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
Pennsylvania Basic Education/Higher Education
Science and Technology Partnerships

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Submitted To:
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PENNSYLVANIA DEPARTMENT OF EDUCATION

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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 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).
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.
Basic Education/Higher Education Science and Technology Partnership
Service Summary, FY 2006-07

Consortium Summary

Date program started: 1-Jul-06
Date first reimbursement arrived: 

OVERVIEW:
Total # teaching visits made* 5,567
  Biology: 2372
  Chemistry: 2247
  Other: 948

# different schools served 331
# different teachers served 776
# different labs taught 1050
# students in accelerated or elective classes**** 69366

Total # equipment loans** 7492
  Biology: 18018
  Chemistry: 40592
  Other: 10756

Total # student contacts*** 262,566
  Biology: 52,495
  Chemistry: 46,065
  Other: 21,025

Non-teaching Equipment Drop-Off: 142,981

CONSORTIUM SUPPORT:
  7/1/2006-6/30/2007 - Assessment Activities (Except Cedar Crest due to funding limitations)
  7/1/2006-6/30/2007 - Sharing Of Special Resources Between Sites
  9/2006 - Mobile Educator Sharing Workshop
  9/2006 - Fall Director's Meeting
  11/29/2006-12/1/2006 - PSTA Booth and Winter Meeting
  5/2/2007 - Capitol Day Demonstration and Spring Consortium Meeting

TEACHER SUPPORT:
Workshop/Seminars: Dates, comments
  There were 43 different teacher workshops and activities held during the project year

STUDENT SUPPORT: Science Fairs, Special Projects: Dates, comments
  16 Out-of-class activities were supported state wide

OTHER SERVICE: Special Events, Presentations, etc.: Dates, comments
  48 Special Events were supported statewide through presentations, demonstrations or provision of resources

*Teaching visits:
Count one visit for each separate class/period/new set of students that you teach.
--If more than one lab is taught in any class, count the additional lab(s) as a separate/additional visit.

**Equipment loans:
Count one loan for each separate class that uses the equipment.
--An "item" of equipment is defined as whatever it takes to conduct a lab, whether it's 2 GCs, 6 microscopes, or 1 DNA "kit" containing a stirrer, dishes, etc.

***Number of students:
--For teaching visits, exact number of students in each separate class you teach.
--For equipment loans, exact number of students in each class that uses the equipment.

****Advanced/Elective classes:
Count any class at the junior or senior level
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.

<table>
<thead>
<tr>
<th>INSTITUTION</th>
<th>ALLOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cedar Crest College</td>
<td>$80,000</td>
</tr>
<tr>
<td>Clarion University of Pennsylvania</td>
<td>$160,000</td>
</tr>
<tr>
<td>Drexel University</td>
<td>$160,000</td>
</tr>
<tr>
<td>Gannon University</td>
<td>$160,000</td>
</tr>
<tr>
<td>Gettysburg College</td>
<td>$160,000</td>
</tr>
<tr>
<td>Juniata College</td>
<td>$320,000</td>
</tr>
<tr>
<td>Susquehanna University</td>
<td>$320,000</td>
</tr>
<tr>
<td>University of Pittsburgh at Bradford</td>
<td>$160,000</td>
</tr>
<tr>
<td>Ursinus College</td>
<td>$160,000</td>
</tr>
<tr>
<td>Westminster College</td>
<td>$160,000</td>
</tr>
<tr>
<td>Wilkes University</td>
<td>$160,000</td>
</tr>
<tr>
<td>Juniata College – Consortium &amp; Middle School Pilot</td>
<td>$270,000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$2,270,000</strong></td>
</tr>
</tbody>
</table>

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 $253,089
Office Staff Secretarial/Project Management/Budget $180,387

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

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 $68,043
Instructional Supplies Instruments; expendable materials $320,625
Science instrument repair and maintenance $8,513
Project Office expense Telephone, photocopies, postage $45,619
Travel support Staff travel expense; Lead Teacher mileage $20,484
Miscellaneous Expense Professional fees, licensing, etc. $12,702

Teacher Support: new technology and content
Teacher conference support $2,526
Science Fair support $1,089
Summer Workshop (professional development)
Planning and module development $1,269
Attendee stipends $42,320
Housing and meals $19,867
Facilities, activities, materials expense $10,357

Administrative Overhead $135,317

Total ESTIMATED expenditures, FY 06 $2,303,323

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)

Total Institutional Contributions $ 33,323

Total expenditures, FY 06 $2,270,000
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
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,…”


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.

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.”
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.

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

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

*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.
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.

![Graph showing 2003 post test results](image)

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.

![Graphs showing pretest and posttest scores](image)

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 |
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.

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.
INFORMATION DISSEMINATION
AND CONSORTIUM ACTIVITIES

Website
The Basic Education/Higher Education Science and Technology Partnership consortium continues to maintain the 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.1,2 As national and international indicators show U.S. students performing poorly in math, science and technology education3,4, 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.5

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:

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

COST SAVINGS TO TAX Payers USING THE SIM APPROACH: 8

$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:

School Districts Served: 23 (see attached listing on page 2)
Mobile Educator Classroom Visits: 1,248
Lab Drop-offs: 1,303
Different Teachers Served: 137
Student Contacts: 46,000
Teacher Workshops (2 weeks): 60 teachers

Annual State Contract Amount: $449,187 ($608,124 = 3-year average)
Corporate & Foundation Donations: $86,286 ($74,429 = 3-year average)
Total Operating Budget: $535,473 ($682,553 = 3-year average)

Footnotes from Page 1:

5Yohn, C, Survey of SIM teachers, unpublished results.
6A 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.
7Estimated from SIM annual expenses divided by number of schools serviced.
8Based on state contract rates from commercial service providers (not SIM).
9This 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

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<th>Name</th>
<th>Quantity</th>
<th>Individual Price</th>
<th>Total Price</th>
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<td><strong>Automatic Pipets</strong></td>
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<td>Rainin pipetmen, 1000uL</td>
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<td>Other automatic pipets, 1000 uL</td>
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<td>10L</td>
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<td>Vernier LabPro Data Interfaces</td>
<td>6</td>
<td>$200.00</td>
<td>$1,200.00</td>
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<tr>
<td><strong>GRAND TOTAL</strong></td>
<td></td>
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<td>$311,130</td>
</tr>
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</table>
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 were 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.

![Program Schools vs Control Schools](attachment:image.png)

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

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Standard Error of the Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIM</td>
<td>166</td>
<td>15.2892</td>
<td>5.15935</td>
<td>0.40044</td>
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<tr>
<td>Control</td>
<td>126</td>
<td>12.7937</td>
<td>4.10330</td>
<td>0.36555</td>
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Table 2: Independent Samples Test

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<thead>
<tr>
<th></th>
<th>Levene’s Test for Equality of Variances</th>
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<tr>
<td></td>
<td>F</td>
</tr>
<tr>
<td>Equal Variances Assumed</td>
<td>8.232</td>
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<tr>
<td>Equal Variances Not Assumed</td>
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Table 3: Reliability Statistics

<table>
<thead>
<tr>
<th>Cronbach’s Alpha</th>
<th>Cronbach’s Alpha Based On Standardized Items</th>
<th>Number of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.657</td>
<td>0.637</td>
<td>40</td>
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</table>
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

<table>
<thead>
<tr>
<th>Group</th>
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<th>Mean</th>
<th>Standard Deviation</th>
<th>Standard Error Of the Mean</th>
</tr>
</thead>
<tbody>
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<td>Control</td>
<td>134</td>
<td>14.0746</td>
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Table 5: Independent Samples Test

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<th></th>
<th>Levene’s Test for Equality of Variances</th>
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<td>F</td>
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<tr>
<td>Equal Variances Assumed</td>
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<tr>
<td>Equal Variances Not Assumed</td>
<td>3.809</td>
</tr>
</tbody>
</table>

Table 6: Reliability Statistics

<table>
<thead>
<tr>
<th>Cronbach’s Alpha</th>
<th>Cronbach’s Alpha Based On Standardized Items</th>
<th>Number of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.679</td>
<td>0.661</td>
<td>40</td>
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</tbody>
</table>
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