

**Positive Economic Impact and
Improved Quality of Life
in the St. Louis Region
through STEM**

Coalition Proposal

**Version 05.6
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Current Situation

The St. Louis Region must increase the talent pool in science, technology, engineering and mathematics if it is to continue to grow and prosper in the knowledge-based national and global markets. Doing so will improve the lives of Regional students and bring the best organizations to the Region, creating a positive economic impact for all residents.

Stakeholders throughout the Region have come together to form the **St. Louis Regional STEM Coalition** to improve STEM opportunities, increase the number of STEM applicants and attract more STEM positions. The Coalition looks to increase the number of STEM programs, align funding with needed initiatives and increase the number of productive employees in STEM competencies.

So far the Coalition has brought together the Saint Louis Science Center, University of Missouri – Columbia, University of Missouri – St. Louis, Washington University in St. Louis, Southern Illinois University Edwardsville, St. Louis Community College, Ranken Technical College, Saint Louis Botanical Gardens, Saint Louis Zoo and a number of corporate partners; Boeing Company, Monsanto, Emerson, Sigma-Aldrich, Peabody Energy, MasterCard, Express-Scripts, Bank of America and AT&T.

The Coalition intends to use data driven decision making to help increase the pipeline of STEM talent from Kindergarten through the job market. By developing a systemized method to support the STEM Learning Community, the Coalition is looking to fill the gaps in the Regional education programs to meet the needs of the growing STEM job market. This will mean creating a database and public portal where we can bring together students, teachers, funders, organizations and any other stakeholders in STEM in a coordinated, Regional effort.

This proposal is to create the St. Louis Regional STEM Coalition, develop grant proposal materials for Coalition members and create a STEM Portal for systematizing the STEM data driven decision making (see Appendix D).

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Statement of Need

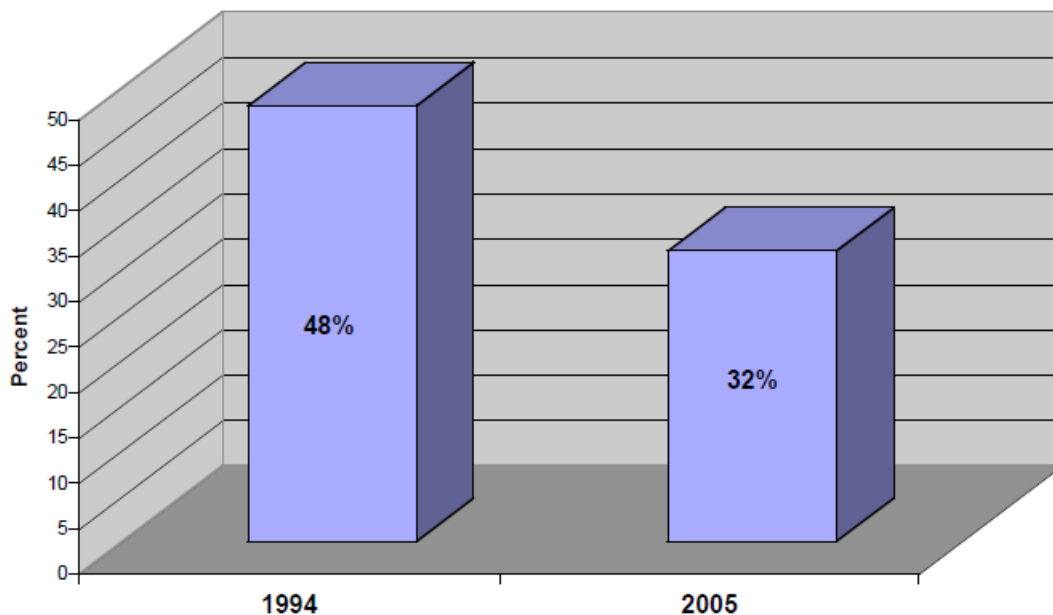
The Coalition has gathered data for the Regional situation in schools and the workplace (see Appendix A) and surveyed the existing STEM programs (see Appendix B). These preliminary lists are critical in confirming some base assumptions and gaps for the Coalition to move forward with understanding the needs of the Region.

The Coalition sees a need for increasing the Engagement, Capacity and Continuity in STEM programs to increase student success, fulfill their potential and increase their quality of life. There is a need for more Regional students to attain STEM Degrees (Associates, Bachelors, Masters, Doctors and Professional) and fill STEM Occupations. There is also a National Security need to develop more Advance STEM Scientists who will be international leaders in STEM fields.

From the data gathering, the Coalition has recognized some current Regional issues in producing enough talent in the STEM pipeline. A number of these issues are in the K-12 school districts:

- There is a need for more K-12 STEM programs to support Students and Teachers in minority and female audiences (see Program Survey)
- There is a need to increase engagement in STEM. A 2005 survey found that only 32% of parents believe their children need more Math and Science.

Fewer Parents Think Their Children Need More Math and Science



Source: Education Insights at Public Agenda, Reality Check 2006

- African-American High School graduation rates are below the Regional average, raising this could increase college attendance.

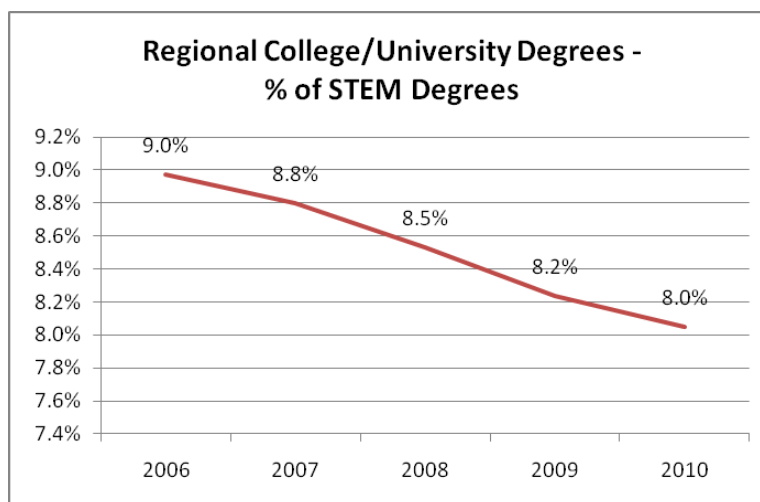
Year	StL MSA(1) Public K-12				
	Total	Grad. Black	Grad% Black	Grad. Total	Grad% Total
2010	409,038	7,422	77.7	29,941	88.0
2009	410,828	7,221	75.8	29,356	86.6
2008	413,956	6,191	75.7	28,537	87.7
2007	412,943	6,224	77.7	27,902	87.8
2006	414,914	5,947	77.2	27,581	87.6

Then there are issues at Regional colleges and universities of attracting students into STEM degree programs:

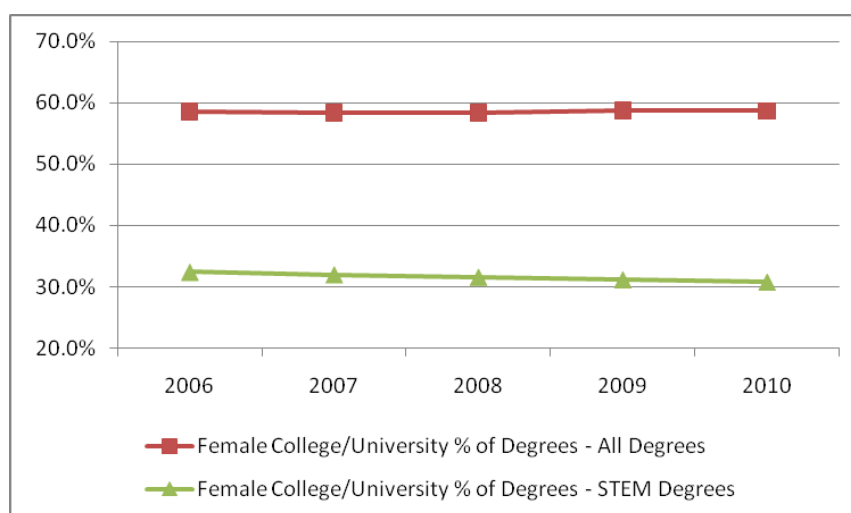
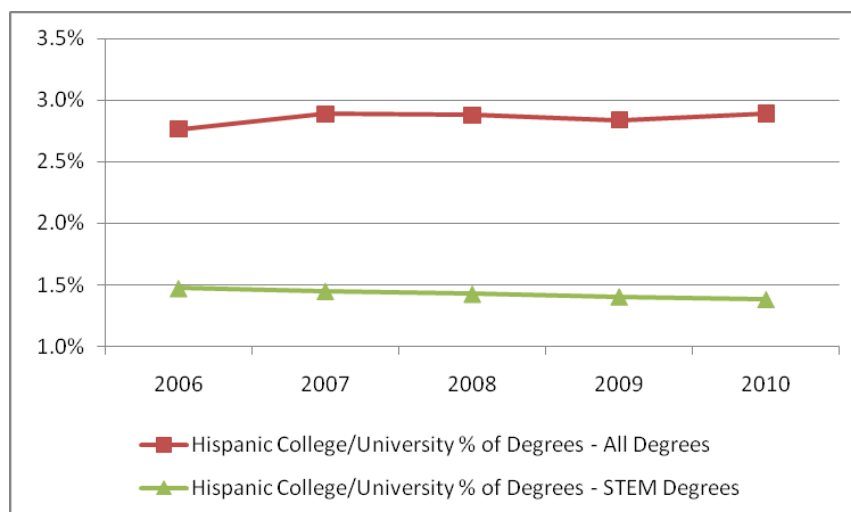
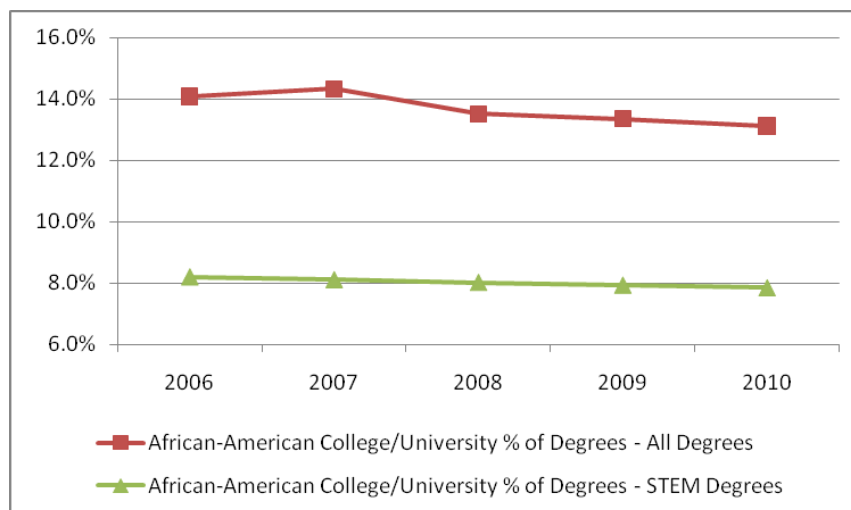
- African-Americans comprise about 18% of the Regional population, 17.6% of the student population but received 13.1% of the degrees in 2010. The degree percentage has been falling each year.

Year	StL MSA Students - 2yr/4yr/Grad+			StL MSA Degrees (All)		
	All	Black	Black%	Total	Black	Black%
2010	226,321	39,788	17.6%	42,681	5,596	13.1%
2009	221,983	38,608	17.4%	41,484	5,541	13.4%
2008	207,720	34,263	16.5%	39,852	5,385	13.5%
2007	201,782	32,980	16.3%	38,419	5,502	14.3%
2006	199,045	31,903	16.0%	37,459	5,275	14.1%

- The percentage of Regional College and University Students obtaining STEM degrees is falling.



- A lower percentage of African Americans, Hispanics, and Females obtain a STEM degree when compared to all degrees – and it is falling each year.



- Minority and female students in the St. Louis area are significantly less likely to show an interest in either IT or STEM related career clusters when compared to their counterparts in both middle school and high school. (from Go-STEM Alliance, 2008)

St. Louis Area Middle & High School Students Interest in Career Clusters				
	Finance	Health Science	STEM	IT
All Students	12.9%	10.9%	7.9%	5.6%
Males	10.7%	4.9%	11.4%	10.0%
Female	14.0%	15.8%	4.1%	0.9%
Minorities	14.1%	16.1%	4.4%	0.9%

Source: Missouri Connections Education and Planning System

- There is a large influx of college students into the Region – there is an average of 12,000 High School Graduates each year and then another 30,000+ students attend Regional Colleges and Universities. Keeping more students in the Region after graduation would improve filling the workforce gap.
- Retaining teachers in the Region needs to be a high priority. The National Commission of Teaching and America's Future found that 46% of teachers leave the profession by their 5th year (<http://www.nctaf.org/documents/NDD.ppt>, 2003). It is important to improve the talent pipeline of inspiring teachers who can bring more students to college and STEM. See Appendix C for the existing metrics on education degrees and occupations in the Region.

Within the Regional workforce there are also STEM issues in attracting talent:

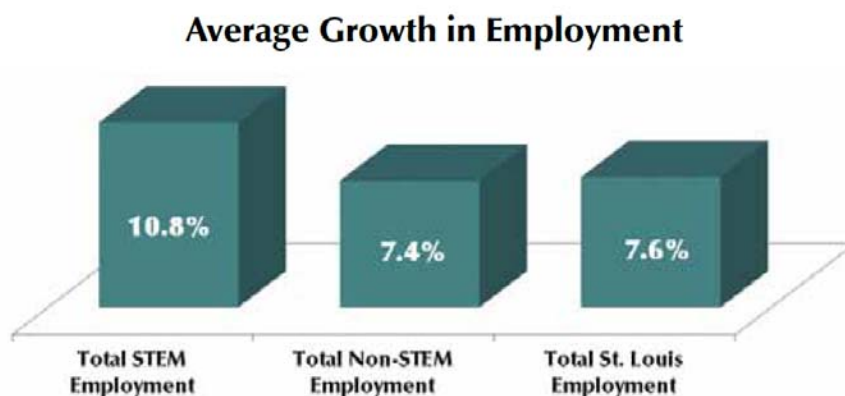
- The Region has historically added, and is projected to continue adding through 2018, about 4,600 STEM jobs (based on Missouri Economic Research and Information Center projections) per year that need post-secondary STEM education – but the Region has only been graduating around 3,400 STEM degree holders per year (based on National Center for Educational Statistics definition and statistics on STEM).

Occupational Code	Title	2009-2011 Openings		2008-2018 Openings		Annual Projection	
		Total	Percent	Total	Percent	Total	Percent
15-0000	Computer and mathematical occupations	1357	4.80%	9720	30.59%	974	3.07%
17-0000	Architecture and engineering occupations	701	4.29%	4638	25.08%	466	2.52%
19-0000	Life, physical, and social science occupations	591	7.94%	3403	43.08%	346	4.38%
29-0000	Healthcare practitioners and technical occupations	4030	6.19%	19953	30.30%	1996	3.03%
31-0000	Healthcare support occupations	1497	4.96%	8555	28.16%	855	2.81%
TOTALS:		8176	5.55%	46269	29.97%	4637	3.00%

- There is a need to train the existing workforce in STEM for the current and future STEM occupational demand of the Region (see stlworkforce.org).

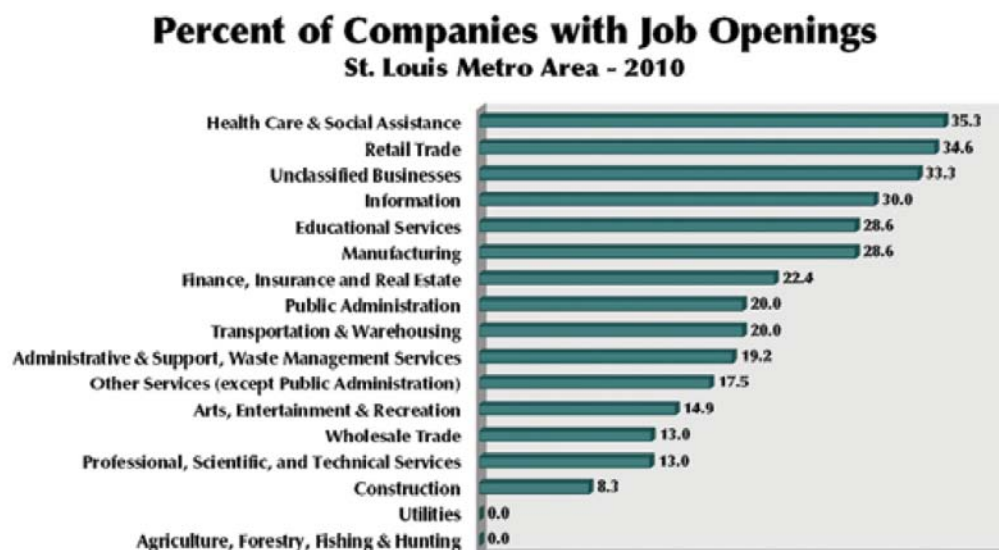
Increase in Employment Over Time - St. Louis Metro - 2010 (stlworkforce.org)			
Industry (STEM Focused)	1 Year Ago	In 1 Year	In 5 Years
Information	10.0%	10.0%	30.0%
Professional, Scientific, and Technical Services	22.2%	29.6%	42.6%
Educational Services	0.0%	7.1%	28.6%
Health Care & Social Assistance	26.5%	29.4%	41.2%

- Other projections by Missouri Economic Research and Information Center and STLWorkforce.org of STEM workforce needs project high needs in STEM occupations.



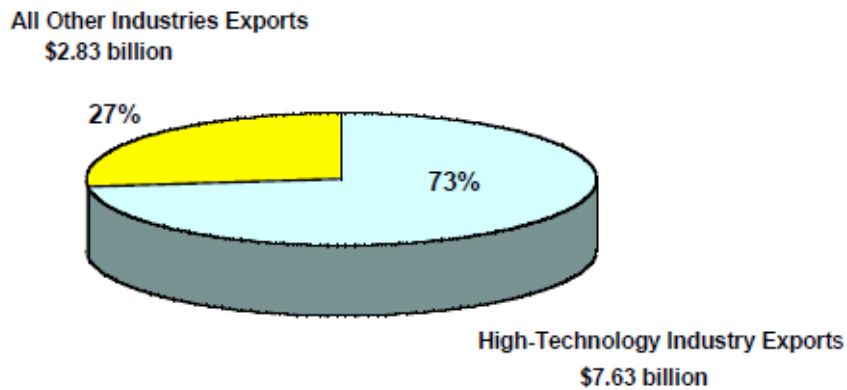
Source: MERIC Employment Projections, 2002-2012, 2004-2014, 2008-2018

- In 2010 Regional companies had 13-35.3% job vacancies in STEM related fields (stlworkforce.org).



- The Missouri Economic Research and Information Center (MERIC) surveyed that 73% of state exports are in High-Technology industries. There are needs for STEM talent in these industries.

**High-Technology Industry Exports
as a Percentage of All Missouri Exports
2005**



Source: WISER and
MERIC

- Regional corporations and organization are spending \$5,000+ on recruiting a STEM qualified person to an opening. This means an estimated \$6MM is spent annually recruiting the 1,200 STEM employees to the region.

Filling the Gaps

The Coalition feels a sense of urgency to improve the quality of life through STEM in the Region and have a positive impact on economic development. The Coalition recognizes the following gaps that need to be filled in order to increase the pipeline of STEM talent in the Region:

1. Increase the public awareness of STEM and the access to STEM opportunities in the Region.
2. Increase the number of STEM capable students through formal and informal programs that increase their Engagement, Capacity and Continuity in STEM.
3. Increase the number of STEM capable teachers which is vital to increasing the number of students who choose and succeed in STEM degrees.
4. Increase the number of St. Louis Regional High School graduates going into STEM degrees.
5. Increase the number of college and university students who choose to obtain STEM degrees.
6. Increase the Regional STEM talent pool to fill the openings in STEM occupations at local corporations, organizations, government agencies and military bases.

Possible Futures and Roadmap Items

Through the existing Coalition's partnerships we propose to work on the following items to meet our goals and close the gaps above.

1. Increasing STEM awareness and access:
 - a. Widen the scope and increase the membership in the St. Louis Regional STEM Coalition.
 - b. Increase the number and/or participation in events which increase the awareness of STEM in the community.
 - c. Create a portal and/or connect together existing portals to provide a central repository and connector for students, teachers, funders, programs, and all Regional STEM constituents.
 - d. Create a central STEM metrics database that is live and continuously updated from the sources used to develop this proposal, or connect to existing databases to provide information, so the Coalition and Region can better understand STEM activities.
2. Increase the number of STEM capable students:
 - a. Better track the STEM Educational experiences of Regional youth.

- b. Increase the number and diversity of STEM K-12 programs for all Audiences. (Define target #/%)
 - c. Increase the participation in STEM programs in Regional Cultural Institutions. (Define target #/%)
- 3. Increase the number of STEM capable teachers:
 - a. Better track the STEM professional development opportunities for Regional teachers.
 - b. Increase the participation in STEM professional development programs. (Define target #/%)
 - c. Increase the percentage of highly qualified teachers in Regional schools.
- 4. Increase the number of High School graduates going into STEM:
 - a. Better track the number of students going into STEM.
 - b. Increase the number of STEM programs that engage High School students. (Define target #/%)
- 5. Increase the number of college and university students who obtain STEM degrees:
 - a. Increase STEM degrees obtained by minorities and women. (Define target #/%)
 - b. Increase the number of STEM programs that engage post-secondary students. (Define target #/%)
- 6. Increase the Regional STEM talent pool to fill occupational openings:
 - a. Members will partner to ensure there are programs and initiatives to fill the Coalitions recognized gaps.
 - b. Meet the STEM occupation needs with more Regional born talent.

The items above drive the following action items that are part of this proposal and may be included in future grants:

- Create an organizational structure and governance for the Coalition
- Develop a detailed memo of understanding for members
- Develop documents for Coalition members to use for grants and funding
- Obtain a grant to create and manage the St. Louis Regional STEM Portal and the supporting database(s)
- Bring all STEM constituents into the Coalition
- Have all Coalition members enter their information into the Portal
- Launch the Portal to the Region (see Appendix D)

Proposed Charter Vision and Mission

The Coalition members have put together this initial charter as a structure to coordinate our efforts and as a proposal to new members. As more members join this charter will be refined and have added detail as needed.

Goal of Coalition: Revitalize the Saint Louis Region through a robust STEM Learning Community that has a positive economic impact. By improving the efficacy of STEM activities in the Region, the Coalition plans to be the Gateway to STEM, incubator for STEM talent, and a STEM rich environment attracting people to the region and helping them discover their future. The coalition will be collaborating to:

1. Promote Partnerships
2. Share STEM practices
3. Reduce costs
4. Leverage strengths
5. Create broader understanding and alignment of STEM resources
6. Increase STEM audiences and interest

Ultimate Objectives:

Increase the level of STEM skills for area youth, the number who select STEM related careers and the number who choose to work in this Region. In other words, increase the size of the local STEM talent pool for Universities, the Government and the Private Sector.

The following will support these objectives:

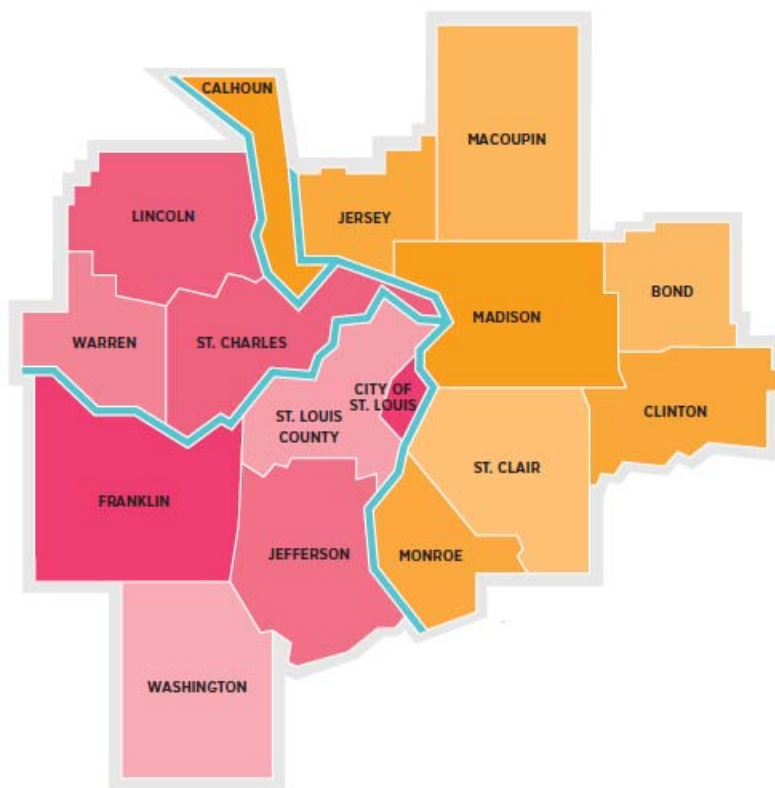
1. Clarify key 'segments' of the STEM skill building system
2. Identify/map existing STEM initiatives and networks
3. Clarify and list all STEM practices (initiatives/programs) for building the desired skills, enthusiasm and attitude in each segment
4. Create a listing (STEM catalog) for public and private sector stakeholders to assist them in making STEM investment decisions (money/resources): identify investment opportunities in the Region and their potential impact
5. Agree on metrics that clarify current baseline and how to measure 'progress'
6. Identify and involve key stakeholders in this collaboration effort
7. Develop a STEM network in the Region to track people and programs
8. Use collective efforts to support/ energize existing STEM networks and when possible, seek to coordinate impacts.
9. Identify "hot areas" or places where "holes exist" to inform future STEM initiatives/ collaborations or the establishment/expansion of STEM networks

Operating Principles for Member Organizations of the Coalition:

1. Agree to be open about their STEM activities and share information with the Coalition
2. Identify STEM Coalition activities in which they will participate
3. Agree to coordinate their activities within the framework of the Coalition's plan
4. Understand and align with Coalition goals
5. Be an active member of the Coalition
6. Explore ways we can collaborate on grant and fund raising activities
7. Clarify identity and role in the Coalition
8. All Coalition members who contribute work and data to the Coalition own the work and data of the Coalition

The St. Louis STEM Region

The Coalition defines the Region as the St. Louis Metropolitan Statistical Area (SMSA). This area consists of the following counties:



FIPS	Metropolitan Statistical Area Titles and Components
17005	Bond County, IL
17013	Calhoun County, IL
17027	Clinton County, IL
17083	Jersey County, IL
17117	Macoupin County, IL
17119	Madison County, IL
17133	Monroe County, IL
17163	St. Clair County, IL
29055	Crawford County, MO (pt.)*
29071	Franklin County, MO
29099	Jefferson County, MO
29113	Lincoln County, MO
29183	St. Charles County, MO
29189	St. Louis County, MO
29219	Warren County, MO
29221	Washington County, MO
29510	St. Louis city, MO

* The portion of Sullivan city in Crawford County, Missouri, is legally part of the St. Louis, MO-IL MSA. Census 2000 tabulations and intercensal estimates for the St. Louis, MO-IL Metropolitan Statistical Areas do not include this area.

Coalition STEM Definitions

STEM

The STEM fields are those academic and professional disciplines that fall under the umbrella areas represented by science, technology, engineering, and mathematics. According to many organizations, the STEM fields are considered the core to an advanced society and an indicator of a society's ability to sustain itself.

STEM Education

The "creation of a discipline based on the integration of other disciplinary knowledge into a new 'whole'. This interdisciplinary bridging among discrete disciplines is now treated as an entity, known as STEM (Morrison, 2006)." STEM education removes the traditional barriers erected between the four disciplines, by integrating them into one cohesive teaching and learning paradigm. Morrison and others have referred to STEM as being an interdisciplinary approach. "STEM education is an interdisciplinary approach to learning where rigorous academic concepts are coupled with real world lessons as students apply science, technology, engineering, and mathematics in contexts that make connections between school, community, work and the global enterprise enabling the development of STEM literacy and with it the ability to compete in the new economy (Tsupros, 2009)."

STEM Innovators

"STEM innovators" are individuals who have developed the expertise to become leading STEM professionals and perhaps the creators of significant breakthrough or advances in scientific and technological understanding. Their capabilities often include math and spatial abilities alone or in combination with verbal aptitude, along with other factors such as creativity, leadership, self motivation, and diligent work ethic. These abilities are not fixed traits, but instead are often dynamic, and this, can be developed over time with proper training.

Current Coalition Members and Stakeholders

Coalition of Corporations:

- Bob Cox, Emerson
- Jeffrey Whitford, Sigma-Aldrich
- Sarah Kramer, Peabody Energy
- Randel Maier, Boeing Company
- Petra Rodgers, MasterCard
- Susan Schlichter, Express-Scripts
- Michelle Tucker, Bank of America
- Debra Hollingsworth, AT&T
- Deborah Patterson, Monsanto
- Mary Swan, Ameren U
- Doug Rasmussen, SLC Economic Council
- Richard Moore, MO Chamber

Coalition of Higher Education, Cultural Institutions and STEM Organizations:

- Rob Duncan, University of Missouri- Columbia (MU)
- Anna Waldron, University of Missouri- Columbia (MU):
- Diane Miller, Saint Louis Science Center
- Vicki May, Washington University in St. Louis
- Sharon Locke, Southern Illinois University – Edwardsville (SIUE)
- Randy Sommers, University of Missouri St. Louis (UMSL)
- Ashok Agrawal, Saint Louis Community College
- Stan Shoun, Ranken Technical College
- Sheila Voss, Saint Louis Botanical Gardens
- Louis Bradshaw, Saint Louis Zoo
- Jeff Buehler, Project LIFTOFF
- Cynthia Hoffman, Project MEGSSS

DoD STEM Coordinators:

- OSD STEM Coordinator: Ms Kim Day
- USN STEM Coordinator: Chief, Office of Naval Research (delegated to Dr. Mike Kassner)
- USAF STEM Coordinator:
- Scott AFB Education Outreach Coordinators:
 - Base Commander Rep: Ms. Christine Spargur
 - STEM Fund Coordinator: Mr. Todd Pollard

Public and Private Schools (K through 12)

- St. Louis City and Counties: CSD
- Private Schools: MICDS
- Madison/St. Claire/O'Fallon

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