2020-2021 Annual Service Report

The Pennsylvania Basic Education/Higher Education Science and Technology Partnership

Executive Summary

The Science in Motion (SIM) program, like most school serving programs had to deal with school closings and virtual classroom instruction during the COVID-19 pandemic restrictions and precautions. The SIM program host institutions were very eager to be able to provide hands-on, inquiry-based experiences to the participating schools in their role as the premier high school science education outreach program for the Commonwealth. Of the sites that had science education specialists (mobile educators) from the ten-member colleges and universities, Science in Motion staff members presented over 130 hands-on laboratory experiences to 156 different schools. The program also provided an additional 4,698 drop-off laboratory kits for short term loan and offered 16 days of professional development workshop opportunities consortium-wide for over 100 teachers. Overall, Science in Motion provided 387 different teachers with 742 different labs, creating 73,931 student experiences during the 2020-2021 school year.

What is Science in Motion?

Most Pennsylvania high schools cannot afford the modern, well-maintained equipment that it takes to prepare students for today's modern technological careers in science, engineering, and other technical fields. Modern scientific training is especially expensive as it 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 an up-to-date 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, technology, engineering, and mathematics in the classroom by providing the following support to schools:

- Access to well-maintained, modern, scientific equipment and supplies costing hundreds of thousands of dollars.

- Visiting science education specialists 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 into classroom activities and hands-on laboratory experiments.
- Standards-aligned laboratory activities for students.

Science in Motion provides these services through a partnership between the Commonwealth and ten higher education institutions 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. Teachers in the program say that SIM makes a difference between being well-resourced for teaching science as opposed to not being adequately resourced. Additionally, the host institutions 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.

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 others, as well as the adoption of the model in other regions, including a statewide program in Alabama.

Why is Science in Motion important to Pennsylvania's economic future?
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 hundreds of thousands of students in the Commonwealth - the same technology required for today's skilled workforce. No other program in the Commonwealth delivers so much state-of-the-art science equipment and supports so many schools at so little cost.

Why is Science in Motion 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 for only $200,000 per year. For a single school to purchase these services and resources independently, it would cost nearly $80,000 per school. The SIM approach realizes a taxpayer cost savings for each subject of nearly $60,000 per school. 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. The 10% overhead allowed by the state contracts falls significantly short of the cost of infrastructure provided by the host 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
- Van parking (at most sites)
- Approved gas tank storage areas
- General clerical and accounting support

It is this infrastructure and the access to higher education science and education faculty expertise that helps make the Pennsylvania Basic Education/Higher Education Science and Technology Partnerships cost-efficient. However, what makes 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

During the 2020-2021 school year, the Science in Motion Consortium consisted of ten higher education institutions including: Bloomsburg University, Clarion University, Drexel University, Elizabethtown College, Gettysburg College, Juniata College, Lehigh Carbon Community College, Ursinus College, Westminster College, and Wilkes University. The COVID-19 pandemic restrictions differed per area/host institution in the Commonwealth. The amount of total SIM services utilized by participating schools varied and was mirrored by school closures or remote status by their regional count for positive COVID-19 cases. Both SIM mobile educators visits to classrooms as well as lab and equipment delivered were affected by COVID-19 pandemic restrictions.

Subject matter varies among host sites and includes, but is not limited to, high school chemistry, biology, physics, and middle school integrated science curricula. Demographics near each site dictate the size of the service area, as well as success of obtaining funding beyond state appropriations, which in turn influences the number of individual schools and school districts served per site. During this past year, half of the SIM sites experienced a decrease in the schools that were willing to use our services, while the other half noticed an increase (Table 1). The host institution map (Figure 1) indicates the PA location of each SIM consortium higher education institution member in the Commonwealth. Some sites have been forced to decrease their historical service area, due to consecutive and multiple funding reductions and delays. Service areas to school districts may change on an annual basis.

Table 1

Science in Motion Consortium sites school service percent change between 2020 and 2021. Due to COVID-19 restrictions, several SIM sites experienced a decrease in the number of schools served, while others increased. Bloomsburg University initiated their program in the 2021 school year, thus had no comparison for change.

	2020 Schools Served	2021 Schools Served	% Change	Change Type
Bloomsburg University	0	5	0%	Start Up
Clarion University	8	16	100%	Increase
Drexel University	8	2	75%	Decrease
Elizabethtown College	31	20	35%	Decrease
Gettysburg College	36	21	42%	Decrease
Juniata College	22	23	5%	Increase
Lehigh Carbon Community College	19	23	21%	Increase
Ursinus College	21	7	67%	Decrease
Westminster College	18	20	11%	Increase
Wilkes University	31	19	39%	Decrease

Figure 1

Geographic locations of the Science in Motion (SIM) Consortium ten host Pennsylvania higher education Institutions: Bloomsburg University, Clarion University, Drexel University, Elizabethtown College, Gettysburg College, Juniata College, Ursinus College, Westminster College, and Wilkes University.

Service Report

With COVID-19 affecting many SIM-serviced schools by causing sudden closures or extended remote learning, as well as changing regulations for visitation to schools for teaching visits and equipment deliveries, the SIM Consortium experienced a decrease in the majority of service record values (Table 2). Sites that run at full capacity have had to secure alternative funding to offer the full-time program schedule; however, most host SIM programs simply do what they can until their financial resources are expended. The total student contacts decreased by just over 77,000 from the 2020 to 2021 school year (Figure 2) which is sadly due to the COVID pandemic restrictions and precautions. The total number of mobile educator teaching visits hit an all-time low for the SIM Consortium (Figure 3); six host sites made no teaching visits, three sites made 15 or less visits to the classroom, and the remaining host site made 127 visits. To accommodate teachers' needs with remote instruction and assist with labs due to the lack of in-person visits, some Science in Motion host sites began virtual teaching visits; five sites made a total of 186 virtual visits (Table 3). There was an 8.6% increase in the equipment loans/delivery services 2020 to 2021 (Figure 4). Bloomsburg University (BU) was set-up to initiate their SIM program this year; despite delays in funds and COVID-19 pandemic closures they were able to serve some school during the 2020-2021 school year.

Table 2

The Science in Motion Consortium site members combined service records for school years 2010 through 2021.

School Year totals	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Teaching Visits												
Biology	1,127	1,576	1,377	1,211	1,080	655	665	669	584	724	652	51
Chemistry	1,407	1,604	1,108	1,019	900	453	389	393	639	343	229	74
Other	896	980	593	646	498	601	686	627	369	395	276	12
Total teaching visits	3,430	4,160	3,078	2,886	2,478	1,709	1,740	1,689	1,592	1,462	1,157	186
Equipment loans	6,403	7,984	8,256	7,238	6,298	6,018	5,648	6,046	6,206	6,585	4,326	4,698
Student contacts	188,622	207,380	208,328	214,164	202,931	143,723	137,100	150,929	158,320	182,229	151,368	73,931
Schools served	291	294	312	244	231	270	179	221	212	282	194	156
Teachers served	612	768	713	626	624	623	443	478	470	642	436	387
Labs taught	1,059	1,046	1,050	925	886	858	842	612	759	751	532	742
Accelerated students	48,010	49,124	46,197	50,043	57,221	29,741	25,711	31,018	40,261	25,740	25,511	10,597

Table 3

The Science in Motion Consortium site members combined virtual teaching visits for school year 2021.

School Year Totals	2021
Virtual Teaching	
Biology	138
Chemistry	24
Other	24
Total Virtual Teaching Visits	186

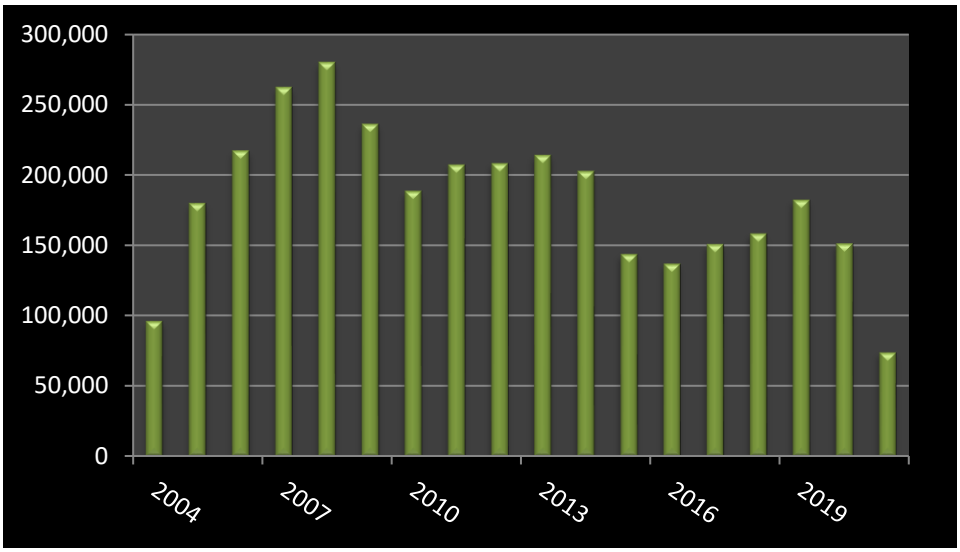

Figure 2

The total number of student contacts by the Science in Motion Consortium from visit and loans for school year 2004 through 2021.

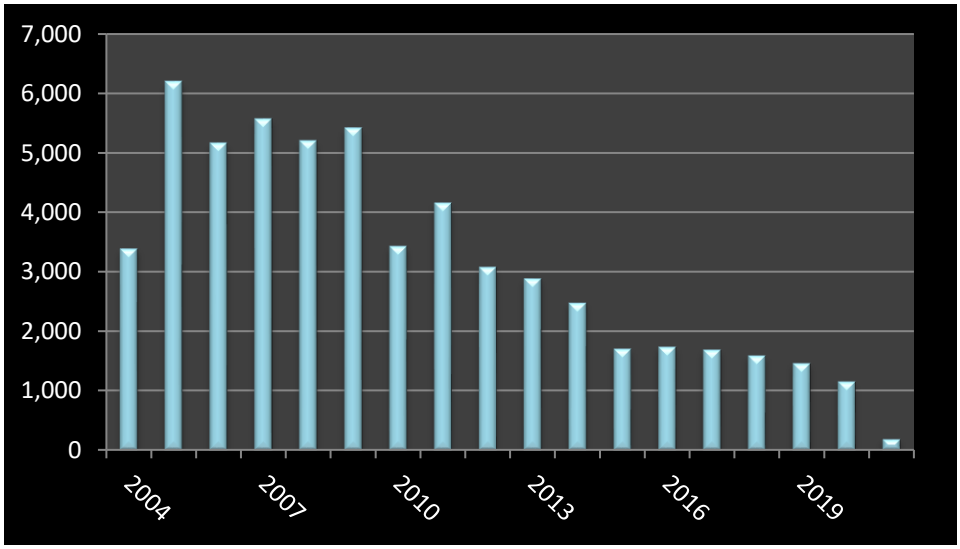

Figure 3

The total number of teaching visits by the Science in Motion Consortium Mobile educators for school year 2004 through 2021.

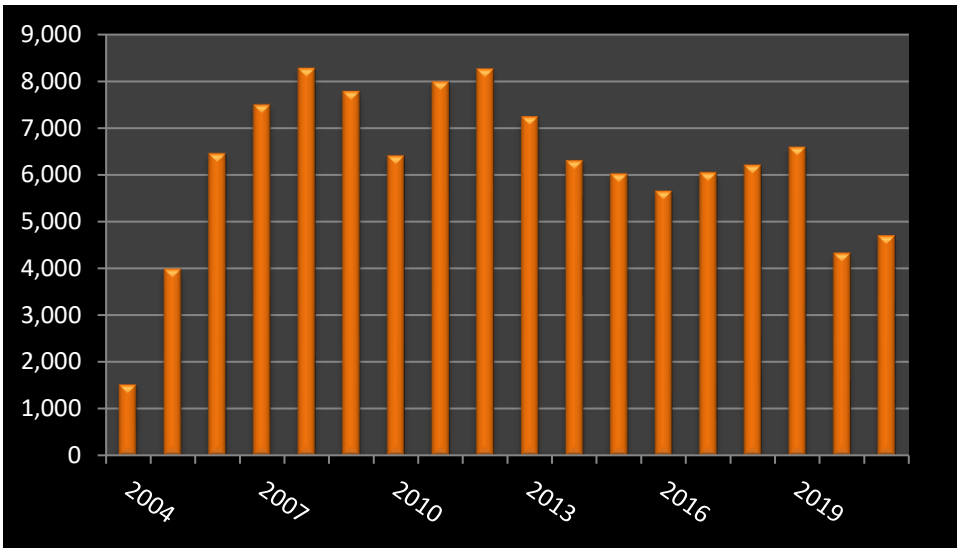

Figure 4
The total number of equipment loans by the Science in Motion Consortium for school year 2004 through 2021.

It is difficult for the SIM consortium higher education member institutions to make business decisions and adequately judge the risk involved with continuing the state partnership and hosting the SIM program at their institutions when they are unsure of budget projections on an annual basis. It has become most difficult for even the established SIM sites to keep their outstanding and experienced mobile educators from accepting other sources of employment due to annual funding uncertainties. Overall, the member institutions would be able to develop a plan and serve more teachers and students if state funding could be reliably anticipated and processed with each funding year. Discovering how much is allocated to the program after a state budget has been passed each year takes months. This makes it difficult as a business partner to determine how to budget and staff our service programs and somewhat impossible to begin service to the school at the beginning of the school year, which has been less than a month away once the confirmed budget information is received. 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, and nothing is ever guaranteed.

Capitol Day is the annual SIM Consortium event to demonstrate to state leaders the importance of science in education and, more specifically, the importance of the Science in Motion program, and provides the opportunity to showcase state-of-the art science equipment and different hands-on laboratories in the Capitol Rotunda. We were unable to hold this event spring 2021 due to the COVID-19 pandemic restrictions in place. The SIM Consortium is contractually obligated through PDE to offer and coordinate employee educator workshops throughout each fiscal year. Traditionally, there have been two workshops hosted by JC: the sharing workshop and the curriculum workshop. This year we decided to use the COVID-19 delay to our advantage and set-up a recording area in the Juniata host site for mobile educators to come record videos for virtual delivery of labs both synchronously and asynchronously for the SIM Consortium network of teachers and students to utilize. We also utilized the

Juniata College Video Production Team to tape and edit the videos of all sites that came to record. We plan to open this opportunity up for host site mobile educators next school year since many could not make it during the time we had the recording area set-up. The SIM staff members also reported being involved and helping over 45 individual students with supplies, materials, and equipment loans for science fairs and special science events such as PA Junior Academy of Science and various science/school club projects.

Science in Motion services are greatly cherished and needed by the school systems, teachers, and students that participate in the program. Many school participants have seen their service diminish and, in some cases, end over recent years. We are a unique and valued program, which cost-shares modern scientific equipment and expertise effectively among the schools we can serve. No other program in the Commonwealth delivers so much state-of-the-art science equipment and supports so many schools at so little cost. The Science in Motion host institution programs are very appreciative of the funds we have been awarded each year from state appropriations; however, they are not enough to offer a whole-hearted program. Science in Motion Consortium sites receive more requests for school service than their sites can provide with the current funding allocation and if we had the chance to change that, we have the infrastructure, knowledge and network of science teachers to do so.