphere for students to express themselves and have fun applying STEM skills and interests to creatively solve personally relevant problems.

2017 Recommendation #4:

Implement metrics to evaluate and recognize quality STEM programs.

- Utilize the STEMworks rubric to vet proposed programs for funding through state legislation.
- Track and communicate outcome data on current programs (best practices) on a STEM dashboard.
- Provide PD resources for proven STEM programs.
- Consider STEM recognition (e.g. a STEM "seal", certification or ranking) for schools/teachers that have formed collaborative relationships that have advanced STEM in their area (e.g. they have collaborated to build a technical training center or acquired a piece of equipment via a partnership with a business, etc.). Direct funds from current 99t and 99u to the MiSTEM Regions.
- Encourage and support the MiSTEM Network regions to implement student and professional development experiences using programs in the STEMworks database.
- Implement 99k Cybersecurity competitions by supporting programs through the MiSTEM regions.

Foundation and Infrastructure

2017 Recommendation #5:

Ensure that the MiSTEM regions will collaborate closely with the regional prosperity regions.

- Provide equitable funding for each region so that each region can be viable and:
- Ensure at least one full time person as the director of the MiSTEM Region to oversee the work of the region and represent the region at the state level;
- Create a regional strategic plan for STEM education with local employers, educators, government organizations, students, and relevant community organizations;
- Facilitate regional STEM events such as educator and employer networking and STEM career fairs to raise STEM awareness.
- Contribute to the MiSTEM website and engage in other MiSTEM network functions to further the mission of STEM in this state in coordination with the MiSTEM advisory council and its executive director.
- Facilitate application and implementation of state and federal funds under this subsection and any other grants or funds for the MiSTEM network region.
- Work with districts to provide STEM programming and professional development.
- Coordinate recurring discussions and evaluation activities regionally and statewide to ensure that feedback and best practices are being shared around funding, program and professional learning opportunities, and regional strategic plans and objectives.
- Additional operational funds for the MiSTEM Network should be provided.

2017 Recommendation #6:

Change STEM funding based on current allocations

- Align funded programs to STEMworks rubric.
- Change funding from 1MM to 3.0MM (99s(2)(e) for funding MiSTEM approved programs (eliminate specific allocations for Science Olympiad, Van Andel and Online Algebra Tool), allowing more flexibility for school districts to apply for STEM program funds that better meet their needs.
- Funding of the new STEM regions: Allocate $5.05 mil + $400,000 budgeted for the state Executive Director and assistant.
- Opening of FIRST Robotics funding to other similar type programs.
- CTE Equipment - The state allocated funds in 2017 for additional CTE development. Those funds and recommendations are being managed elsewhere. Career and technical education is a part of STEM that should to be aligned with other STEM developments in the state.

Appendices

Appendix A

Michigan MiSTEM Council

The MiSTEM Advisory Council consists of business, higher education, K-12 education, and philanthropic leaders. It was created in 2015 under MCL 388.1699s and is made up of 11 voting members serving at the pleasure of the Governor and 4 ex-officio legislators appointed from the House of Representatives and Senate.

Voting members:

- Co-Chair: Christian Velasquez, Global Market Director, Dow Chemical
- Co-Chair: Kathleen Bushnell Owsley, President, Bosch Community Fund
- Harrison Ford, Kettering University Alumni (Graduated 2016)
- Lee Graham, Executive Director, Operating Engineers 324 LMEC
- Jay Kulbertis, Ed.D., Superintendent, Gladstone Area Schools
- Josh Nichols, STEM Teacher, Stockbridge Community Schools
- Carolyn Wierda, Executive Director of STEM, Saginaw Valley State University
- Edward Silver, Senior Associate Dean for Research and Graduate Studies, School of Education, University of Michigan
- Hina Baloch, Manager, Global Social Impact & STEM Education, General Motors
- Heidi Maltby-Skodack, Assistant Principal & STEM Director, Traverse City Area Public Schools
- Open Position

Recent Members (2017):

- Jim Heath, Chief Operating Officer, Flexfab
- Satish Udpa, Ph.D., Executive Vice President, Michigan State University

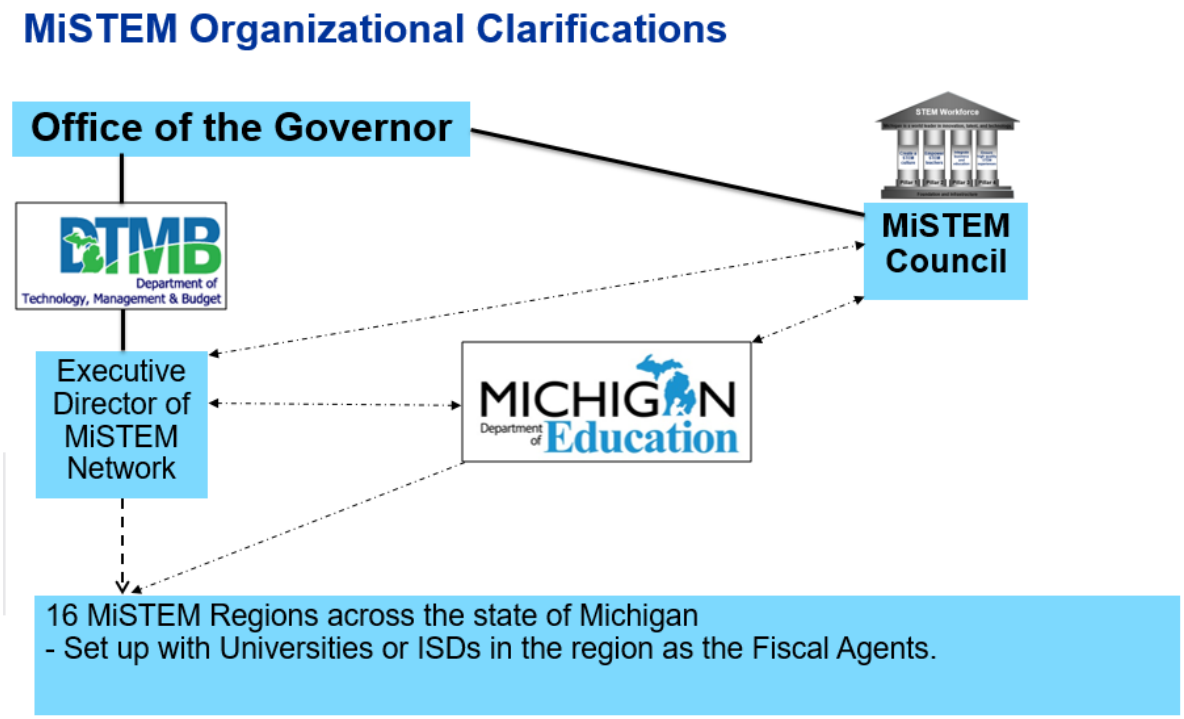
Legislative Appointees:

- Representative Leslie Love, 10th District (Detroit, Redford)
- Representative Jim Tedder, 43rd District (Waterford Township, Lake Angelus, Clarkston, Independence Township)
- Senator Hoon-Yung Hopgood, 6th District (Belleville, Romulus, Taylor, Westland)
- Senator John Proos, 21st District (Berrien, Cass, and St. Joseph Counties)

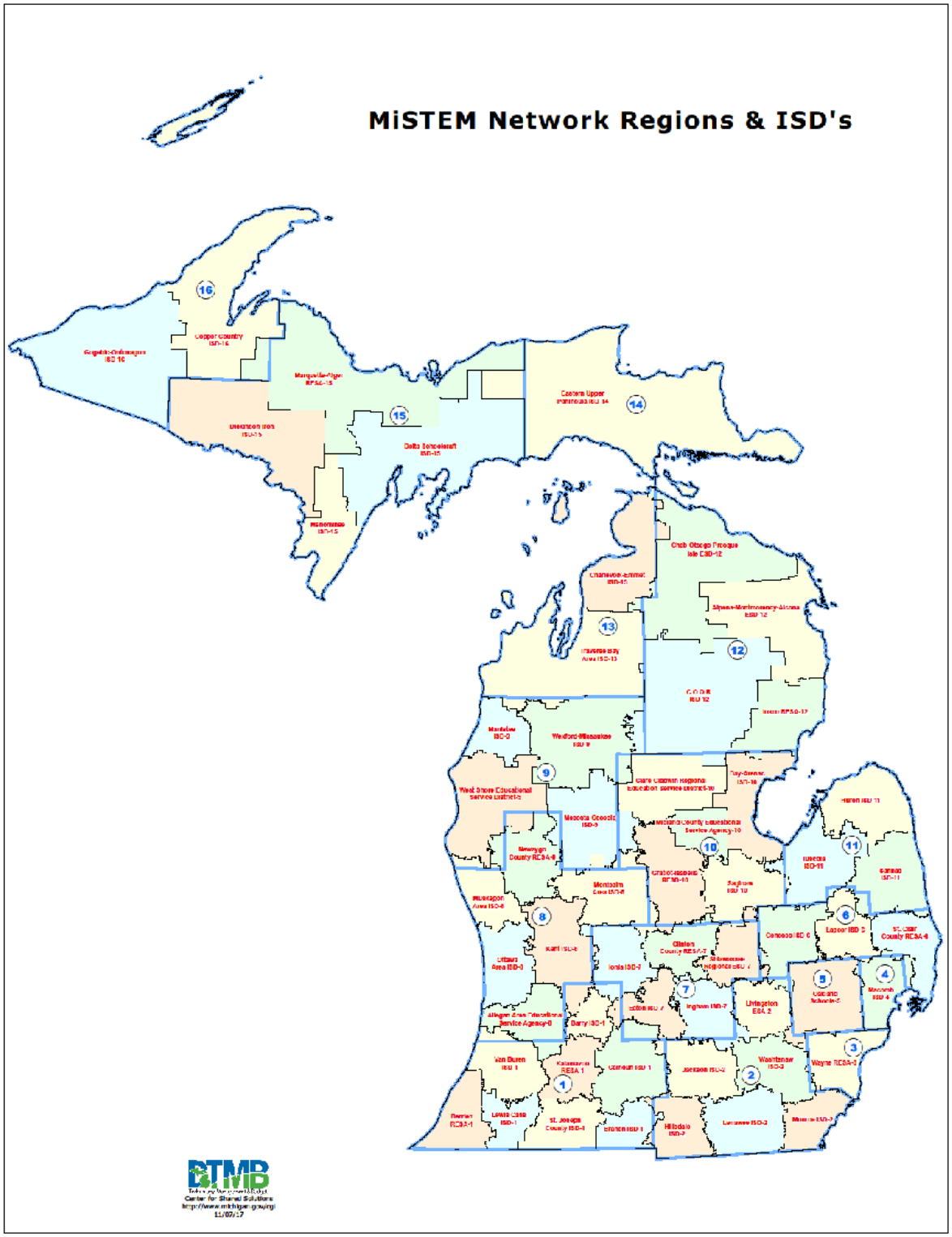
Appendix B

MiSTEM Network

Michigan, together with business, education, and community partners, is embarking on a journey to create a MiSTEM Network throughout the state. This opportunity grew out of Governor Snyder's MiSTEM Advisory Council recommendation to make Michigan a world leader in STEM education. The Council report lists four pillars as necessary components to establish a system that will produce STEM-equipped students and educators. These pillars are: create a STEM culture, empower STEM teachers, integrate business and education, and ensure high quality STEM experiences. The work of the MiSTEM Network is to build on existing STEM networks to create a STEM ecosystem that supports and implements the components outlined in the four pillars. More information, including the MiSTEM Network Plan can be found at www.michigan.gov/mistem.



Map of MiSTEM Network Regions



Appendix C

Budget Recommendations

	Actual **FY2016**	Actual **FY2017**	**Recommended FY2018**
SECTION 99s			
MiSTEM Council Admin (2)	50,000	50,000	50,000
MiSTEM Council Grants (3)	1,000,000	2,800,000	4,900,000
Math/Science Centers (4)	2,750,000	2,549,300	0
Math/Science Centers PD grant (4e)		750,000	
Math/Science Centers Transition		85,000	
MiSTEM Network Regions (6)		1,400,000	3,800,000
Locally -developed programs (2g)			1,250,000
Science Olympiad (5)	250,000		0
Van Andel Institute (13)	250,000	150,000	0
SECTION 99r			
MiSTEM Network Regions			
Executive director/assistant (2 &3)	75,000	250,000	400,000
SECTION 99h			
First Robotics	2,500,000	2,500,000	
Science Olympiad		300,000	0
First Robotics or Equivalents*			2,500,000
* Vex, Square One, or?? (Allow schools to choose)			
SECTION 99k			
Cybersecurity programs/competitions		500,000	500,000
SECTION 99t			
Online algebra tool [Algebra Nation]	1,500,000	1,100,000	0
SECTION 99u			
Online Math Tool [Imagine Learning]		1,000,000	0
Total Sec. 99 Budget	8,375,000	13,434,300	13,400,000
SECTION 64d			
IT certification/Minecraft	1,300,000	2,300,000	0
Total STEM budget	9,675,000	15,734,300	13,400,000

Appendix D

Comparison of MiSTEM Advisory Council 2016 and 2017 Recommendations

Pillar 1: Create a STEM Culture

2016 Recommendations

Recommendation #1:
Support a state funded, coordinated campaign to build STEM awareness, and communicate needs and opportunities for all stakeholders (students, parents, educators, and the business community).

2017 Recommendations

Recommendation #1:
Support a state funded, coordinated campaign to build STEM awareness, and communicate needs and opportunities for all stakeholders (students, parents, educators, and the business community).

Implemented	Not Implemented	Carried over/Modified	New
	• Develop and implement a multi-level communication campaign (similar to the Pure Michigan campaign) with specific messaging for teachers, businesses, parents & students. • Establish and fund a central website, owned by the Council, for the state wide MiSTEM initiative. • Partner with Michigan businesses to showcase talent needs that connect to specific STEM career opportunities. • Develop a strong brand for STEM by modeling the campaign after the successfully branded Pure Michigan campaign (e.g. Pure MiSTEM). • Support the campaign with large STEM events that integrate business/industry with teacher training and parent training.	• Develop and implement a multi-level communication campaign (similar to the Pure Michigan Campaign) with specific messaging for teachers, businesses, parents & students. • *Establish and fund a central website through the MiSTEM Network.* • Partner with Michigan businesses to showcase talent needs that connect to specific STEM career opportunities. • Develop a strong brand for STEM by modeling the campaign after the successfully branded Pure Michigan campaign (e.g. Pure MiSTEM). • *Highlight STEM events that integrate business/industry with teacher and parent training. Support the campaign with regional/grass roots events that provide a visual awareness of STEM (e.g. MiSTEM*	• Promote a message that all students need to be competent in STEM thinking and understanding .

Implemented	Not Implemented	Carried over/Modified	New
	● Get parent involvement in STEM utilizing practical applications with the students ● Support the campaign with regional/grass roots events that provide a visual awareness of STEM (e.g. MiSTEM booths at local career fairs or parent nights). ● Promote the Michigan Department of Education's Top 10 in 10 Strategy 2.6 c: Develop a P-12 system wherein every student in Michigan is able to engage in integrated STEM and STEAM programming, with certification for STEAM competencies to be included on their high school diploma/transcript.	*booths at local career fairs or parent nights).* ● Solicit parent involvement in STEM by engaging them in practical applications with students. ● Promote the Michigan Department of Education's Top 10 in 10 Strategy 2.6 c: Develop a P-12 system wherein every student in Michigan is able to engage in integrated STEM…programming, with certification for [STEM] competencies to be included on their high school diploma/transcript.	

Pillar 2: Empower STEM Teachers

2016 Recommendations

Recommendation #2:
Empower STEM teachers by integrating new ESSA law changes into the state plan and offering incentives for STEM teachers to remain in the education system.

2017 Recommendations

Recommendation #2:
Empower STEM teachers by offering incentives for STEM teachers to enter and remain in the education system.

Implemented	Not Implemented	Carried over/*Modified*	New
	● Ensure the new state plan that incorporates the ESSA law changes continues to focus on teacher training (including the STEM Master Teacher Corps). ● Ensure the new state ESSA plan allows for more flexibility in STEM teacher	● *Encourage MDE to allow for more flexibility in STEM teacher certification (e.g. flexibility in placement of teachers in the classroom).* ● *Develop and promote policies for alternative*	● Develop a Master STEM teacher ecosystem that supports sharing of ideas within regions and across the

Implemented	Not Implemented	Carried over/*Modified*	New
	certification (e.g. flexibility in placement of teachers in the classroom). ● Examine alternative paths for teacher certification in STEM. ● Implement models that ensure focused STEM teachers in elementary (e.g. Team Teaching models). ● Offer incentives (e.g. differential pay) to encourage math/science teachers to remain in teaching positions as opposed to pursuing other higher paying opportunities outside the educational system. ● Provide hands-on practical applications (props/tools) integrated into STEM teaching. ● Encourage more business and teacher engagement. Experiential engagement like internships or job shadowing is preferred. Will require creativity for funding with ideas like tax incentives for companies. ● Engage Michigan universities receiving state funds to participate in STEM developed teacher recruitment, training, and retention.	*paths toward teacher certification in STEM, including the use of micro-credentials as a form of endorsement.* ● *Support the implementation of models that leverage teachers with STEM subject expertise in elementary grades (e.g. team teaching; and cross-curricular, project-based learning).* ● *Offer incentives (e.g. differential pay; coaching and facilitating opportunities) to encourage math/science teachers to remain in teaching positions as opposed to pursuing other higher paying opportunities outside the educational system.* ● *Provide hands-on practical applications and props/tools/equipment that support STEM teaching.* ● *Encourage more business and teacher experiential engagement like internships or job shadowing; and tax incentives for companies who provide these experiences.* ● Engage Michigan universities receiving state funds to participate in STEM teacher recruitment, training, and retention.	state to build STEM capital within the state (e.g. coaching; partnerships with industry experts.) ● Encourage regional public-private partnerships to support problem-, phenomena- and competency-based teaching and learning, including teacher training and classroom resources. ● Encourage use of state and local ESSA funds to support STEM teaching and learning. ● Encourage and support the MiSTEM Network to implement professional development experiences using programs in the STEMworks database.

Pillar 3: Integrate Business and Education

2016 Recommendations

Recommendation #3:
Implement a proven, outcome-based model for regional collaboration that integrates all STEM stakeholders (business and education).

2017 Recommendations

Recommendation #3:
Implement a proven, outcome-based model for regional collaboration that integrates all STEM stakeholders (business and education).

Implemented	Not Implemented	Carried over/*Modified*	New
	● Form collaborations with all business and educational stakeholders including the Michigan Chamber of Commerce, Michigan Economic Development Corporation, Michigan Department of Education, and Business Leaders for Michigan, higher Education, Business, and K-12 school systems, etc. ● Research and identify a best practice to serve as a model for further development (e.g. Talent 2025, Great Lakes Bay Regional Alliance, etc.). ● New STEM centers (previous Math & Science Centers) to lead efforts if there isn't one already within their region in alignment with their developed regional STEM plans.	● Form collaborations with all business and educational stakeholders including the Michigan Chamber of Commerce, Michigan Economic Development Corporation, Michigan Department of Education, and Business Leaders for Michigan, Higher Education, Business, and K-12 school systems, etc. ● *Share learnings and best practices as the MiSTEM Regions are established (e.g. Talent 2025, Great Lakes Bay Regional Alliance, etc.).* ● *The MiSTEM directors are to lead the efforts for the business-education collaborations within their regions and make a key part of their regional strategic plans.*	● Encourage businesses to provide opportunities for industry-based experiential learning opportunities for students and teachers (e.g.. internships, apprenticeships). ● Develop policies that support these learning opportunities to be visible on student transcripts and teacher certifications (i.e. micro-credentials)

Pillar 4: Ensure High Quality STEM Experiences

2016 Recommendations

Recommendation #4:
Implement metrics to evaluate and recognize quality STEM programs.

2017 Recommendations

Recommendation #4:
Implement metrics to evaluate and recognize quality STEM programs.

Implemented	Not Implemented	Carried over/Modified	New
● Utilize the STEMworks rubric to evaluate current STEM programs supported by the state and vet new programs as directed in the 2016 budget legislation.[3] ● Provide PD resources for proven STEM programs.	● Track and communicate outcome data on current and approved programs (best practices) on a STEM dashboard. ● Consider STEM recognition (e.g. a STEM "seal", certification or ranking) for schools/teachers that have formed collaborative relationships that have advanced STEM in their area (e.g. they have collaborated to build a technical training center or acquired a piece of equipment via a partnership with a business, etc.).	● *Utilize the STEMworks rubric to vet proposed programs for funding through state legislation.* ● Track and communicate outcome data on current programs (best practices) on a STEM dashboard. ● Provide PD resources for proven STEM programs. Consider STEM recognition (e.g. a STEM "seal", certification or ranking) for schools/teachers that have formed collaborative relationships that have advanced STEM in their area (e.g. they have collaborated to build a technical training center or acquired a piece of equipment via a partnership with a business, etc.).	● Direct funds from current 99t and 99u to the MiSTEM Regions. ● Encourage and support the MiSTEM Network regions to implement student and professional development experiences using programs in the STEMworks database. ● Implement 99k Cybersecurity competition with supporting programs, through the MiSTEM regions.

[3] Partially implemented – still STEM programs in legislation that did not go through the STEMworks vetting process.

Foundation and Infrastructure

2016 Recommendations

Recommendation #5:

Rebrand the Michigan Math & Science Centers as Michigan STEM Centers and align them regionally to the 10 Prosperity zones in Michigan.

2017 Recommendations

Recommendation #5:

Ensure that the MiSTEM regions will collaborate closely with RPI regions.

Implemented	Not Implemented	Carried over/*Modified*	New
● Reduce the current number of Math & Science centers to ten[4]. ● Require all STEM Centers to facilitate the creation of a regional strategic plan for STEM education with local employers, educators, government organizations, students, and relevant community organizations	● Fund the 10 STEM Centers at $200,000 each (2MM total) + $100,000 budgeted for an Executive Director separate from the 10 STEM Center leaders. ● Ensure at least one full time person at each STEM center. ● The Executive Director of the STEM centers would be the liaison between the network, the state, Michigan Department of Education, and the MiSTEM council and would manage the website recommended elsewhere in this report as well as implementation of the STEMworks program. The council sees the position reporting in to the Governor's office for management. This Executive Director will need to lead the development of a new vision and master plan for the STEM centers. ● We have a history with current Michigan Math & Science centers with success highly	● *Provide equitable funding for each region so that each region can be viable and:* o *Ensure at least one full time person as the director of the MiSTEM Region to oversee the work of the region and represent the region at the state level;* o *Create a regional strategic plan for STEM education with local employers, educators, government organizations, students, and relevant community organizations;* o *Facilitate regional STEM events such as educator and employer networking and STEM career fairs to raise STEM awareness.* o *Contribute to the MiSTEM website and engage in other MiSTEM network functions to further the mission of STEM in this state in coordination with the MiSTEM advisory council and its executive director.* o *Facilitate application and implementation of state and federal funds under this subsection and any other grants or funds for*	● *Additional operational funds for the MiSTEM Network should be provided*

[4] Partially implemented – 16 MiSTEM regions instead of 10

Implemented	Not Implemented	Carried over/*Modified*	New
	impacted from collaborative models. High collaboration includes a stronger higher education involvement or alignment. Recommend that these STEM centers be through a university/community college located within the Prosperity Zone. Ideal to cap or manage overhead costs for universities to a minimal amount. Universities would follow the recommendations outlined by MiSTEM and be networked back to MDE (alignment to MiSTEM strategy). ● Empower STEM Centers to facilitate STEM events, such as educator/employer networking and STEM career and university recruitment fairs to raise STEM awareness. ● Allow STEM Centers to connect educators and employers to support a culture of intern/externships and apprenticeships for both teachers and students. ● Empower STEM Centers to bring together regional employers and educators to create guided pathways for regional STEM careers. ● Allow STEM Centers to contribute to the	*the MiSTEM network region.* o *Work with districts to provide STEM programming and professional development.* o *Coordinate recurring discussions and evaluation activities regional and statewide to ensure that feedback and best practices are being shared around funding, program and professional learning opportunities, and regional strategic plans and objectives.*	

Implemented	Not Implemented	Carried over/*Modified*	New
	MiSTEM website, all stakeholders to network, access regional and state events, explore STEM careers, seek professional development and externship opportunities, and engage in other functions to further the mission of STEM in Michigan.		

Resources

2016 Recommendations

Recommendation #6:
Change STEM funding based on current allocations.

2017 Recommendations[5]

Recommendation #6:
Change STEM funding based on current allocations.

Implemented	Not Implemented	Carried over/*Modified*	New
	● Align funded programs to STEMworks rubric. ● Change funding from 1MM to 3.0MM (99s(2)(e) for funding MiSTEM approved programs (eliminate specific allocations for Olympiad and Van Andel and Online Algebra Tool), allowing more flexibility for school districts to apply for STEM program funds that better meet their needs. ● Funding of the new STEM (math/science centers): Allocate $200,000 each (2MM total) + $100,000 budgeted for an Executive Director.	● Align funded programs to STEMworks rubric. ● Change funding from 1MM to 3.0MM (99s(2)(e) for funding MiSTEM approved programs (eliminate specific allocations for Olympiad and Van Andel and Online Algebra Tool), allowing more flexibility for school districts to apply for STEM program funds that better meet their needs. ● *Funding of the new STEM regions: Allocate $5.05 mil + $400,000 budgeted for the state Executive Director and assistant.* ● Opening of FIRST Robotics funding to other similar type programs.	

[5] Detailed budget recommendations can be found in Appendix C of this report

Implemented	Not Implemented	Carried over/*Modified*	New
	● Opening of FIRST Robotics funding to other similar type programs[6].		
	CTE Equipment - The state allocated funds in 2016 for additional CTE development. Those funds and recommendations are being managed elsewhere. The council still believes that technical education is part of STEM and needs to be aligned with the bigger picture of total STEM developments within the state.	CTE Equipment - The state allocated funds in 2017 for additional CTE development. Those funds and recommendations are being managed elsewhere. The council still believes that technical education is part of STEM and needs to be aligned with the bigger picture of total STEM developments within the state.	

[6] Other programs can be lower cost and offer access to more students while still providing similar learning and skill building experiences.

Appendix E

Summary of MiSTEM Advisory Council Grant Program

Under Section 99s(2) and (3) in the fiscal year 2017 School Aid Act, $2,850,000 was provided to fund grants recommended by the MiSTEM Advisory Council for the implementation of STEM programs in Michigan. To be eligible for MiSTEM advisory council approval, a program had to satisfy all of the following:

- Align with this state's academic standards.
- Be in the STEMworks database.
- Provide project-based experiential learning, student programming, or educator professional learning experiences.
- Focus predominantly on classroom-based STEM experiences or professional learning experiences.

The Council was charged with making specific funding recommendations for awards up to $100,000 for a diverse array of options for students and educators and at least 1 program in each of the following areas: robotics; computer science or coding; and engineering or bioscience.

The Michigan Department of Education managed the grant application process on behalf of the Council. A request for applications was released in September with grant applications due by November 2. Applications were then reviewed by volunteer reviewers with expertise in STEM education and/or program and grant management. Using a scoring rubric, applications were rated as highly competitive, competitive or not recommended for funding. Applications were presented to the MiSTEM Council in a spreadsheet with the reviewer ratings, the selected STEMworks program, the MiSTEM Network region the application proposed to serve, and other information.

The response to this opportunity was overwhelming. There were 134 applications totaling over $10 million vying for the $2.85 million allocation. Thirty-six applications, totaling over $4 million, were rated highly competitive by reviewers. The number of applications per region ranged from two to twenty. The MiSTEM Advisory Council started the selection process by first selecting one application per region looking primarily at reviewer ratings and proposed coverage within the region. They repeated the process several times, adding considerations such as the number of students within a region and types of programs with the goal of equitably distributing the grant funds across regions, audiences (teachers and students), and programs (science, technology, engineering and mathematics). They eventually selected 34 proposals with funding ranging from $24,000 to $100,000. Two fiscals received multiple awards to provide professional development in regions other than their own (Oakland Schools and West Shore ESD). Like many of the other projects funded under this grant program, both fiscals are using these grant funds to build on work they have been implementing statewide for several years

with seed funding from other sources. Most of the programs selected by districts and eventually selected for funding by the Council were developed right here in Michigan and/or supported by Michigan facilitators. In other words, nearly all the $2.85 million will be staying right here in Michigan.

Programs selected included:

- Programs in the priority areas identified in legislation (some programs addressed more than one priority area).
    - Robotics - $191,382
    - Computer science or coding - $928,988
    - Engineering or bio-science - $585,910
- Curriculum
    - Michigan-developed - $498,906
    - Other - $281,871
- Professional development
    - Modeling Instruction in Michigan - $600,000
        - provided by Michigan facilitators whose capacity was grown with Title IIB Math/Science Partnership grant funds;
    - AP Computer Science Principles/Computer Science Discoveries – $568,927
        - provided by Michigan facilitators whose capacity was grown through a partnership with code.org and the Michigan Math/Science Center Network (MSCN);
    - Math Recovery – $483,899
        - provided by Michigan facilitators whose capacity was grown with Title IIB Math/Science Partnership grant funds;
    - Place-based education – $99,166
        - provided by the Michigan-developed Great Lakes Stewardship Initiative.
- Student activities
    - Vendor provided - $317,231

Funding by Program

STEMworks Program	Funding totals
AP Computer Science Principles/Computer Science Discoveries	6 total - $568,927
A World in Motion® (AWIM)	1 total - $97,730
Camp Invention	1 total - $100,000
Cereal City Science	4 total - $375,962
Engineering is Elementary	1 total - $28,119
Full Option Science System (FOSS)	1 total – $60, 185
Great Lakes Stewardship Initiative	1 total – $99,166
Iridescent	1 total - $91,382
Math Recovery	7 total - $483,899
MiSTAR	2 total – 122,944
Modeling Biology	2 total - $200,00
Modeling Chemistry	1 total - $100,00
Modeling MS Science	2 total - $200,000
Modeling Physical Science	1 total - $100,000
Project Lead the Way (PLTW)	3 total - $221,686

Funding by Region

Organization	STEMworks Program	Amount
Region 1 – Southwest Michigan		
Lakeview School District (Calhoun)	PLTW	$94,340
Region 2 – South Central Michigan		
Oakland Schools	Modeling MS Science – Jackson/Lansing	$100,000
Brighton Area Schools	PLTW	$53,007
Region 3 – Wayne County		
National Inventors Hall of Fame, Inc.	Camp Invention	$100,000
Wayne RESA	Math Recovery	$62,716
Plymouth-Canton Community Schools	PLTW	$74,339
Detroit Public Schools Community District	A World In Motion® (AWIM)	$97,730
Iridescent	Iridescent	$91,382

Organization	STEMworks Program	Amount
Region 4 – Macomb County		
Macomb ISD	Math Recovery	$53,737
Region 5 – Oakland County		
Oakland Schools	Modeling Biology	$100,000
Oakland Schools	Modeling Chemistry	$100,000
Region 6 – Genesee, Lapeer, St. Clair Counties		
Genesee ISD	Math Recovery	$98,406
Region 7 – Capital Area		
Shiawassee Regional ESD	Math Recovery	$99,120
Region 8 – West Michigan		
Otsego Public Schools	MiSTAR	$34,160
Kent ISD	Math Recovery	$45,675
Oakland Schools	Modeling MS Science - Muskegon	$100,000
Region 9 – West Central Michigan		
Mason County Eastern Schools	Cereal City Science	$100,000
Region 10 – Central Michigan		
Midland Public Schools	MiSTAR	$88,784
Region 11 – Thumb		
Sanilac ISD	Cereal City	$100,000
Region 12 – North East Michigan		
Oakland Schools	Modeling Biology - Roscommon	$100,000
Region 13 – North West Michigan		
Public Schools of Petoskey	Full Option Science System (FOSS)	$60,185
Region 14 – Eastern UP		

Organization	STEMworks Program	Amount
Eastern Upper Peninsula ISD	Cereal City Science - elementary	$93,488
Eastern Upper Peninsula ISD	Cereal City Science – middle school	$82,474
Region 15 – Central UP		
Oakland Schools	Modeling Physical Science - Marquette	$100,000
Region 16 – Western UP		
L'Anse Area Schools	Engineering is Elementary	$28,119
Public Schools of Calumet, Laurium & Keweenaw	Math Recovery	$24,285
Statewide		
Great Lakes Fishery Trust	Great Lakes Stewardship Initiative	$99,166
Muskegon Area ISD	Math Recovery	$99,960
West Shore Educational Service District	AP Computer Science/Computer Science Discoveries	$668,927 (6 applications total)