Pennsylvania Basic Education/Higher Education Science and Technology Partnerships

Science in Motion & Advancing Science

2009-2010 Annual Report

Executive Summary
The year 2010 brought new financial challenges for Science In Motion in its role as the premier high school science education outreach program for the Commonwealth. Current economic times resulted in serious budget reductions and funding freezes that forced many of the consortium sites to reduce service areas, cut service for many months, or completely shut down for the entire year. Despite these challenges, Science In Motion weathered the storm and all sites anticipate resuming service again for the 2010-2011 school year. Furthermore, despite budget passage delays and an overall 25% budget cut, Science in Motion was still able to muster impressive service statistics. Our science education specialists from the twelve colleges and universities presented over 3,400 hands-on laboratory experiences to 291 different schools. The program also provided an additional 6,403 drop-off laboratory kits for short term loan and offered 43 days of professional development workshop opportunities for teachers. Overall, Science In Motion provided 612 different teachers with 1,059 different labs creating 188,622 student experiences during the 2009-2010 school year.

Despite an unprecedented budget deficit year for the Commonwealth, Science In Motion continued to experience high bipartisan support by members of the Pennsylvania General Assembly. Bills to codify the SIM program in state law have been unanimously supported by the House and Senate Education Committees and by the full House and Senate. A school code bill that establishes a higher education basic education science partnership has been passed and sent to the governor.

What is Science in Motion?
Most Pennsylvania high schools cannot afford the modern high-tech equipment that it takes to prepare students for today’s careers in science, engineering and other technical fields. High-tech science training is especially expensive as this requires multiple sets of equipment so that each student can get a hands-on inquiry-based experience. This classroom deficiency is compounded by the added need for intensive maintenance and management of equipment and software, training to keep teachers up to date on advances in science and technology, and access to relevant standards-aligned activities that utilize the technology. Additionally, even if an individual school musters the resources to provide a high-tech lab experience, much of the equipment would sit on the shelf for most of the year as it would be used for only one topic in the breadth of curriculum that must be covered. In 1987, a team of Pennsylvania Science teachers, a local college and the National Science Foundation set out to tackle these problems. They developed a hugely successful shared resources partnership that is now known nationally as Science In Motion.

Science In Motion (SIM) addresses the needs of science, engineering, and technology in the classroom by providing the following support to schools:
• Access to hundreds of thousands of dollars worth of well maintained modern scientific equipment and supplies.
• Visiting science education specialists that go into the classroom to team teach high-tech science labs with the school’s faculty.
• Professional development workshops to help teachers keep abreast of the latest developments in science and transfer that knowledge to the classroom.
• Standards aligned laboratory activities for students.

Through SIM, even the poorest rural and urban schools can provide their students with hands-on modern science and technology training. Eight out of ten teachers in the program agree that SIM makes the difference between being adequately resourced for teaching science as opposed to not being adequately resourced.

Science In Motion provides these services through a partnership between the commonwealth and 12 select colleges and universities in Pennsylvania. This shared resources partnership has several advantages. First, high schools now have access to multiple sets of equipment that they could otherwise never afford. This equipment remains in circulation, shared by a regional cluster of schools rather than sitting on a shelf of a single school most of the time. Additionally, the host colleges and universities provide not only administrative and grant support, but also modern laboratory space for preparation of experiments, chemical ordering, safety and disposal services, and work study and assistantship opportunities for pre-service teachers. Finally with colleges and universities as partners, the door is now open for local corporate, foundation and community backing for science education. For example, in 2008, SIM leveraged nearly one quarter of a million dollars in matching support.

The value of the SIM model has been proven in multiple assessments, and its success can also be seen by the spread of SIM throughout much of Pennsylvania, a backlog of requests for establishment of new sites in the commonwealth, and the adoption of the model in other regions, including statewide programs in Delaware and Alabama.

Why is Science In Motion important?
As older industries cease to be a source for jobs in the commonwealth, it is imperative for job creation and sustained economic growth that Pennsylvania has a workforce trained for the new emerging economy in science, technology, engineering and math. Science In Motion addresses this need by providing hands-on experiences with modern technology to tens of thousands of students in the commonwealth- the same technology required for today’s high-tech workforce. No other program in the commonwealth delivers so much high-tech science equipment and support, to so many schools at so little cost.

Why Science In Motion is cost effective
Through its shared resources model and partnerships with higher education, SIM is an extremely cost effective model. By sharing equipment, science expertise and professional development resources, SIM provides services that no single school could individually afford. For example, a SIM site can thoroughly
support one subject area (e.g., chemistry) in at least 10 schools districts for only $200,000 per year. For a single school to purchase these services and resources independently, it would cost nearly $79,600 per district. The SIM approach realizes a taxpayer cost savings for each subject of nearly $59,600 per school district. The typical SIM center serves more than 10 schools resulting in a savings of at least $595,820 per site to the commonwealth compared to non-resource sharing models.

The value of services and resources not charged to the state-awarded budget and thus, not quantified, should not be overlooked. In addition, the 10% overhead allowed by the state contracts falls significantly short of the cost of infrastructure provided by these higher education institutions. This infrastructure, which is provided at the cost of the participating higher education institutions, includes:

- Office and laboratory space
- Access to advanced chemistry and biology research equipment not yet purchased by the outreach program
- Electric, gas, and water utilities
- Deionized/distilled water sources
- Chemical safety, storage, and disposal services
- Shared preparation area equipment including chemical hoods, autoclaves, and dishwashers
- Approved gas tank storage areas
- Van parking
- General clerical and accounting support

It is this infrastructure and the access to higher education science and education faculty expertise that makes the Pennsylvania Basic Education/Higher Education Science and Technology Partnerships cost efficient. However what makes the these partnerships most effective in keeping Pennsylvania science curricula current is the constant infusion of new concepts and related activities into high school classrooms through the close relationships formed between teachers at the secondary level and their college/university counterparts who are actively engaged in cutting edge research.

**Science In Motion service areas**

There are currently 12 colleges and universities integrated in the Science In Motion consortium including: Cedar Crest College, Clarion University, Drexel University, Elizabethtown College, Gannon University, Gettysburg College, Juniata College, Susquehanna University, University of Pittsburgh at Bradford, Ursinus College, Westminster College, and Wilkes University. The subject matter (i.e., biology, chemistry, physics) varies among sites along with the size of the service area (Figure 1.) and individual schools served per site (Appendix A). The map represents historic service areas. Some sites have experienced shrinkage in their service area due to funding reductions.
Is Science In Motion Effective?
Science In Motion has consistently demonstrated its effectiveness to improve classroom science test scores, averaging over the years a 13% improvement in biology scores, and a 17% improvement in chemistry scores compared to students in control schools. These findings are consistent with those of sister science van programs in other states.

In 2008, SIM initiated pilot pre/post testing for individual labs both to measure student learning as well as improve curriculum quality. Students across the commonwealth participating in the SIM program in 2008 demonstrated an average 67% improvement in the pre/post test results for laboratory modules. In 2009, the initial budget delay and the mid-year SIM complete budget line cut forced many sites, to shut down for a period or completely close for the remainder of the year. Hence, very little assessment was completed and the majority of the sites did not complete any pre/post testing for individual labs.

Service Report
The SIM Consortium service record for both the 2008/2009 and 2009/2010 school years reflect decreased service (Table 1.) due to the decreased funding. Current service levels are constrained by inadequate funding. There was a plateau in total student contacts (Figure 2.) and total equipment loans (Figure 3.) that mirrored funding in the 2007/2008 school year and declined subsequent years due to decreased funding.
Now more than ever, due to the historical delays in the receipt of funds, many of the higher education partners are unable to allow programs to begin until the annual passage and signing of the budget enables contracts to be processed. It has become increasingly difficult for even the established sites to keep their outstanding and experienced Mobile Educators from looking for and accepting other sources of employment due to annual funding uncertainties. Overall, the sites would be able to serve more teachers and students if state funding and contracts could be reliably anticipated.

Table 1.
The Science in Motion Consortium combined service record for school years 2003/04 to 2009/10.

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<tbody>
<tr>
<td>Biology teaching visits</td>
<td>958</td>
<td>2,432</td>
<td>2,184</td>
<td>2,372</td>
<td>2,090</td>
<td>2,216</td>
<td>1,127</td>
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<tr>
<td>Chemistry teaching visits</td>
<td>1,261</td>
<td>2,676</td>
<td>1,961</td>
<td>2,247</td>
<td>1,830</td>
<td>2,001</td>
<td>1,407</td>
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<td>Other teaching visits</td>
<td>1,171</td>
<td>1,091</td>
<td>1,020</td>
<td>948</td>
<td>1,283</td>
<td>1,204</td>
<td>896</td>
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<tr>
<td>Total teaching visits made</td>
<td>3,390</td>
<td>6,199</td>
<td>5,165</td>
<td>5,567</td>
<td>5,203</td>
<td>5,421</td>
<td>3,430</td>
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<tr>
<td>Total equipment loans</td>
<td>1,517</td>
<td>3,986</td>
<td>6,447</td>
<td>7,492</td>
<td>8,271</td>
<td>7,775</td>
<td>6,403</td>
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<tr>
<td>Total student contacts</td>
<td>96,235</td>
<td>179,990</td>
<td>217,366</td>
<td>262,566</td>
<td>280,224</td>
<td>236,359</td>
<td>188,622</td>
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<td>Total different schools served</td>
<td>235</td>
<td>280</td>
<td>307</td>
<td>331</td>
<td>337</td>
<td>324</td>
<td>291</td>
</tr>
<tr>
<td>Total different teachers served</td>
<td>449</td>
<td>589</td>
<td>698</td>
<td>776</td>
<td>715</td>
<td>752</td>
<td>612</td>
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<td>Total different labs taught</td>
<td>565</td>
<td>724</td>
<td>986</td>
<td>1,050</td>
<td>1,143</td>
<td>1,286</td>
<td>1,059</td>
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<td>Total in accelerated classes</td>
<td>19,083</td>
<td>31,289</td>
<td>48,819</td>
<td>69,366</td>
<td>72,298</td>
<td>18,993</td>
<td>48,010</td>
</tr>
</tbody>
</table>

Figure 2.
Total student contacts by the Science in Motion Consortium from school years 2003/04-2009/10.
All sites have struggled to maintain a high level of service to their schools despite funding reductions and delays. Other sources of grants, gifts, and donations have allowed some sites to significantly enhance programs beyond the level supported by the state allocation; however, such support is transient at all sites. All sites receive more requests for school visits than the Mobile Educators are able to service.

**National Recognition of Science In Motion**

The Science In Motion program was awarded a certificate from the Center for Excellence in Education (CEE) for being an exemplary model for excellence in science education and received gratitude for its contribution to STEM learning. The CEE mission is to nurture young scholars to careers of excellence and leaderships in science, technology, engineering and mathematics (STEM), and to encourage international collaboration among leaders in the global community. At the CEE National Lab Skills Symposium, in Washington D.C. in April 2010, focus groups called attention to exemplary efforts by programs to help high school teachers and students involved in science and technology education. Science In Motion was a program chosen that exemplifies several of the criteria which will be used by CEE as it makes available programming to different states.
Appendix A

Schools served in 2009-2010 by each site of the Science In Motion Consortium.

1. Cedar Crest College
   - Agora Cyber Charter School
   - Catasauqua High School
   - Emmaus High School
   - Freedom High School
   - Jefferson Elementary
   - Liberty High School
   - Muhlenberg Elementary
   - Parkland High School
   - Pleasant Valley High School
   - Shafer Elementary
   - Whitehall High School
   - William Allen High School

2. Clarion University
   - Allegheny -Clarion Valley Junior/Senior High School
   - Brockway Junior/Senior High School
   - Brookville Junior/Senior High School
   - Clarion Area Junior/Senior High School
   - Clarion –Limestone Junior/Senior High School
   - Clarion County Career Center
   - Cranberry Junior/Senior High School
   - DuBois Middle School
   - DuBois High School
   - DuBois Christian School
   - East Forest School
   - West Forest School
   - Elderton Middle School
   - Ford City Junior/Senior High School
   - Franklin Middle School
   - Franklin High School
   - Keystone Junior/Senior High School
   - Kittanning Middle School
   - Kittanning High School
   - North Clarion Junior/Senior High School
   - Oil City Middle School
   - Oil City High School
   - Punxsutawney Middle School
   - Punxsutawney High School
Punxsutawney Christian School
Redbank Valley Junior/Senior High School
Rocky Grove Junior/Senior High School
Saint Patrick’s Catholic School
Titusville Middle School
Titusville High School
Union Junior/Senior High School
West Shamokin Junior/Senior High School
Venango Christian High School

3. **Drexel University**
   Agora Cyber Charter School
   Bartram High School
   Ben Franklin High School
   Beulah Baptist Christian School
   Bodine High School
   Central High School
   Franklin Learning Center
   George Washington High School
   Girls High School
   Lamberton High School
   Masterman High School
   Mennonite High School
   New Media Technology Charter Middle School
   PA Clinical Junior/Senior High School
   Parkway-Northwest High School
   Philadelphia Military Academy at Elverson
   Samuel Fels High School
   Science Leadership Academy
   West Philadelphia High School
   West Philadelphia High School Academy of Automotive and Mechanical Engineering

4. **Elizabethtown College**
   Elizabethtown Area High School
   Hempfield High School
   J.P. McCaskey High School
   Lebanon High School
   McCaskey East High School
   Mt. Calvary Christian School
   Pequea Valley High School
   Pottsville Area High School
   Reading High School
5. **Gannon University**
   Cathedral Preparatory
   Central Tech
   Central Transitional
   Corry High School
   East High School
   Fairview High School
   Fort Leboeuf High School
   General McLane High School
   Girard High School
   Harbor Creek High School
   Iroquois High School
   Maritime School of Excellence
   McDowell Intermediate High School
   McDowell Senior High School
   McKean Elementary
   Mercyhurst Preparatory High School
   North East High School
   Northwest Collegiate Academy Charter School
   Northwestern High School
   Roosevelt Middle School
   Seneca High School
   Strong Vincent
   Union City High School
   Union City Middle School
   Villa Maria Academy

6. **Gettysburg College** (Advancing Science)
   Adams County Christian Academy
   Arendtsville Elementary School
   Bishop McDevitt High School
   Camp Hill High School
   Cedar Cliff High School
   Central York High School
   Chambersburg Area Middle School
   Chambersburg Area Senior High School
   Crabbs/Littlestown Christian Academy
   Cumberland Valley Christian Academy
   Delone Catholic High School
   Fairfield Area Middle School
   Fairview Elementary School
   Gettysburg Area High School
Good Shepherd School
Greencastle-Antrim H.S.
Hanover High School
Hanover Middle School
Hershey Christian School
Immaculate Conception School
Littlestown Christian Academy
Mechanicsburg Middle School
Montessori Academy of Chambersburg
New Oxford High School
Northern High School
Paxtonia Elementary School
Shalom Christian Academy
Shippensburg Area Middle School
Spring Grove Area High School
Spring Grove Area Middle School
St. Andrew Catholic School
St. Francis Xavier School
Upper Adams Middle School
Upper Dauphin Area High School
Upper Dauphin Area Middle School
West Perry High School
William Penn High School
York Suburban High School
York Suburban Middle School

7. Juniata College
   Altoona Area Junior High School
   Bishop Guilfoyle High School
   Calvary Christian Academy
   Central High School
   Grier School
   Hollidaysburg Area High School
   Hollidaysburg Catholic Middle School
   Hollidaysburg Junior High School
   Huntingdon Area High School
   Huntingdon Area Middle School
   Indian Valley Area High School
   Indian Valley Middle School
   Juniata Valley Junior/Senior High School
   Lewistown Area High School
   Lewistown Middle School
Mount Union Area Junior/Senior High School
Southern Huntingdon County Junior/Senior High School
Spring Cove Middle School
St. John's Evangelist Middle School
St. Rose Lima Middle School
State College Area High School
Strodes Mills Middle School
Tussey Mountain Junior/Senior High School
Tyrone Area Junior/Senior High School
Williamsburg Community Junior/Senior High School

8. **Susquehanna University**
   Berwick Area High School
   Bloomsburg Christian School
   Bloomsburg High School
   Central Columbia High School
   Central Columbia Middle School
   Central Dauphin High School
   Danville Area High School
   Greenwood High School
   Hughesville High School
   Jersey Shore High School
   Juniata High School
   Lewisburg Area High School
   Line Mountain High School
   Loyalsock Township High School
   Meadowview Christian Academy
   Millville Area High School
   Milton Area Senior High School
   Montoursville High School
   Mt. Carmel Area Junior/Senior High School
   North Schuylkill Junior/Senior High School
   Selinsgrove Area High School
   Shamokin Area Junior/Senior High School
   Shikellamy High School
   South Williamsport Area High School
   Sunbury Christian Academy
   Tri-Valley Junior/Senior High School
   Williamsport Area High School

9. **University of Pittsburgh at Bradford**
   Austin Area Elementary and Middle School
Austin Area High School
Beacon Light
Bradford Area Christian Academy
Bradford Area High School
Cameron County High School
Chestnut Street Elementary
Coudersport Area Junior and Senior High School
Eisenhower Middle School and High School
Elk County Catholic
Floyd C. Fretz Middle School
Galeton Area Junior and Senior High School
Johnsonburg Junior and Senior High School
Kane Area High School
Kane Area Middle School
Mt. Jewett Elementary
Northern Potter Junior and Senior High School
Oswayo Valley Junior and Senior High School
Otto-Eldred Elementary
Otto-Eldred Junior and Senior High School
Port Allegany Elementary
Port Allegany Junior and Senior High School
Ridgway Middle School
Ridgway High School
School Street Elementary
Sheffield Middle School and High School
Smethport Elementary
Smethport Junior and Senior High School
St. Bernard Elementary & Middle School
St. Marys Middle School
St. Marys High School
The Learning Center
Warren High School
Youngsville Middle School/High School

10. **Ursinus College**

Arcola Middle School
Boyertown High School
Downingtown East High School
Downingtown West High School
Downingtown Middle School
Esperanza Academy High School
Methacton High School
North Penn High School
Owen J. Roberts High School
Owen J. Roberts Middle School
Pennridge High School
Penn Woods High School
Perkiomen Valley High School
Perkiomen Valley Middle School
Phoenixville High School
Plymouth Whitemarsh High School
Souderton High School
Spring-Ford High School
Spring-Ford 9th Grade Center
Spring-Ford 7th Grade Center
Twin Valley High School
Upper Marion High School
Wyomissing High School

11. Westminster College
   Center Elementary
   C.M. Musser Elementary
   Cochranton Elementary School
   Dassa McKinney School
   East Side Elementary
   East Lawrence Elementary
   Northside Elementary School
   Grove City Christian Academy
   Grove City College
   Grove City High School
   Hermitage Elementary School
   Hermitage Middle School
   Hickory High School
   Hillview Intermediate School
   Jamestown Elementary School
   Jamestown High School
   Kennedy Catholic High School
   Lakeview Area High School
   Laurel Elementary
   Laurel High School
   Lincoln High School
   Maplewood High School
   Mercer Elementary School
   Mercer High School
Mohawk Elementary School
Mohawk High School
Neshannock Elementary School
Neshannock High School
New Castle High School
Notre Dame
Oakview Elementary
Perry Traditional Academy
Pine Richland High School
Pulaski Elementary
Portersville Christian School
Reynolds Elementary School
Reynolds High School
Saegertown High School
Seneca Valley Intermediate School
Seneca Valley High School
Sharon High School
Sharpsville High School
Shenango Elementary
Slippery Rock Elementary School
Slippery Rock High School
South Butler Elementary School
Sto Rox Elementary School
Union Elementary School
West Middlesex Elementary School
Westminster College Preschool
Wilmington Area Elementary
Wilmington Area Middle School
Wilmington Area High School

12. Wilkes University
   Blue Mountain High School
   Coughlin High School
   Crestwood Middle School
   Dallas High School
   Elk Lake High School
   Grand Army of the Republic High School
   Hanover High School
   Hazelton High School
   Holy Redeemer High School
   Lakeland High School
   Lehighton High School
Meyers High School
Northwest High School
Pen Argyl High School
Pittston Area High School
Pocono Mountain East High School
Pocono Mountain West High School
Towanda High School
Troy High School
Tunkhannock High School
Wallenpaupack High School
Western Wayne High School
Wyoming Valley West-Middle School
Wyoming Valley West- High School