

**Pennsylvania Basic Education/Higher Education  
Science and Technology Partnerships**

***SCIENCE IN MOTION***  
**&**  
***ADVANCING SCIENCE***

***2006-2007 PROGRAM REPORT:***  
***A Ten Year Report on Funding by the  
Commonwealth of Pennsylvania***

for regional service providers at:

**Cedar Crest College  
Clarion University of  
Pennsylvania  
Drexel University  
Gannon University  
Gettysburg College  
Juniata College**

**Susquehanna University  
University of Pittsburgh  
at Bradford  
Ursinus College  
Westminster College  
Wilkes University**

submitted to:

**THE COMMONWEALTH OF PENNSYLVANIA  
and the  
PENNSYLVANIA DEPARTMENT OF EDUCATION**

**August 2007**

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**Submitted To:**

**THE COMMONWEALTH OF PENNSYLVANIA  
AND THE  
PENNSYLVANIA DEPARTMENT OF EDUCATION**

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**August 2007**

**Pennsylvania Basic Education/Higher Education  
Science and Technology Partnerships  
2006-2007 PROGRAM REPORT: A Ten Year Report**

**TABLE OF CONTENTS**

<b>Executive Summary.....</b>	<b>1</b>
<b>School Districts and Schools Served in 2006-2007 (Listed by Higher Education Service Provider).....</b>	<b>5</b>
<b>Consortium Service Summary and Report.....</b>	<b>16</b>
<b>Consortium Financial Summary and Report.....</b>	<b>18</b>
<b>Supplement External Program Funding Summary.....</b>	<b>21</b>
<b>Legislation, Recommendations, and Funding History.....</b>	<b>24</b>
<b>Program Assessment.....</b>	<b>28</b>
<b>Achievements and Awards.....</b>	<b>31</b>
<b>Information Dissemination and Consortium Activities.....</b>	<b>32</b>
<b>Website.....</b>	<b>32</b>
<b>Consortium Mobile Educator Sharing Workshop.....</b>	<b>32</b>
<b>Conferences.....</b>	<b>32</b>
<b>Appendices</b>	
<b>Appendix A: Cost Savings Analysis.....</b>	<b>A1</b>
<b>Appendix B: Pending Legislation.....</b>	<b>B1</b>
<b>Appendix C: 2002-2003 Program Assessment.....</b>	<b>C1</b>

## **EXECUTIVE SUMMARY**

The Pennsylvania Basic Education/Higher Education Science and Technology Partnership Program was first funded by the Commonwealth of Pennsylvania at Juniata College in 1997. This high school science outreach program was expanded by 2001 to include a consortium of ten Science In Motion programs and one Advancing Science outreach program (SIM/AS). These SIM/AS programs are supported by 11 Pennsylvania colleges and universities and serve over 40% of the Commonwealth's school districts as well as numerous private and parochial schools. During the 2006-2007 fiscal year, the consortium provided outreach support to 776 teachers in 331 public, private, and parochial schools, reaching 204 school districts.

The Pennsylvania institutions of higher education serving as the hubs of these programs are: Cedar Crest College, Clarion University of Pennsylvania, Drexel University, Gannon University, Gettysburg College, Juniata College, Susquehanna University, University of Pittsburgh at Bradford, Ursinus College, Westminster College, and Wilkes University.

### **Consortium Service Report and Summary**

The Service Report and Summary (page 16) contains activity statistics for the statewide consortium. SIM/AS Mobile Educators supported 5,567 classes during the 2006-2007 fiscal year. Equipment loans and prepared experiments were delivered to an additional 7,492 classrooms. Altogether, 262,566 student experiences were provided through SIM/AS programs. These total service levels reflect an 8% increase in the number of classes taught and a 14% increase in the number of equipment loans provided relative to the service levels provided in the previous fiscal year.

### **Consortium Financial Report and Summary**

Consortium services were optimized during the 2006-2007 academic year by the prompt processing of contracts. The five-year contracting process established by the PA Department of Education in 2002, in conjunction with the timely passing of the state budget, enabled the 2006-2007 contract renewals to be processed with minimal paperwork. Staff layoffs, which had been encountered during previous years due to contract delays, were avoided. Contracts for the 2007-2008 fiscal year, which will require the initiation of new contracts, are now underway.

The Financial Report and Summary (page 18) provides expenditure information for the SIM/AS consortium. All awards for the 2006-2007 fiscal year continued to be based on an 80% funding level of the \$200,000 budget required to support a

single subject (chemistry or biology). Eight sites (Clarion University of Pennsylvania, Drexel University, Gannon University, Gettysburg College, University of Pittsburgh at Bradford, Ursinus College, Westminster College, and Wilkes University) received appropriations for service in one-subject area (\$160,000 allocations). Juniata College and Susquehanna University received an allocation \$320,000 to support two subject areas. Cedar Crest College continued for a third year to be funded at 40% the level of a single subject, receiving only \$80,000. Juniata College also received a \$270,000 allocation for consortium coordinating activities and continuation of a middle school pilot project.

Service reports showed that most sites served more than one subject area. This is possible because many of the sites that were funded to cover only one subject area have extended their services to a second subject by securing supplemental funding sources, serving smaller student populations (due to low population densities in the more rural areas), or serving larger student populations less frequently in each subject.

Individual site service reports are not provided herein because inadequate data is available to ensure an appropriate interpretation with respect to individual site efficacy. The Budget Summary report reflects only funds appropriated to each site by the Commonwealth and awarded through the Pennsylvania Department of Education; the amount of funding available at each site from other sources may vary significantly as suggested by the reported \$383,994 of external funding (page 21). In addition, the many issues that contribute to diversity among the schools served by the consortium impact the efficiency with which individual consortium sites are able to implement services. Differences such as distances between schools and the individual wealth of schools served can significantly impact both the number of visits that can be made by mobile educators in a given day and the extent of the computer support, equipment, materials and supplies that must be provided to poorer schools.

### **Program Assessment**

Assessment initiatives in 2006-2007 included 1) pre-test/post-tests of student learning associated with individual SIM/AS teaching models and 2) surveys of teacher attitudes toward SIM/AS. These assessments are being coordinated internally by Dr. Charles Yohn, Interim Co-Director for Science Outreach at Juniata College. External, independent third-party review was conducted by the following consultants: Dr. Paul Bell, Professor Emeritus of Education from Penn State University, and Dr. KB Boomer, former Director of the Penn State Statistical Consulting Center and current Assistant Professor at Bucknell University.

## **Information Dissemination and Consortium Activities**

The Pennsylvania Basic Education/Higher Education Partnership portal at [www.scienceinmotion.org](http://www.scienceinmotion.org) continues to provide links to each of the eleven programs around the state. Each higher ed partner in the consortium continues to maintain and update individual websites to support their activities. Teachers are able to use these websites to find information on the laboratory equipment and activities available to them through the consortium and to access lesson plans for these activities.

Consortium members also disseminate information through workshops and presentations at meetings of the Pennsylvania Science Teacher's Association, National Science Teachers Association, ChemEd, American Chemical Society, and the national meeting of science outreach programs held annually at North Carolina State University.

All consortium members hold regular regional teacher workshops during the academic year and during the summer. Summer activities involve week-long introductory and advanced workshops in both chemistry and biology. One-day workshops are frequently offered on special topics during the academic year. SIM/AS programs also support in-service activities for school districts across the Commonwealth.

The mobile educators employed by the SIM/AS consortium also participate in an annual two-day SIM/AS Sharing Workshop each September. This provides a venue for exchange of newly-developed lab activities and training with new equipment, providing a network for disseminating activities and information to teachers across the Commonwealth.

During the week of May 21-25, 2007, the first SIM/AS curriculum workshop was held at the Juniata College Raystown Field Station. Seven directors and fourteen mobile educators participated. Outcomes included:

- Professional development on modifying labs to advance inquiry
- Establishment of a standard SIM/AS laboratory classroom format
- Draft of the most popular 20 SIM/AS laboratory activities in the standardized format

## **Conclusions and Legislative Recommendations**

Faculty and staff at the current SIM/AS sites continue to receive more requests for classroom support than can be served with the current \$2.27 million dollar appropriation. Requests also continue to be received from teachers in schools around the state that are not within the service area of current consortium programs. Such requests are frequently received during the Pennsylvania Science Teacher's Association meeting and Pennsylvania Governor's Institute for Life Sciences. The list of higher education institutions willing to establish programs to serve additional schools continues to grow. Duquesne University,

Elizabethtown College, Pennsylvania Technical College, Shippensburg University, St. Vincent's College of Pennsylvania, Washington and Jefferson College, and Waynesburg College have all shown interest in establishing programs under the Science In Motion model.

Legislation to support and expand Pennsylvania Basic Education/Higher Education Partnership Programs through creation of Science and Technology Partnerships has been introduced in legislative sessions for the past five year. Current pending bills include SB472 (referred to the Education committee on March 19, 2007) and HB1227 (referred to the Education committee on May 4, 2007).

# **SCHOOL DISTRICTS & SCHOOLS SERVED in 2006-2007**

(Listed alphabetically by HIGHER EDUCATION SERVICE PROVIDER)

## **1. Cedar Crest College**

### ***School Districts Served***

Allentown SD  
Bangor SD  
Bethlehem SD  
Catssauqua SD  
East Penn SD  
Easton SD  
Jim Thorpe SD  
Lehighton SD  
Northern Lehigh SD  
Northwestern Lehigh SD  
Palmerton SD  
Panther Valley SD  
Parkland SD  
Salisbury SD  
Southern Lehigh SD  
Whitehall-Copley SD

### ***Other Schools Served***

Carbon County Vo-Tech  
Lehigh County Vo-Tech

## 2. Clarion University

### ***School Districts Served***

Allegheny-Clarion Valley SD  
Armstrong Area SD  
Brockway SD  
Brookville SD  
Clarion SD  
Clarion-Limestone SD  
Cranberry SD  
DuBois SD  
East Forest SD  
Franklin SD  
Keystone SD  
North Clarion SD  
Oil City SD  
Punxsutawney SD  
Redbank SD  
Rocky Grove SD  
Titusville SD  
Union SD  
West Forest SD

### ***Other Schools Served***

Clarion County Career Center  
Jefferson County Vocational Technical School  
Venango Christian High School  
Saint Patrick Parochial School

**3. Drexel University**

***School Districts Served:***

City of Philadelphia SD High Schools

Abraham Lincoln

Bartram Motivational

Benjamin Franklin

Central

Edward Bok Voc-Tech (migrant workers)

Frankford

George Washington

George Washington Carver

Girls' High School

Leed's Military Academy

Mastbaum

Masterman High School

Parkway Northwest High School of Peace and Justice

Roxborough

West Philadelphia

William Bodine

William Penn

Young Women's Leadership School at Rhodes

City of Philadelphia SD Middle Schools

Masterman Middle School

***Other Schools Served***

City Center Academy

Germantown Friends School

St. Hubert's High School

**4. Gannon University**

***School Districts Served***

Corry SD

Erie SD

East High

Central High

Strong Vincent High

Northwest Pennsylvania Colligate Academy

Harbor Creek SD

Iroquois SD

McDowell SD

North East SD

Seneca SD

Union City SD

***Other Schools Served***

Cathedral Prep

Mercyhurst Prep

Villa Maria Academy

**5. Gettysburg College**

***School Districts Served***

Camp Hill SD  
Central Dauphin SD  
Chambersburg Area SD  
Conewago Valley SD  
East Pennsboro SD  
Gettysburg Area SD  
Greenwood SD  
Halifax SD  
Hanover Public SD  
Halifax SD  
Lower Dauphin SD  
Middletown SD  
Northern York SD  
Shippensburg Area SD  
South Middleton SD  
South Western SD  
Southern York County SD  
Spring Grove Area SD  
Steelton-Highspire SD  
Susquehanna Township SD  
Upper Dauphin Area SD  
Upper Adams SD  
Waynesboro SD  
West Perry SD  
West Shore SD  
York City SD  
York Suburban SD

***School Districts Served***

***Other Schools Served***

Adams County Christian Academy  
Carlisle Christian Academy  
Diocese of Harrisburg Catholic Schools  
Harrisburg Academy  
Hershey Christian School  
Littlestown Christian Academy  
Montessori Academy of Chambersburg  
Shalom Christian Academy

**6. Juniata College**

***School Districts Served***

Altoona Area SD  
Bald Eagle Area SD  
Bellefonte Area SD  
Bellwood-Antis SD  
Claysburg-Kimmel SD  
Everett Area SD  
Forbes Road SD  
Glendale SD  
Hollidaysburg Area SD  
Huntingdon Area SD  
Juniata Valley SD  
Mifflin County SD  
Mount Union SD  
Northern Bedford County SD  
Penns Valley SD  
Southern Huntingdon SD  
Spring Cove SD  
State College Area SD  
Tussey Mountain SD  
Tyrone Area SD  
West Branch SD  
Williamsburg Community SD

***Other Schools Served***

Belleville Mennonite  
Bishop-Guilfoyle  
Calvary Christian  
Grier School  
Mifflin County Christian

## 7. Susquehanna University

### ***School Districts Served***

Berwick SD  
Bloomsburg Area SD  
Central Columbia SD  
Danville SD  
East Juniata SD  
East Lycoming SD  
Jersey Shore SD  
Juniata SD  
Lewisburg SD  
Line Mountain SD  
Loyalsock SD  
Mifflinburg Area SD  
Milton Area SD  
Millville Area SD  
Montoursville SD  
Mt. Carmel Area SD  
Muncy SD  
North Schuylkill SD  
Selinsgrove SD  
Shamokin SD  
Shikellamy SD  
South Williamsport SD  
Southern Columbia SD  
Tri-Valley SD  
Warrior Run SD  
Williamsport Area SD

### ***Other Schools Served***

Bloomsburg Christian School  
Columbia Montour Vocational Technical Schools  
Meadowbrook Christian  
Sunbury Christian Academy

**8. University of Pittsburgh at Bradford**

***School Districts Served***

Austin SD  
Bradford SD  
Cameron County SD  
Coudersport SD  
Galeton SD  
Johnsonburg SD  
Kane Area SD  
Northern Potter SD  
Oswayo Valley SD  
Otto-Eldred SD  
Port Allegany SD  
Ridgway SD  
Smethport SD  
St. Marys SD  
Warren County SD

***Other Schools Served***

Elk County Catholic  
St. Bernard Elementary/Middle School  
The Learning Center  
Bradford Area Christian Academy  
Beacon Light Behavioral Health Systems

**9. Ursinus College**

***School Districts Served***

Boyertown Area SD  
Cheltenham SD  
Coatesville Area SD  
Daniel Boone SD  
Downingtown Area SD  
Great Valley SD  
Methacton SD  
Norristown Area SD  
North Penn SD  
Oley SD  
Owen J Roberts SD  
Pennridge SD  
Perkiomen Valley SD  
Phoenixville Area SD  
Pottsgrove SD  
Pottstown SD  
Souderton Area SD  
Spring-Ford SD  
Tredyffrin-Easttown SD  
Twin Valley SD  
Unionville-Chadds Ford SD  
William Penn SD  
Wyomissing Area SD

***Other Schools Served***

Montgomery County Youth Detention Center Schools  
Renaissance Charter School  
Souderton Charter School

**10. Westminster College**

***School Districts Served***

Farrell SD  
Grove City SD  
Hermitage SD  
Highlands SD  
Jamestown SD  
Lakeview SD  
Laurel SD  
Leachberg Area SD  
Mercer SD  
Mohawk SD  
Moon Area SD  
Neshannock SD  
New Castle SD  
North Allegheny SD  
Penn Crest SD  
Pine-Richland SD  
Seneca Valley SD  
Sharon SD  
Sharpsville SD  
Slippery Rock SD  
Wilmington SD

***Other Schools Served***

Central Catholic High School  
Evangel Heights Christian  
Grove City Christian Academy  
Kennedy Catholic

## 11. Wilkes University

### ***School Districts Served***

Abington Heights SD  
Carbondale SD  
Crestwood SD  
Dallas SD  
Dunmore SD  
Greater Nanticoke SD  
Hanover SD  
Hazleton SD  
Lackawanna Trail SD  
Lakeland SD  
Lake-Lehman SD  
Mid Valley SD  
North Pocono SD  
Northwest Area SD  
Old Forge SD  
Pittston SD  
Pocono Mountain SD  
Riverside SD  
Scranton SD  
Tunkhannock SD  
Valley View SD  
Wilkes-Barre Area SD  
Wyoming Area SD  
Wyoming Valley West SD

### ***Other Schools Served***

Bishop Hoban High School  
Bishop Hannon High School  
Bishop O'Reilly  
Scranton Prep  
Seton Catholic

## CONSORTIUM SERVICE SUMMARY AND REPORT

The following page is a summary of the services provided by the Pennsylvania Basic Education/Higher Education Science and Technology Partnership during the 2006-2007 fiscal year. The summary service report shows that SIM/AS Mobile Educators visited and taught 5,567 classes, an 8% increase over the previous year. Equipment loans accompanied by prepared experiments were delivered to an additional 7,495 classrooms, a 14% increase over the previous year. The number of schools served increased from 307 in 2005-2006 to 337 in 2006-2007. Altogether, there were 262,566 student experiences using the resources provided by the SIM/AS programs. A student experience is defined as one 40-60 minute class period.

The service record for 2006-2007 reflects continuing increases in service levels as the eleven sites continue to mature. However the rate of increase is beginning to plateau as all current service providers are becoming saturated with requests.

Increased funding is needed to serve all the requests received. Current service levels are constrained by funding has had no increase for inflation in 10 years. Deferred equipment repairs and maintenance are now forcing some sights to reduce services in order to cover essential operating expenses.

Service records are not provided herein for individual sites because the differing funding levels and the varied challenges to educational equity in the schools served by each location make such comparisons difficult to interpret. For example, sites serving rural areas with lower population densities must meet the challenges of larger travel distances between schools. Urban sites meet the challenges of traffic, parking, and student crowding. Sites serving poorer districts have more time invested in lab preparation when schools fail to have basic utilities, such as running water, in science classrooms. All sites address, to varying degrees depending on the cumulative wealth of the area, the challenge of poorly-equipped science classrooms. Large variations in resources are encountered among schools found within each of the individual service areas. In addition, the total operating budgets vary at every site.

Due to 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 renewed. It is becoming 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.



## CONSORTIUM FINANCIAL SUMMARY AND REPORT

The summary financial report on page 20 shows how the \$2,270,000 state appropriation for 2006-2007 was expended by the Pennsylvania Basic Education/Higher Education Science and Technology Partnership Programs. These funds were allocated to individual sites as shown in Table 1.

Table 1: Allocation of 2006-2007 Pennsylvania Basic Education/Higher Education Science and Technology Partnership Appropriation.

INSTITUTION	ALLOCATION
Cedar Crest College	\$80,000
Clarion University of Pennsylvania	\$160,000
Drexel University	\$160,000
Gannon University	\$160,000
Gettysburg College	\$160,000
Juniata College	\$320,000
Susquehanna University	\$320,000
University of Pittsburgh at Bradford	\$160,000
Ursinus College	\$160,000
Westminster College	\$160,000
Wilkes University	\$160,000
Juniata College – Consortium & Middle School Pilot	\$270,000
<b>TOTAL</b>	<b>\$2,270,000</b>

The value of services and resources not charged to these state-awarded budgets and, thus, not quantified by these reports, 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 lab 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 prep area equipment including chemical hoods, autoclaves, and dishwashers;
- approved gas tank storage areas;
- van parking; and
- 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 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.

Budget information contained on the following page of this report fully reflects the funds appropriated by the Commonwealth through the Pennsylvania Science and Technology Partnerships appropriation; however, some sites have additional support through other small grants also described in the pages following the summary report. **The total of the additional supporting grants reported by all members of the consortium this fiscal year is \$383,994.**

While the consortium has been limitedly successful in finding supplemental funding for new initiatives within their outreach programs, it must be understood that the National Science Foundation (NSF) and most funding agencies refuse to fund established, proven programs such as Science In Motion, which NSF already funded for the first ten years (1987-1997). NSF officials have repeatedly reminded program directors that they fund new ideas and that when those ideas are already proven successful (i.e., Science In Motion), the support of an ongoing educational program is constitutionally a state-mandated responsibility.

In response to a legislative request, a report on the cost-efficacy of the SIM/AS model was prepared. This report, showing a minimum of a 4-fold cost savings in the cost of science education for the Commonwealth is provided in Appendix A.

**Basic Education/Higher Education Science and Technology Partnership  
Budget Summary, FY 2006-2007**

**Consortium**

**Date program started:** 1-Jul-06  
**Date first reimbursement arrived:** \_\_\_\_\_

**Administrative Salaries**

Project Administration	
Director(s), academic year and summer	<u>\$253,089</u>
Office Staff	
Secretarial/Project Management/Budget	<u>\$180,387</u>

**Educational Services Salaries**

Mobile Educator: 1st subject area	
Classroom and professional development services	<u>\$423,888</u>
Mobile Educator: 2nd subject area	
Classroom and professional development services	<u>\$197,742</u>
Mobile Educator: Other subjects	<u>\$9,454</u>
Equipment Manager(s)	
Equipment delivery oversight and summer maintenance	<u>\$63,007</u>
College Faculty: Subject Area/Education Advisors	
Content, Continuing Ed, and Assessment	<u>\$18,649</u>
Area Teachers: Content Lead Teachers	700
Student Assistants	
Assists in lab prep, materials, summer workshops	<u>\$48,758</u>

**Total salaries and wages** \_\_\_\_\_ \$1,195,674

**Fringe Benefits** \_\_\_\_\_ \$288,122

**Consortium Support:** \_\_\_\_\_ \$130,604

**Operating Expenses: to provide Project services**

Science vehicles	
Van Expense	
Vehicle fuel, upkeep	<u>\$68,043</u>
Instructional Supplies	
Instruments; expendable materials	<u>\$320,625</u>
Science instrument repair and maintenance	<u>\$8,513</u>
Project Office expense	
Telephone, photocopies, postage	<u>\$45,819</u>
Travel support	
Staff travel expense; Lead Teacher mileage	<u>\$20,484</u>
Miscellaneous Expense	
Professional fees, licensing, etc.	<u>\$12,702</u>

\$476,186

**Teacher Support: new technology and content**

Teacher conference support	<u>\$2,526</u>
Science Fair support	<u>\$1,080</u>
Summer Workshop (professional development)	
Planning and module development	<u>\$1,269</u>
Attendee stipends	<u>\$42,320</u>
Housing and meals	<u>\$19,867</u>
Facilities, activities, materials expense	<u>\$10,357</u>

\$77,420

**Administrative Overhead** \_\_\_\_\_ \$135,317

**Total ESTIMATED expenditures, FY 06** \_\_\_\_\_ \$2,303,323

**Total expenditures, FY 06** \_\_\_\_\_ \$2,270,000

**Institutional Contributions (not supported by external grants & gifts)**

\*2006\_07 FY appropriation totaled \$2,270,000. Overexpenditures were absorbed by these institutions:

Cedar Crest College	\$ 4,125
Drexel University	\$ 3,652
Gannon University	\$ 5,469
Juniata College	\$ 1
University of Pittsburgh at Bradford	\$ 6,502
Westminster College	\$ 13,718
Clarion University	\$ 793
Wilkes ( under spent )	\$ (937)
<b>Total Institutional Contributions</b>	<u>\$ 33,323</u>

## **SUPPLEMENTAL EXTERNAL PROGRAM FUNDING SUMMARY**

(Grants & gifts listed alphabetically by higher education service provider.)

**Consortium Total = \$383,994**

### **1. Drexel University (Total = \$55,000)**

Funding Source: **Chiron Foundation**

Funding Awarded: **\$10,000**

Funding Period: **July 1, 2006 – June 30, 2007**

Spending Restrictions (if any): To expand the Science In Motion Outreach Program; may be spent on personnel expenses only.

Special Notes: Funds spent were used for a part-time mobile educator to expand the Drexel University Science In Motion program to reach more Philadelphia schools.

Funding Source: **GlaxoSmithKline**

Funding Awarded: **\$40,000**

Funding Period: **July 1, 2006 – June 30, 2007**

Spending Restrictions (if any): To support middle and high school outreach; \$37,500 spent on equipment and supplies and \$2,500 allocated for a part-time mobile educator.

Funding Source: **Christopher Ludwick Foundation**

Funding Awarded: **\$5,000**

Funding Period: **July 1, 2006 – June 30, 2007**

Spending Restrictions: To expand the Science In Motion Outreach Program; may be spent on personnel expenses only.

Special Notes: Funds spent were used for a part-time mobile educator to expand the Drexel University Science In Motion program to reach more Philadelphia schools.

### **2. Gettysburg College (Total = \$156,600)**

Funding Source: **NOAA B-Wet**

Amount Awarded: **\$130,000**

Funding Period: **July 1, 2006 – June 30, 2007**

Spending Restrictions (if any): Funds spent during the 2006-2007 FY were used to provide services for the Chesapeake Bay Watershed Program, including a Mobile Educator, workshop costs, teacher stipends, van fuel, and equipment.

Funding Source: **School Districts throughout our Service Area**

Amount Awarded: **\$6,600**

Funding Period: **September 1, 2006 – June 30, 2007**

Spending Restrictions (if any): Funds spent during the 2006-2007 FY were used to provide services to individual schools. Due to a perennially under funded state budget, *Advancing Science* was forced to charge for services during the 2006-2007 school year. Schools were asked to pay a nominal fee to help defer the cost of *Advancing Science* visits and loans.

Funding Source: **The Tyco Electronics Foundation**

Amount Awarded: **\$20,000**

Funding Period: **January 1, 2007 – June 30, 2007**

Spending Restrictions (if any): Funds spent during the 2006-2007 FY were used to provide services for grades K-4 and to supplement state allocation by providing funds for part time Mobile Educators, expendable materials, and Lead Teacher stipends.

### **3. Juniata College (\$107,500)**

Funding Source: **DC Goodman & Sons**

Funding Awarded: **\$40,000**

Funding Period: **June 1, 2006 – May 31, 2007**

Spending Restrictions (if any): For equipment, materials & supplies for secondary science outreach activities.

Funding Source: **GlaxoSmithKline**

Funding Awarded: **\$40,000**

Funding Period: **July 1, 2006 – June 30, 2007**

Spending Restrictions (if any): For equipment, materials & supplies for secondary science outreach activities.

Funding Source: **Kish Bank**

Funding Awarded: **\$5,000**

Funding Period: **June 1, 2006 – May 31, 2007**

Spending Restrictions (if any): For equipment, materials & supplies for secondary science outreach activities.

Funding Source: **PNC Bank**

Funding Awarded: **\$2,500**

Funding Period: **June 1, 2006 – May 31, 2007**

Spending Restrictions (if any): For equipment, materials & supplies for secondary science outreach activities.

Funding Source: **Lititz Mutual Insurance Company**

Funding Awarded: **\$10,000**

Funding Period: **June 1, 2006 – May 31, 2007**

Funding Expended: **\$10,000**

Spending Restrictions (if any): For equipment, materials & supplies for secondary science outreach activities.

Funding Source: **Martin Limestone Company**

Funding Awarded: **\$10,000**

Funding Period: **June 1, 2006 – May 31, 2007**

Spending Restrictions (if any): For equipment, materials & supplies for secondary science outreach activities.

Funding Source: **Extended service to Bedford County Vocational Technical School**

Funding Awarded: **\$2,500**

Funding Period: **April 16, 2007 – June 10, 2007**

Spending Restrictions (if any): For special Biology and Technical Lab visits

### **4. Susquehanna University (Total = \$55,000)**

Funding Source: **Chesapeake Bay Commission**

Amount Awarded: **\$55,000**

Funding Period: **June 6, 2006 through July 31, 2007**

Spending Restrictions (if any): To be used for the SIM-SRBC Water Quality Project

Source: **ConAgra Foods Inc.**

Equipment Donation: Autoclave, steam washer, glassware drying racks, and balance

Date of Donation: March 19, 2007

**5. University of Pittsburgh at Bradford (Total = \$9,894)**

Funding Source: **Alcohol & Drug Abuse Services, Inc.**

Amount Awarded: **\$8,102.00**

Funding Period: **July 1, 2006 – June 30, 2007**

Spending Restrictions (if any): The purpose of this grant was to demonstrate the effects of nicotine on living organisms to 5th and 6th grade students in McKean County. We did this by conducting labs showing the effects of nicotine on Daphnia Magna and California Blackworms.

Funding Source: **Bradford Area School District**

Amount Awarded: **\$1,791.75**

Funding Period: **May 2007**

Spending Restrictions: Funds provided for materials needed to conduct special science program for all 6th grade students at Floyd C. Fretz Middle School in Bradford. We showed the students labs using GPS units, UV beads, wind tunnels, FACES forensic face reconstruction program on laptop computers, making of polymers “slime”, and spec 20's.

## **LEGISLATION, RECOMMENDATIONS, AND FUNDING HISTORY**

### **Pending Pennsylvania Legislation**

Legislation making the Pennsylvania Basic Education/Higher Education Partnership part of the Pennsylvania School Code is needed to provide maximum efficacy of services in the state. Without codification of the program, Mobile Educators have little job security and difficulty maintaining their state certification. This uncertainty leads to the loss of well-trained staff members and delays in service startups at the beginning of each new academic year.

During each legislative session over the past ten years, bills have been introduced routinely by both the House and the Senate to support SIM/AS funding, but none have made it into law. Appendix B of this report provides copies of the following bills that are under current consideration:

SB 472 – Proposes to amend the public school code by adding an article to provide for funding of Science and Technology Partnerships through grants administered by the Department of Education. Partnerships would consist of an institution of higher education and at least three public schools or school districts. This bill is currently under consideration by the Senate Education Committee, where it was referred on March 19, 2007.

HB 1227 –Provides for Science and Technology Partnership Grants to be administered by the PA Department of Education. Grants would be available in the amount of \$200,000 per subject area, including chemistry, biology, physics, and earth and space science. This bill is currently under consideration by the House Education Committee, where it was referred on May 4, 2007.

### **Governor's Commission for College and Career Success**

Governor Ed Rendell appointed a commission during the fall of 2005 to produce a report by December 2006 containing recommendations for producing high school graduates who would be prepared to meet the workforce demands of the Commonwealth's economy. Science In Motion was recognized as a model for the type of partnerships needed to improve science education in Pennsylvania.

Recommendation 9 of the commission's report (page 18) reads:

“Establish new regional alliances of business, high schools, and higher education institutions where necessary and more fully utilize existing alliances to address specific challenges in preparing students to be college and career ready. These challenges, perhaps unique to specific regions, will be overcome most effectively with local stakeholders working in concert with statewide efforts to achieve college and career readiness.”

The report concludes, “There are several creative and effective partnership models in Pennsylvania that can serve as models of school improvement infrastructures. Examples include: Science In Motion,…”

The complete report can be accessed at  
[http://www.pde.state.pa.us/stateboard\\_ed/cwp/view.asp?Q=126850&A=3](http://www.pde.state.pa.us/stateboard_ed/cwp/view.asp?Q=126850&A=3).

### **Past Legislative Recommendations and Actions**

Recognition of the benefits of the Science In Motion model for Basic Education/Higher Education Science and Technology Partnerships began in 1994 with a Senate Select Committee on the Structure and Financing of Public Education in the Commonwealth. Since this time, the partnership has received numerous citations, awards and other forms of recognition, suggesting the need to make these programs an integral part of the Commonwealth’s educational system.

### **Senate Select Committee To Study The Structure And Financing Of Public Education In The Commonwealth (1994)**

Two of the four policy recommendations in this report refer to Science In Motion:

- Policy Implication 3 – “Resource-Based Education Funding,” Juniata College’s *Chemistry In Motion* (the predecessor of “Science In Motion”) was cited as a resource-based cost-effective model for science education.
- Policy Implication 4 – “Fostering Cooperative Agreements” also cited *Chemistry in Motion* as a model for improving educational opportunities for school children through basic education/higher education partnerships.

### **Keystone Commission On Education For Employment in the 21st Century (2001)**

The Pennsylvania House of Representatives formed a bipartisan commission to study workforce preparation in the state. Recommendation #24 of the December 1, 2001 report states: “The commission recommends that the Commonwealth provide full and permanent funding of the Science In Motion partnership between institutions of higher education and school districts that provide advanced learning opportunities for students and professional development for teachers; and, that the Commonwealth provide incentives for institutions of higher education to establish partnerships with school districts on a regional basis.”

### **Council Of State Governments 2003 Innovation Award (2003)**

The Pennsylvania Basic Education/Higher Education Science and Technology Partnership consortium received national recognition as one of eight winners of the 2003 Innovation Awards presented by the Council of State Governments (CSG). These awards are presented to recognize successful, cost-effective programs funded by state government. A presentation was made to the national judging panel in New York City on September 11, 2003. The award was received October 24, 2003 at the CSG national meeting in Pittsburgh, PA. More information on this prestigious award program is available at [www.csg.org](http://www.csg.org).

### **Pennsylvania House Of Representatives' Commission On Rural Education Recommendation (2003)**

The Pennsylvania House of Representatives formed a 25-member bipartisan Pennsylvania Commission on Rural Education (CORE) with the passing of House Resolution 8 on February 11, 2003. The resolution established the CORE to "examine and study the status of rural education in this Commonwealth and make recommendation for enhancing the quality of education in rural communities."

The final report of the commission was released June, 2004 and contains 32 final recommendations. Recommendation #11 of Section C: Meeting the Challenges of "No Child Left Behind" reads:

11. The Commission recommends that the General Assembly should enact legislation establishing a basic education-higher education science technology partnership, such as the Science In Motion Program, in order to expose rural students to the world of science. (adopted 21-0)

### **Pennsylvania Funding**

The PA Basic Education/Higher Education Science and Technology Partnership was funded by the Pennsylvania legislature for the first time in 1997-1998. This first year appropriation was for the founding site at Juniata College after the program had been developed and tested with ten years of prior funding (1987-1997) by the National Science Foundation.

In 1999-2000, an additional eight higher education sites (Clarion University of Pennsylvania, Drexel University, Gannon University, Gettysburg College, University of Pittsburgh at Bradford, Ursinus College, Westminster College, and Wilkes University) were funded as service providers. Each new site was provided with a \$200,000 allocation to begin serving one subject area or to expand existing services.

Two additional sites (Cedar Crest College and Susquehanna University) were added in 2001-2002 to make the total number of higher education partners equal the current eleven members. The total original appropriation for 2001-2002 was

\$2,500,000, which was allocated as follows: Juniata College and Susquehanna University at \$400,000 each; Clarion University of Pennsylvania, Drexel University, Gannon University, Gettysburg College, University of Pittsburgh at Bradford, Ursinus College, Westminster College, and Wilkes University at \$200,000 each; and Cedar Crest College at \$100,000. During the same year, however, statewide 20% across-the-board budget reductions reduced these amounts to \$320,000, \$160,000, and \$80,000 respectively. These funding levels have remained flat, at the reduced level, since that time. Table 2 provides a summary of this awarded funding history.

Table 2: Pennsylvania Basic Education/Higher Education Science and Technology Partnership Appropriation History

Fiscal Year	Total Allocation	Site(s)
1997-1998	\$ 350,000	Juniata only
1998-1999	\$ 400,000	Juniata only
1999-2000	\$ 2,000,000	Original nine consortium sites*
2000-2001	\$ 2,000,000	Original nine consortium sites*
2001-2002	\$ 2,000,000	Original nine consortium plus Cedar Crest and Susquehanna**
2002-2003	\$ 2,000,000	Continuing eleven consortium sites
2003-2004	\$ 2,000,000	Continuing eleven consortium sites
2004-2005	\$ 2,050,000	Continuing eleven consortium sites
2005-2006	\$ 2,000,000	Continuing eleven consortium sites
2006-2007	\$ 2,270,000	Continuing eleven consortium sites
2007-2008	\$ 2,270,000	Continuing eleven consortium sites (contracts pending)

\*The original consortium members include Clarion University of Pennsylvania, Drexel University, Gannon University, Gettysburg College, Juniata College, University of Pittsburgh at Bradford, Ursinus College, Westminster College, and Wilkes University.

\*\*\$2,500,000 was originally appropriated; all sites shared a statewide 20% budget reduction.

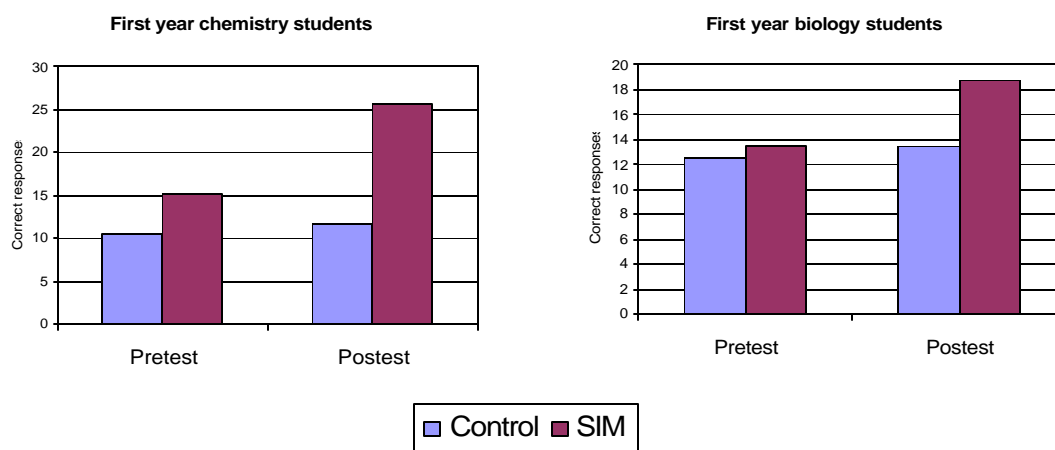
All sites have struggled to maintain a high level of service despite flat funding and individual funding reductions during the past seven years. [Note: \$50,000 of the 2004-2005 allocation was for a specific item of equipment and did not represent a general appropriation increase.] Other sources of grants, 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.

## PROGRAM ASSESSMENT

Assessment initiatives in 2006-2007 included 1) pre-test/post-tests of student learning associated with individual SIM/AS teaching models and 2) surveys of teacher attitudes toward SIM/AS. These assessments are being coordinated internally by Dr. Charles Yohn, Interim Co-Director for Science Outreach at Juniata College. External, independent third-party review was conducted by the following consultants: Dr. Paul Bell, Professor Emeritus of Education from Penn State University, and Dr. KB Boomer, former Director of the Penn State Statistical Consulting Center and current Assistant Professor at Bucknell University.

### Assessment History

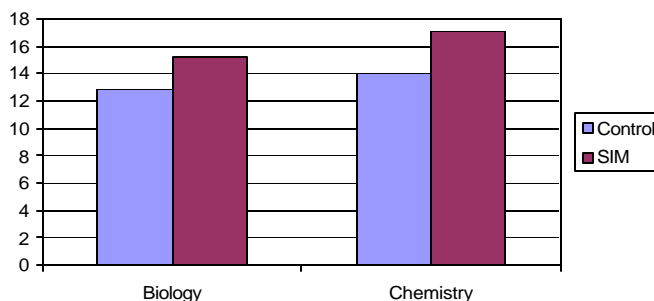
The third-party, independent assessment of program impact on student learning began ten years ago under the direction of Dr. Paul Bell, Professor Emeritus of Science Education at Penn State University. Preliminary results show that students at *Science In Motion* schools scored significantly higher on posttests than did students in non-SIM schools. Score improvements between pretests and posttests were significantly greater for SIM schools than non-SIM schools (Anderson 1998).



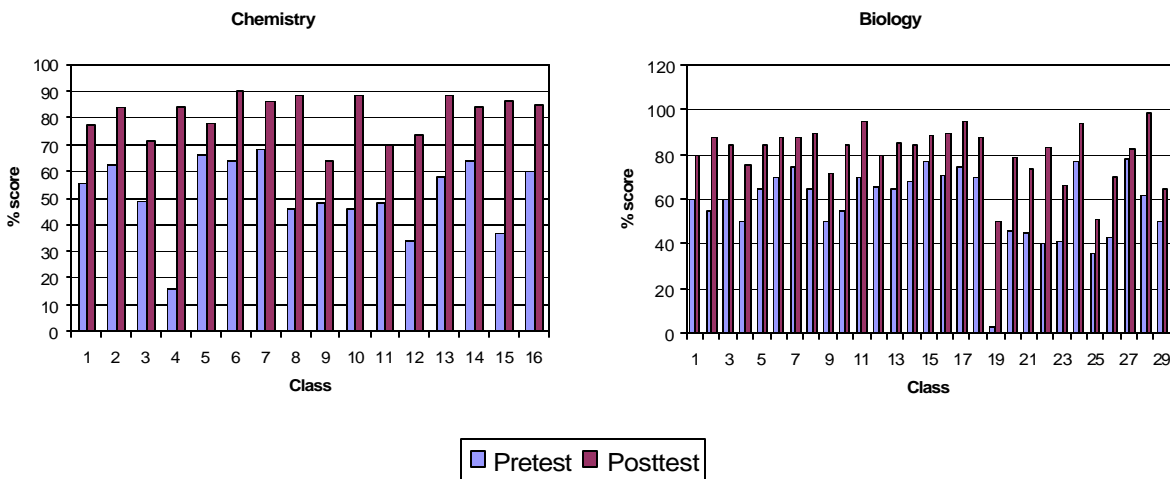
Assessment activities continue with the support of the Penn State Statistical Consulting Center, under the direction of Dr. KB Boomer. All higher education partnership faculty members, both directors and mobile educators, have devoted significant effort since the 2002-2003 academic year when the development of statewide assessment instruments began. Drs. Charles and Sharon Yohn at Juniata College now provide internal coordination and management of the testing process for the consortium. The new assessment instruments were piloted in the spring of 2003 by administration to high school students in a single chemistry and single biology class in each SIM/AS higher education site service area and to similar control classrooms not served by SIM/AS. In this limited assessment, scores were significantly higher for SIM/AS schools than control schools for both

biology and chemistry. This is despite the fact that some of the consortium sites had been established as recently as 2002. These results are summarized in the graph on the following page. Details of this analysis are provided in Appendix C.

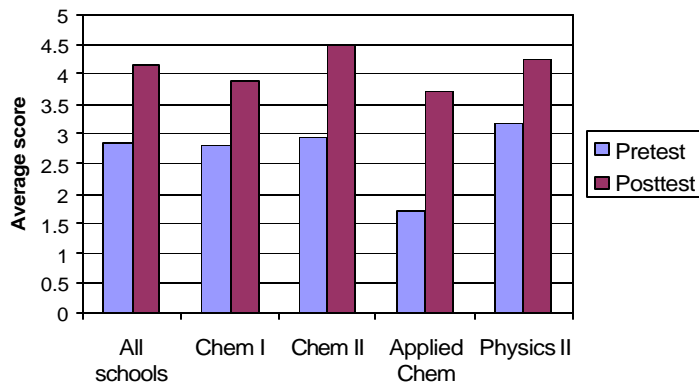
2003 post test results



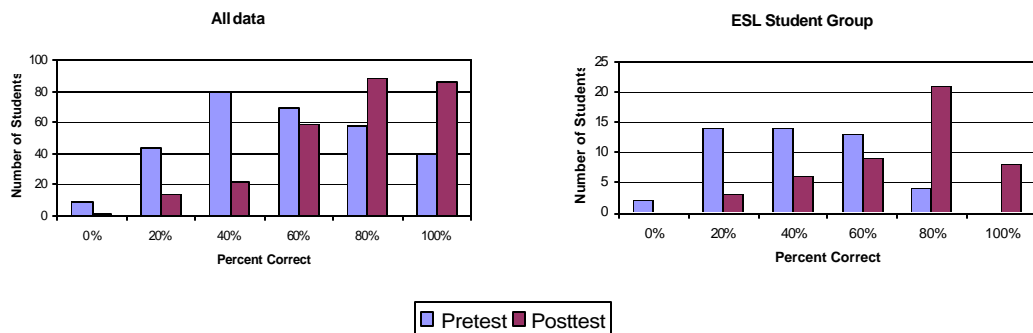
Individual laboratory modules have also been assessed to evaluate their effectiveness. Testing from 2003-2004 from five different consortium sites in chemistry and biology suggest that the labs are effectively teaching chemistry and biology concepts.



A subset of the results was also separated by type of class (Chemistry I, Chemistry II, Applied Chemistry, and Physics II). These results indicate that scores improved after the gas chromatograph laboratory exercise regardless of the type of class. Of particular note is the significant increase in scores of the Applied Chemistry class.



Results from a subset of biology *Science In Motion* data also suggests that students in an English as a Second Language class improved their scores significantly after a DNA fingerprinting lab.



Subsequently, the 2003-2004 academic year was used to refine and develop additional questions that were used to improve these assessment instruments. As part of this effort, each site began to design and implement assessments for individual laboratory activities. Five-question multiple choice quizzes were developed for individual laboratories and were used as pre-post assessments.

Biology	636	426	379	287	257	139
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## ACHIEVEMENTS AND AWARDS

Ms. Eleanor Siegrist, a recently-retired teacher from the Hollidaysburg School District, was honored as the American Chemistry Society's James Bryant Conant Award for High School Chemistry Teaching at the national meetings in Chicago, IL on March 27, 2007. Ms. Siegrist recognized Science In Motion for providing key support for her teaching activities.

Oil City students conducting research on T-Tauri stars in IC2118 presented a poster session at the American Astronomical Society Conference, Seattle WA, January 2007 -. Students are using the Perth Telescope to monitor T-Tauri Candidates.

Oil City High School students competed for and won observing time on the Kitt Peak 0.9 Meter telescope. Additional data was collected for their ongoing research of T-Tauri stars in IC2118 by the Kitt Peak Observatory, Tucson AZ, January 2007 -

Oil City teacher Tim Spuck was one of seven teachers selected nationally for the American Institute of Aeronautics and Astronautics Educator Achievement Award in 2007.

Lily Liu, a 10th Grade student in Dr. Ranjini's class at Masterman High School, had an award winning science fair project based on an experiment provided by Science In Motion at Drexel University. She received the gold medal in the George Washington Carver Science Fair and the silver medal in the Delaware Valley Science Fair, both in Spring 2006.

Mr. Rick Imler, Hollidaysburg Area School District, was named Pennsylvania's AP Teacher of the Year for 2005 by the Siemen's Foundation. Mr. Imler uses Science In Motion support from Juniata College as the source of much of the laboratory work taught in both his AP and introductory high school science courses.

Dr. Donald Mitchell, founder of Science In Motion, was named the 2004 Technology Educator of the Year for Pennsylvania by the Technology Council of Central Pennsylvania. Dr. Mitchell was selected to recognize the contributions that Science In Motion programs have made to facilitating and improving technology education for Pennsylvania students served by the program. More information on this award is available at [www.tccp.org](http://www.tccp.org).

The Pennsylvania Basic Education/Higher Education Science and Technology Partnership one of eleven regional semifinalist in the Council of State Governments' national 2003 Innovation Award program.. More information on this prestigious award program is available at [www.csg.org](http://www.csg.org).

## INFORMATION DISSEMINATION AND CONSORTIUM ACTIVITIES

### **Website**

The Basic Education/Higher Education Science and Technology Partnership consortium continues to maintain the [www.scienceinmotion.org](http://www.scienceinmotion.org) website domain. This homepage provides links to consortium member websites as well as to similar programs and resources around the country.

### **Consortium Sharing and Curriculum Workshop**

Mobile Educators from the eleven higher education sites established the first sharing workshop in June of 2003. This event continued in 2006 with a two-day workshop held September 4 and 5, 2006. The participating mobile educators rated the workshop as highly valuable for sharing laboratory activities among the sites of the statewide consortium. The fourth annual workshop is now planned for September 6 and 7, 2007.

A one-week curriculum development workshop was held May 21-25, 2007 at the Raystown Field Station. Dr. Sue Coursen of the Clarion University of Pennsylvania provided a one-day workshop on adapting activities for high levels of inquiry. Seven directors and fourteen mobile educators worked throughout the remainder of the week on adapting 20 of the most popular SIM/AS laboratory activities into a standardized format, modifying the activities when possible for increased level of inquiry.

### **Recent Invited Presentations and Conferences**

#### ***2006 PSTA Conference***

Members of the Pennsylvania Basic Education/Higher Education Science and Technology Partnership Program have an annual presence at the Pennsylvania Science Teachers Association (PSTA) in Hershey, PA. Mobile educators from several sites conducted individual hands-on workshops for teachers who attended the meeting as PSTA members. A booth was staffed in the vendor displays to provide teachers additional information about services provided by the consortium.

#### ***Bayer Best Practices in K-12 Education***

*Science In Motion* was featured as a "K-12 Best Practice" at the September 2006 in Bayer's STEM Education Diversity Forum in Arlington, VA. The conference entitled, "Bridging the Diversity Gap in Science and Engineering: Introducing STEM Industries to K-12 Best Practice Programs" attracted participants from industries across the country.

### ***Other Invited Presentations***

Invited presentations on the SIM/AS model were made at the following events:

- *UK/US Transatlantic Conference on STEM Education, Boston, MA, June 18, 2007*
- *3rd International Seminar on Teaching Nanoscience with Scanning Probe Microscopy, Chicago, IL. March 2007.*

# APPENDIX A Cost Savings Analysis

## Science in Motion: The Cost Effective Way to Deliver Science Education

Multiple national reports released since 2001 highlight the call for more students following careers in science in order to staff the workforce needed for a strong U.S. economy.<sup>1,2</sup> As national and international indicators show U.S. students performing poorly in math, science and technology education<sup>3,4</sup>, 95% percent of our teachers report that Science in Motion (SIM) makes the difference between being adequately resourced to teach science and not being adequately resourced.<sup>5</sup>

Through its shared resources model and partnerships with higher education, SIM is an extremely cost effective model to meet this resource need. 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 school districts for only \$200,000 per year. For each school to purchase these services and resources independently, the costs would include:

<i>Classroom Equipment (purchase, repair, replacement):</i> <sup>6</sup>	\$60,000
<i>Supplies and Materials:</i> <sup>7</sup>	\$1,700
<i>Part-time Mobile Educator Equivalent (15 days/yr @ \$300/day):</i> <sup>7</sup>	\$4,500
<i>Lab Prep, Set-up and Ordering Staff (10 hours/week @ \$12/hr + fringe):</i> <sup>7</sup>	\$4,882
<i>Teacher Development Workshops (2 weeks on site @ \$750/day):</i> <sup>8</sup>	\$7,500
<i>Hazardous Waste Pickups (2)</i>	\$1,000
<b>Total Annual Budget for Each School</b>	<b>\$79,582</b>
<b>Total Annual Budget for 10 School Service Area<sup>9</sup></b>	<b>\$795,820</b>

### **COST SAVINGS TO TAX PAYERS USING THE SIM APPROACH: <sup>8</sup>**

**\$795,820 - \$200,000 = \$ 595,820 / subject / site or**

**\$59,582 per school district / subject**

This represents a minimum of a 4-fold taxpayer cost-savings for just one subject area. Schools require support in three other areas as well: biology, physics and earth/space science. The estimate is conservative in every respect as it does not take into account the free infrastructure (deionized water, autoclaves, space) provided by the SIM higher ed sites. In addition, the SIM model creates a strong consortium that is able to leverage foundation and industry dollars for public schools in a manner that individual schools can not approach (\$448,041 in 2005-2006). This leverage is obtained not only through the appeal of the shared resources model, but also through the grant experience and services support available at the higher education partners. Most

importantly, the involvement of higher education faculty in teacher professional development provides a means to ensure update-to-date curricula in our schools.

## **Juniata College Science In Motion: Service and Funding Record**

### **2005-06 Service Data for grades 6-12 in the Juniata College service area:**

<i>School Districts Served:</i>	23 (see attached listing on page 2)
<i>Mobile Educator Classroom Visits:</i>	1,248
<i>Lab Drop-offs:</i>	1,303
<i>Different Teachers Served:</i>	137
<i>Student Contacts:</i>	46,000
<i>Teacher Workshops (2 weeks):</i>	60 teachers
<b><i>Annual State Contract Amount:</i></b>	<b>\$449,187 (\$608,124 = 3-year average)</b>
<i>Corporate &amp; Foundation Donations:</i>	\$86,286 (\$74,429 = 3-year average)
<b>Total Operating Budget:</b>	<b>\$535,473 (\$682,553 = 3-year average)</b>

### **Footnotes from Page 1:**

<sup>1</sup>U.S. Department of Education, *Before It's Too Late. A Report to the Nation from the National Commission on Mathematics and Science Teaching for the 21st Century*, January 2001, p.10.

<sup>2</sup>National Academies Committee on Science, Engineering, and Public Policy, *Rising Above the Gathering Storm. Energizing and Employing America for a Brighter Economic Future*, NAP Publication #11463, 2006.

<sup>3</sup>American Institutes for Research, *Reassessing U.S. International mathematics Performance: New Findings from the 2003 TIMSS and PISA*, prepared for: U.S. Department of Education Policy and Program Studies Service, November 2005.

<sup>4</sup>US Department of Education Institute for Education Sciences, *The Nations Report Card: Science 2005. National Assessment of Education Progress*, NCES publication #2006466, June 2006.

<sup>5</sup>Yohn, C, Survey of SIM teachers, unpublished results.

<sup>6</sup>A sampling of costs for chemistry equipment is provided on page 3. These costs are depreciated over 5-years, a conservative time period for computers and electronics.

<sup>7</sup>Estimated from SIM annual expenses divided by number of schools serviced.

<sup>8</sup>Based on state contract rates from commercial service providers (not SIM).

<sup>9</sup>This cost estimate is based on an optimized rural service area of 10 medium-sized school districts. The Juniata College SIM program currently serves 23 school districts and, by doing so, provides more than twice the cost efficiency calculated. However, the program cannot provide the full level of service requested by all schools because of the over-sized service area.

## BASIC CHEMISTRY EQUIPMENT

Name	Quantity	Individual Price	Total Price
<b>Automatic Pipets</b>			
Rainin pipetmen, 1000uL	32	\$250.00	\$8,000.00
Rainin pipetmen, 10mL	6	\$250.00	\$1,500.00
Rainin pipetmen, 200uL	6	\$250.00	\$1,500.00
Rainin pipetmen, 20uL	6	\$250.00	\$1,500.00
Other automatic pipets, 1000 uL	10	\$250.00	\$2,500.00
<b>Hot Plates/Stirrers</b>	32	\$200.00	\$6,400.00
<b>Microscale Kits</b>	32	\$250.00	\$8,000.00
<b>HPLC</b>	2	\$8,000.00	\$16,000.00
<b>Refractometer</b>	2	\$300.00	\$600.00
<b>Dewars</b>			
Glass Dewar, Pope Scientific	3	\$400.00	\$1,200.00
10L	5	\$800.00	\$4,000.00
4 L	2	\$500.00	\$1,000.00
<b>Conductivity Meters</b>	12	\$20.00	\$240.00
<b>Balances</b>			
Analytical	11	\$2,000.00	\$22,000.00
Top Loader	19	\$200.00	\$3,800.00
<b>pH Meters</b>			
Accumet 910	11	\$500.00	\$5,500.00
Beckman 10 pH Meter	9	\$500.00	\$4,500.00
<b>Spectrophotometers</b>			
Milton Roy Co. Spectronic 20D	18	\$1,200.00	\$21,600.00
Brandtech WPA Lightwave	6	\$7,000.00	\$42,000.00
Infrared Spectrophotometer	2	\$10,000.00	\$20,000.00
<b>Mel-Temps</b>			
Laboratory Devices Mel-Temp II	12	\$700.00	\$8,400.00
<b>Gas Chromatographs</b>			
Buck Scientific Model 310	5	\$5,000.00	\$25,000.00
<b>Scalars</b>			
	12	\$1,200.00	\$14,400.00
<b>Sun Radon monitors</b>			
	2	\$700.00	\$1,400.00
<b>Digital Thermometers</b>			
Sper Scientific 800013	6	\$150.00	\$900.00
Hanna Instruments HI8753	6	\$200.00	\$1,200.00
Flinn Scientific DT	14	\$20.00	\$280.00
<b>Microscale Thermometers</b>	17	\$20.00	\$340.00
<b>Atomic Force Microscope</b>	1	\$55,000.00	\$55,000.00
<b>Laptops, Printers, &amp; Accessories</b>			
Vernier Probes (6 or 4 types)	24	\$249.00	\$5,976.00
Palm Data Acquisition Devices	6	\$199.00	\$1,194.00
Vernier LabPro Data Interfaces	6	\$200	\$1,200
<b>GRAND TOTAL</b>			<b>\$311,130</b>

## **APPENDIX B**

### **Pending Pennsylvania Legislation**

#### **Pa Basic Ed / Higher Ed Science & Technology Partnership**

This appendix contains copies of the following bills from the current PA legislative session:

SB 472 – Proposes to amend the public school code by adding an article to provide for funding of Science and Technology Partnerships through grants administered by the Department of Education. Partnerships would consist of an institution of higher education and at least three public schools or school districts. This bill is currently under consideration by the Senate Education Committee where it was referred on March 19, 2007.

HB 1227 – A House education bill providing for Science and Technology Partnership Grants to be administered by the PA Department of Education. Grants would be available in the amount of \$200,000 per subject area, including chemistry, biology, physics, and earth and space science. This bill is currently under consideration by the House Education Committee, where it was referred on May 4, 2007

## APPENDIX C

### 2002-2003 Program Assessment

#### Pa Basic Ed / Higher Ed Science & Technology Partnership

##### Executive Summary

Paul E. Bell  
June 2004

#### ASSESSMENT PLANNING

Site directors and mobile educators from the Pennsylvania Basic Ed / Higher Education Science and Technology Partnerships (*Science In Motion* and *Advancing Science*) met in the spring of 2002 to plan a statewide program assessment under the direction of an independent evaluator, Paul Bell. The group met several times to develop separate biology and chemistry assessment instruments consisting of 40 multiple choice questions. Both assessment instruments were ready for pilot testing during the spring of the 2002-2003 academic year.

Piloting of the chemistry and biology assessments was planned with the following expectations and limitations:

- the first administration of the assessment would be used primarily for item analysis to evaluate the quality and validity of the questions in each instrument,
- variation in the types and frequency of laboratory activity usage among the eleven program sites was expected to underestimate student performance at individual sites and thereby underestimate average student performance among program sites statewide,
- varying lengths of program longevity among the eleven sites in the Commonwealth as well as delayed annual startups due to discontinuous funding was expected to minimize the overall differences in performance between students in schools served by the eleven program sites and students in schools not served, and
- no pre-test data would be available.

#### RESULTS

##### Student Performance

Despite the limitations of the test instrument and conditions for program implementation during the 2002 – 2003 academic year, students in program schools (schools served by *Science In Motion* or *Advancing Science*) were able to correctly answer an average of 20% more questions when compared to students in schools not having access to the program. These results are summarized in Figure 1. The differences in performance were significant at the 95% confidence level. In biology, the average numbers of questions answered correctly were 12.8 in control schools and 15.3 in program schools.

In chemistry, the average numbers of questions answered correctly were 14.1 in control schools and 17.0 in program schools.

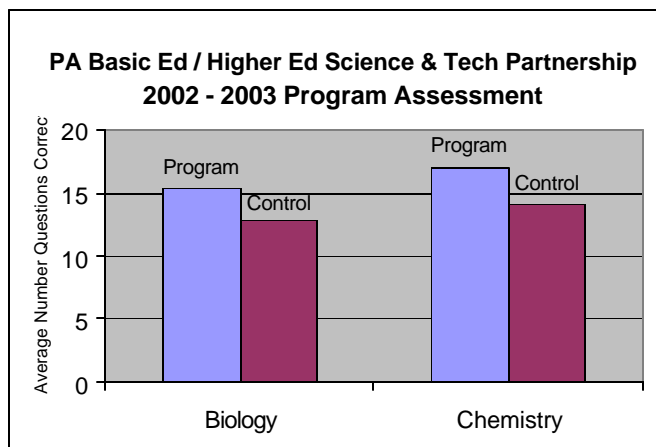


Figure 1: Program Schools (served by either *Science In Motion* or *Advancing Science*) out-performed Control Schools (outside the program service areas) by 20%. These differences are significant at the 95% confidence level.

### Instrument Evaluation

The 40 individual questions included in the chemistry and biology assessment instruments were evaluated. In the biology instrument, none of the items were too easy; five were too difficult, and eleven items had some problem in discriminating between high and low scoring students as determined by low correlations with the total test. In the chemistry instrument, none of the items were too easy; four were too difficult, and eleven had some problem in discriminating between high and low scoring students as determined by low correlations with the total test. Some of these problematic items may still be legitimate to use in individual quizzes or future tests, but only after they are examined for agreement with the program's high-tech objectives, correct key choices, confusing stems (such as negative stems), and semantic problems with distracter choices. Changes in laboratory usage across sites may also increase the rating of certain items in the future.

### Conclusions

1. These data show that both the biology and chemistry tests were sensitive to *Science In Motion/Advancing Science* instruction and that these program classes performed significantly (at least at the 0.95 level) better than the control classes. This is a remarkable result in that there were so many differences among classes across the eleven sites in availability of equipment, actual class time for use of equipment, the focus of lab objectives and individual teaching styles. Therefore, it may be claimed that *Science In Motion* and *Advancing Science* lab instruction is a powerful approach for teaching lab-based problem solving and inquiry.
2. Because the mean scores failed to come close to the mastery level, the concepts examined by the tests should accommodate considerably more intensive instruction in the areas covered. The test items probably would be sensitive to instruction of students in second year or advance placement courses.
3. Because the classes that were tested represented such a variety of district wealth, student sophistication, and school size, it may be claimed that the *Science In*

*Motion/Advancing Science* approach might be a powerful equalizer for students lacking access to district owned high tech science laboratory equipment.

## STATISTICAL ANALYSIS

### Biology

The analysis of biology test data that compare the *Science In Motion/Advancing Science* instruction classes with the control classes are shown in Tables 1 and 2. Table 3 shows the internal reliability of the test.

**Table 1: Spring 2003 SIM v. Control Biology Means**

#### Group Statistics

Group	N	Mean	Standard Deviation	Standard Error of the Mean
SIM	166	15.2892	5.15935	0.40044
Control	126	12.7937	4.10330	0.36555

**Table 2: Independent Samples Test**

	Levene's Test for Equality of Variances	
	F	Significance
Equal Variances Assumed	8.232	0.004
Equal Variances Not Assumed		

**Table 3: Reliability Statistics**

Cronbach's Alpha	Cronbach's Alpha Based On Standardized Items	Number of Items
0.657	0.637	40

## Chemistry

The revised analysis of chemistry test data that compare the *Science In Motion/Advancing Science* instruction classes with the control classes are shown in Tables 4 and 5. Table 6 shows the internal reliability of the test.

**Table 4: Spring 2003 SIM v. Control Chemistry Means**

### Group Statistics

Group	N	Mean	Standard Deviation	Standard Error Of the Mean
SIM	223	17.0359	5.17431	0.34650
Control	134	14.0746	4.22066	0.36461

**Table 5: Independent Samples Test**

	Levene's Test for Equality of Variances	
	F	Significance
Equal Variances Assumed	3.809	0.052
Equal Variances Not Assumed		

**Table 6: Reliability Statistics**

Cronbach's Alpha	Cronbach's Alpha Based On Standardized Items	Number of Items
0.679	0.661	40

**Pennsylvania Basic Education/Higher Education  
Science and Technology Partnerships**

2006-2007 Regional Service Providers:

Cedar Crest College  
Clarion University of Pennsylvania  
Drexel University  
Gannon University  
Gettysburg College  
Juniata College  
Susquehanna University  
University of Pittsburgh at Bradford  
Ursinus College  
Westminster College  
Wilkes University