A TIME for Physics First

Academy for Teachers - Inquiry and Modeling Experiences for **Physics First**

For 9th grade science teachers

NEWSLETTER: Vol 1, No. 2, August 2007

Physics First during the Academic Year

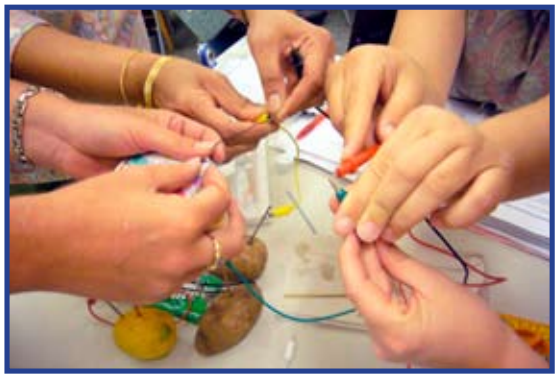
Sara Torres, Columbia Public Schools

The 2007 Physics First Summer Academy was a wonderful learning opportunity by all who participated. During the academy, 50 teachers returned for year 2, 22 protégés attended the academy for 4 weeks, 12 math teachers attended one week, and 14 administrators attended two days. In addition, Dr. Leon Lederman, Physics Nobel Prize Winner, visited the academy and spoke to the participants on June 11th about the Physics First movement.

When the administrators attended the academy, we discussed a variety of things to help support your ninth grade physics teachers. Here is a recap of our discussion:

- The teachers should teach a minimum of one section of a year-long physics course using the **A TIME for Physics First** curriculum. In addition, they need to complete the pre- and post-test for each unit and turn in the data to the evaluators.
  - If teachers do not turn in the assessments as stated on the commitment form, the Project Director of the grant will notify the teacher and the principal and consequences will be discussed.
- Teachers will be involved in a Professional Learning Team (PLT) and complete a lesson study.
  - The PLT should meet 20 hours outside contracted time. Minutes of the meetings will be sent to the Coach-Mentor and the Project Director for verification.
  - The grant does *not* reimburse teachers for mileage if they need to travel to the PLT meeting; however, participating schools *can* reimburse the teachers for their mileage.

Contents



Partnership can even make a vegetable battery work

  - *Each school* will support their teacher(s) in lesson study by covering substitute costs for teacher(s) to observe each other and discuss student learning (minimum 1 day per teacher).
- Coach-Mentors will be visiting each participant every month. The Coach-Mentor will also be available to visit with you as desired.

Besides attending the academy, administrators are invited to attend the regional follow-up sessions throughout the year. Mark your calendars for December 1st (snow date Dec. 8th) and April 12th. ☯

Spend June with Physics First

Sarah Hill, University of Missouri, Columbia

The recent Physics First academy in June was a success for the 50 returning science teachers, 22 science teacher Protégés, 15 math teachers, 16 administrators and 9 Coach Mentors in attendance. At present, there are 29 Missouri districts and 2 non-public schools participating in the Physics First program.

Fifty of the science teachers were returning for their second year. They met daily from June 11-29 for content instruction from two teaching teams. Content in the Year 2 classrooms consisted of Units 5-9 of the PF curriculum, including Free Fall and 2-D Motion, Energy, Momentum, Planetary Motion and Electrical Circuits.

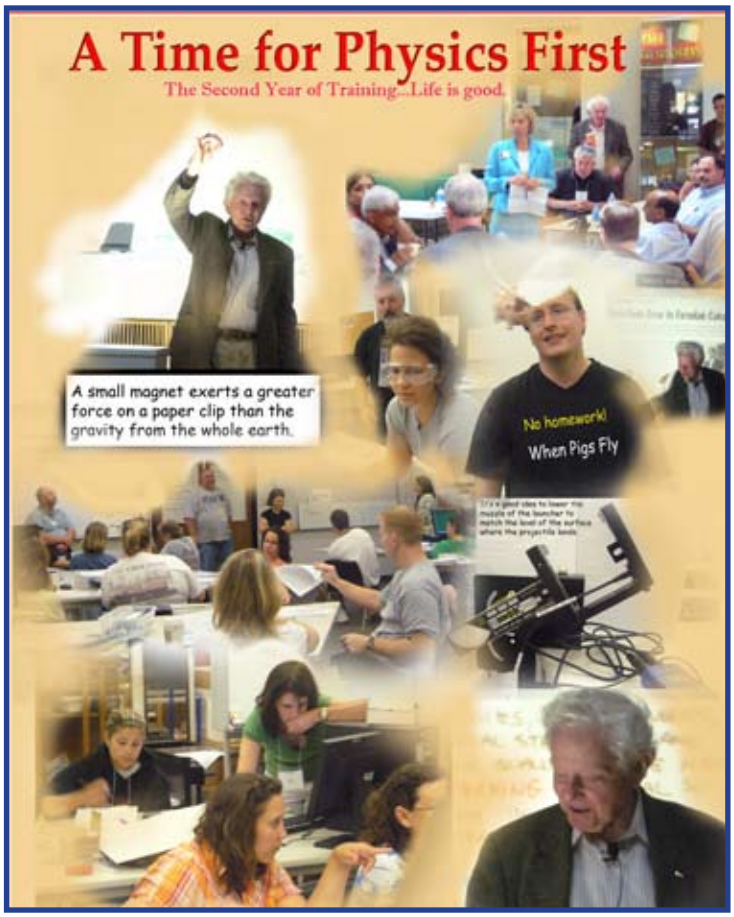


photo montage courtesy Glenn Owens

Twenty-two science teachers from 14 districts signed on to attend the Academy for the first time, making up the Protégé class. They started a week earlier than the Year 2 group and studied Units 1-5 and 9 of the PF curriculum; Uniform Motion, Accelerated Motion, Introduction of Forces, Newton's Laws and Free Fall & 2D Motion, and Electrical Circuits.

Classes were held on the MU campus and team taught by a faculty instructor paired with a peer teacher. The Year 2 instructor teams were Profs. Meera Chandrasekhar (MU) and Dennis Nickelson (William Woods Univ.) and Prof. Dorina Kosztin (MU) with Mr. Gabe de la Paz (Clayton Schools). Protégés were team-taught by Prof. Mani Manivannan (MSU) and Mr. Jim Roble (Francis Howell Schools). Daily schedules included Professional Learning Team (PLT) time coordinated by Ms. Sara Torres (Columbia Public Schools) and Prof. Mark Volkmann (MU), as well as time specifically focused on Modeling and Inquiry pedagogies, which were integrated within the curriculum.

Fifteen math teachers from participating districts attended the academy for a week from June 11-15, sitting in on Physics First content time as well as meeting with each other, their science teacher colleagues and Prof. James Tarr (MU) to foster collaboration upon returning to their respective classrooms.

Participating district administrators were invited to attend the academy for a 2-day period. Their agenda included program updates and discussion, a vendor exhibit and time to get acquainted with each other as well as collaborate with their teachers.

Coach Mentors attended the academy with their mentees. This year the group increased to nine with the addition of Calene Cooper, formerly a science teacher in Columbia Public Schools. Ms Cooper attended the Protégé academy for the 4-week period. She will be working with teachers in north-central Missouri.

In this issue of the Physics First newsletter, you will hear more about the 2007 Academy from Project Director Sara Torres, Coach Mentor Glenn Owens, science teacher participants John Dedrick, Brian Foster and Laura Zinszer, Protégé Melissa Reed and MU Math Ed professor James Tarr. A very special guest speaker, Prof. Leon Lederman, visited the academy and we report on his speech and connection to this program elsewhere in this newsletter. ☯

The Star Farm

Brian Foster, Mehlville Senior High School, St. Louis

On June 25, the Physics First participants had an opportunity to take a "field trip" to view the night sky at a local farm. Many of us were quite anxious for this trip, as the always-reliable Missouri weather had caused significant disruption in our astronomy plans up until that point! Luckily, we arrived that evening to find the weather was fine and the visibility was excellent.

In addition to many brand-new amateur astronomers from the Physics First program, several members of the Central Missouri Astronomical Association (CMAA) were present to guide us. The CMAA crew not only brought their considerable expertise, but some amazing telescopes. We were quickly awed by close-up visions of various planets, including some impressive views of Saturn and Jupiter.

In addition to the telescopes, the farm seemed to have yielded a crop of tripod-mounted binoculars, as the Physics First participants were provided tripods and binoculars to enhance the astronomy unit. To our pleasure, we found that these binoculars gave excellent views of the planets – the more eagle-eyed amongst us spotted Saturn's "ears" (the bulge from its rings) and three of Jupiter's moons!

At least one of those present was determined to catch up on his moon observations for class, and this was an excellent opportunity to do so. The moon was in its waxing gibbous phase; our astronomy instruction had taught us new terminology – this simply means that over half of the moon is lit, and the lit amount is still increasing. The binoculars really came into their own for this observation; it was extremely easy to identify various craters and features on the moon using a "moon map" that the CMAA had distributed earlier.

As the night grew darker, more and more features of the night sky became visible. Once it was dark enough, we were given a "guided tour" of the visible objects. I was able to see more constellations than on a usual night – especially with the lack of city lights. Ironically, the wonderfully visible moon made it more difficult to see some of the stars due to its reflected light, but overall the stars were still very plentiful.

With the equipment and expertise at hand – not to mention the viewing site – we were able to see the celestial features we had discussed in class and more. Our field trip gave us a solid, hands-on introduction to astronomy. ☯

Editor's Note: We thank Randall Durk, Val Germann, Ralph Dumas and Lanika Ruzhitskaya of the CMAA for arranging the trip to the farm and the visits to the Laws Observatory at MU's Physics Department.

Physics First participants set up their binoculars at a farm east of Columbia

End-of-Course Assessments

John Dedrick, Winnetonka High School, North Kansas City

Science education is evolving in the state of Missouri. Those students who graduate in 2010 are required to complete three units of science for graduation, and the process of developing new "end-of-course assessments" for those courses has started. These exams will be designed to assess both student progress on the local level and district progress at the state level. There are lots of rumors, questions and misconceptions concerning this process. The following information is public knowledge.

A draft of the state Science Course Level Expectations is currently on the DESE website at http://dese.mo.gov/divimprove/curriculum/unitindex.html

In that document, the Course Level Expectations (CLE) highlighted in yellow define expectations for state assessments for End-of-Course (EOC) Exams. The CLEs are arranged to support development of conceptual understanding for all students. Although all CLEs are considered important, test items covering only the highlighted expectations would be part of an assessment for all students. Questions on the EOC are to assess appropriate concepts in strands 1-5; concepts found in strand 6 and strand 7 are to be integrated into these assessment items.

Grade-span assessments will be administered in science at grades 5, 8 and 11 in the spring of the 2007-08 school year. The test window for the 2007-08 MAP Test is March 31-April 25. Beginning no later than spring 2009, students completing Biology I (or its equivalent) will be administered the Biology I EOC assessment. The development and administration of future EOC assessments is dependent upon decisions of the State Board of Education and state funding.

The content areas for the future EOC assessments are yet to be determined. There have been proposals to design an instrument to assess Chemistry, along with an instrument designed to assess Physics, Physical Science or Earth Science. Timelines for the development and implementation of these instruments has been discussed, but no decision has yet been made.

A suggested plan of implementation dictates that the Biology Assessment will have at least one performance event as a requirement for all districts. Districts would then be allowed to select a second assessment from two choices, consisting of Chemistry and either Physics, Physical Science or Earth Science. Only two assessments will be written. Funds are not available for other options.

It is my personal opinion that students completing Chemistry I (or its equivalent) should be given the option of taking the Chemistry I EOC assessment.

It is my personal opinion that students completing Physics I (or its equivalent, and the equivalent could be

Year 2 Participants analyze data (left); Year 1 (Protégé) participants conduct an experiment on circular motion (right)

Physical Science) should be given the option of taking the Physics I EOC assessment. The CLEs selected for testing in the Physics content area would be suitable for Physical Science students. It would be redundant to test Physical Science Students over the same CLEs addressed in the Chemistry I Assessment.

Two options are available to educators at this point.

Option 1: Read this and do nothing else. Allow me and others like me to express our opinions and possibly influence future decisions. Be aware that decisions will be made that will directly affect the way you teach and work.

Option 2: Get involved. Express your opinion and help decide how you will teach, and what your students will be required to learn.

A draft copy of the Science Course Level Expectations was posted on DESE website on June 20, 2007. The complete URL is http://dese.mo.gov/divimprove/curriculum/unitindex.html . Click on Science Course Level Expectations - DRAFT. These documents are drafts. Your comments and suggestions can be sent to webreplyimpr@dese.mo.gov (attn: Science Consultant) until August 31, 2007.

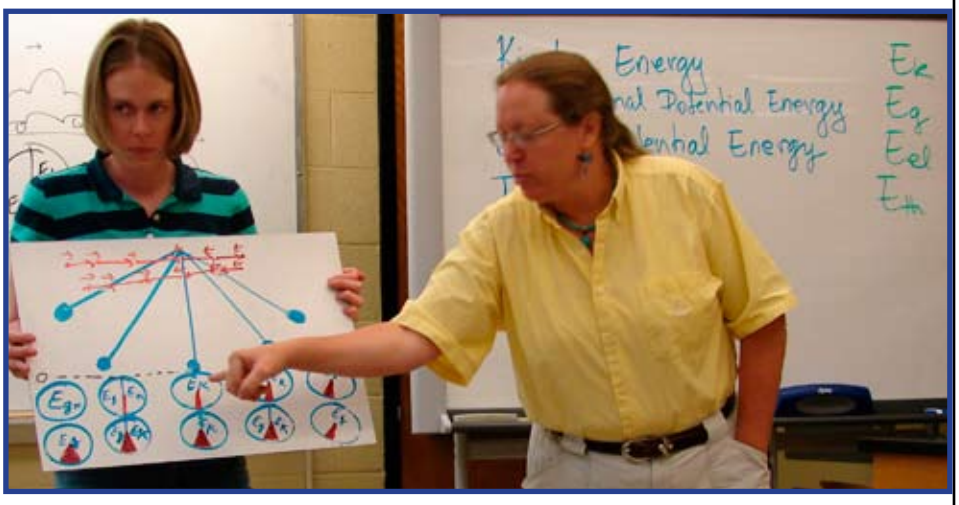
It should also be noted that in the midst of this process, there have been personnel changes at DESE. Mr. Michael Muenks is the new Coordinator of Curriculum and Assessment, and Mr. Shawn Bates is the state's new Science Consultant. An email or a letter expressing your feelings or thoughts may be well worth the effort. ☯

Notebooking

Laura Zinszer, West Junior High School

Science notebooks have been incorporated into the Physics First classrooms in Columbia Public Schools over the past two years. Notebooks enhance student learning by encouraging inquiry investigations in physics. For example, as we study Uniform Motion, students record observations of the motion of different types of toy cars in their notebooks in their own words. Students may use language, draw pictures, arrows or any means that describes their ideas about the cars' motion. Once students decide which car to investigate, they create a hypothesis, identify variables, produce a data table, record data and create a graph of their analysis of the motion of the car, all in their physics notebook. The notebooks allow students to reflect on their investigation, analyze the graph and create a conclusion about Uniform Motion.

One important factor for student learning and understanding of science is the ability to reflect back on their work. Notebooking encourages student reflection after the investigation. A second factor that encourages student learning is student ownership in the educational process. Physics notebooks are student developed and provide students the ability to create and describe their own investigations, reflection and overall work in Physics First classrooms. As Physics First continues to develop as a successful curriculum for high school freshmen, physics notebooks are one aspect leading to student success. ☯



Year 2 Participants conduct an experiment on kinetic energy (left) and present a problem on the conservation of energy (right)

Working Towards a Coordinated Effort in Science and Math Education

James Tarr, University of Missouri, Columbia

Student success in Physics First requires coordination between science and mathematics teachers. However, the disciplines of mathematics and science are often considered to be quite different in nature. Science is viewed as complex and "messy" as students try to make sense of measurement data from laboratory experiments. By way of contrast, mathematics is viewed as straightforward and "elegant," a tool for solving problems in a step-by-step fashion. Further contrasts are evident in the science and mathematics curricula. In science, nearly all problems are set in a real-world context, metric units are commonplace, and "carrying through units" is emphasized throughout student work. In traditional mathematics, exercises are often devoid of a problem context and thus "solutions" do not require units at all; in application problems, standard (U.S.) units are customary, but ultimately students and teachers may ignore units when solving problems. Calculators are largely required in science but sometimes forbidden in some mathematics classrooms. Do science and mathematics teachers send "mixed messages" to students?

In this summer's Physics First academy, science and mathematics teachers pledged to better coordinate their respective curricula and pedagogies, but it was essential that they first come to better understand one another's perspectives. With that in mind, an initial writing prompt elicited the challenges science teachers have experienced related to the mathematics of Physics First. Patterns of responses indicated that many science teachers are teaching more mathematics than they "signed on for" because the Physics First curriculum is laden with mathematics, especially algebra. Moreover, they reported deficiencies in their own mathematics background and found it difficult to manage the wide range of mathematics abilities among students. In a follow-up session, Physics First teachers shared success stories in working with mathematics teachers in their buildings. In another session, each set of teachers offered "wish lists" of what they want from one another, and later brainstormed suggestions for administrators in making these ideas a reality.

The consensus is that mathematics and science teachers need to realize they do not operate in isolation but instead must work in a coordinated effort if they are to improve student learning. Physics First teachers request opportunities to visit mathematics classrooms, mathematics teachers ask to observe Physics First lessons, and both desire opportunities to team teach key topics throughout the year. Moreover, they seek time to discuss where their curricula overlap with one another and how each relates to the Course-Level Expectations (CLEs) of the Missouri Department of Elementary and Secondary Education (2007).

Working together, science and mathematics teachers can provide coherent experiences that collectively promote greater learning for all students in Physics First and beyond. ☯

Math Concepts Encountered

Algebra
- Literal equations
- Linear functions
- Quadratic functions
- Issues related to graphing functions
- Solving systems of equations

Geometry
- Area (including area under a line in a graph)
- Tangent lines
- Similarity
- Transformational geometry

Measurement
- Understanding, selecting, and using units of appropriate size to measure phenomena
- Converting one unit to another unit

Number and Operation
- Exponents
- Include more decimal numbers in examples and problems
- Ratio and proportion

Data Analysis and Probability
- Display data
- Linear and quadratic regression

Physics First - The Second Time Around

Glenn Owens, Coach Mentor

It was a dark and stormy night...that's the way it was during one of our scheduled evenings to use Laws Observatory on the roof of the Physics Building, but that was just a trivial obstacle in the big picture of events for the second year of the Physics First Academy.

As a Coach Mentor (CM), it was again my pleasure to attend classes at the academy with bright, young—and some not-so-young—science teachers from all areas of Missouri. Some of the school districts represented sent nearly as many science teachers as other districts had teachers in their entire high school. That factor did not limit the camaraderie in the classroom or on the social scene. The teachers worked in teams of three or four, much like the setting in a high school science class. Each week the groups were juggled, emphasizing the importance of *learning to work together*, a primary goal in the PF academy.

From my perspective, the second year of the academy showed marked improvement over the first year, due to the flexibility of the teaching and support staff at the University and the regularly scheduled CM/staff conferences calls during the previous academic year. During the conference calls, CMs discussed progress and pitfalls and then brainstormed to find solutions. Sometimes the questions were tabled and Dr. Volkmann would take them to the Leadership Team for definitive answers. These twice-a-month conference calls helped us to address questions as they arose and helped in the collaboration and planning of a more meaningful summer academy.

As a recently retired science teacher, I can relate to questioning the validity of changing one's curriculum, which points to another of the highlights of the academy. Guest speaker and Nobel Laureate Dr. Leon Lederman, one of the original pioneers of the concept of Physics First, delivered an appealing rationale in support of physics as the basis of other sciences in the high school sequence.

Seminars for math teachers and administrators were included in the academy again this year. The math teachers attended the Academy for one week to examine the math skills necessary for 9th grade students to achieve success in Physics First. Administrators were encouraged to support the program with funding for supplies and by allowing teachers the time to observe other classes. (Not all of the school districts had administrative representatives at the academy, but those who did were supportive.) It was also a good opportunity for the administrators to collectively ask questions and share in the spirit of discovery in science education. ☯

Top to bottom: Year 2 participants conduct experiments on energy, circular motion, trajectories, and planetary motion

A Special Visit by a Physics First Pioneer

Sarah Hill, University of Missouri

A prominent pioneer of the Physics First concept, Dr. Leon Lederman, Nobel Laureate in Physics (1988), visited the Academy participants on June 11.

In our knowledge-based 21st Century society, scientific connections occur across all disciplines, highlighting the goal of a scientifically literate citizen. Teaching physics at the ninth grade begins this process, says Lederman, strengthening the foundation of the core sciences.

Dr. Lederman explained the Physics First concept within a historical perspective. Many significant scientific discoveries have influenced the logical sequence of the teaching and learning of science in our schools. Using a "pyramid" diagram of core disciplines he illustrated how math forms the foundation for physics and astronomy. In turn, chemistry is arguably applied physics, and structural and molecular biology are based on chemical bonding. So, logically the science sequence, in collaboration with mathematics curricula, is physics, chemistry and then biology. However, Lederman says, although there has been massive recognition of the validity of this model, there has been a concurrent failure to implement change in an entrenched system.

The small number of high schools across the nation that have implemented this sequence change, Lederman says, report dramatic improvement in the learning and enthusiasm of students. Subsequent enrollment in elective sciences rises 3-5 times, especially among female and minority students.

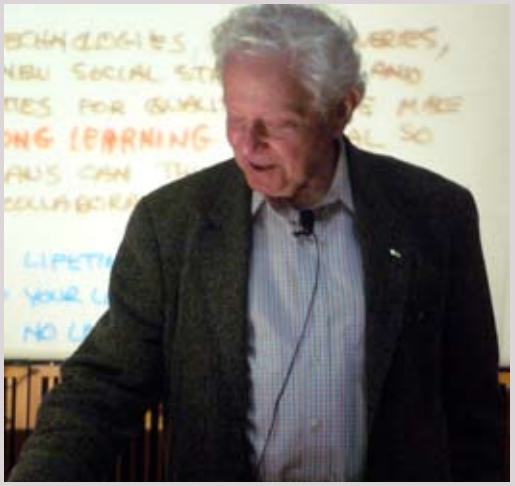
However, Lederman feels that it is not enough to merely rearrange the sequence – one must appreciate that the Physics First student is now more prepared to learn chemistry, which may necessitate a change in the depth of subsequent curricula. A virtue of the sequence change is that the student builds on and uses knowledge learned previously. To implement this institutional change Lederman strongly recommends frequent collaborative time among core discipline teachers, especially during the academic year. "Professional development is crucial to teaching – not just two weeks in the summer, but regular daily discussion," he says.

Our Physics First program seeks to provide just that - content and pedagogy instruction in the summer, and academic year support. Besides support from the program, participating schools have pledged district-level support to PF teachers in many forms.

Even though Lederman's visit was short, he remarked that even so, he noticed "the enthusiasm and excitement of both staff and students." He continued, "I left regretting the shortness of the stay but full of admiration and respect for the Physics First gang." ☯

Lederman, an internationally renowned high-energy physicist is Director Emeritus of Fermi National Accelerator Laboratory in Batavia, Illinois, and Pritzker Professor of Science at Illinois Institute of Technology, Chicago. He served as Chairman of the State of Illinois Governor's Science Advisory Committee. He is a founder and the inaugural Resident Scholar at the Illinois Mathematics and Science Academy, a 3-year residential public high school for gifted students. He is a founder and Chairman of the Teachers Academy for Mathematics and Science, and active in the professional development of primary school teachers in Chicago. Dr. Lederman was the Director of Fermi National Accelerator Laboratory from 1979 to 1989.

In 1990 he was elected President of the American Association for the Advancement of Science. He is a member of the National Academy of Science. His numerous awards include the National Medal of Science (1965), the Elliot Cresson Medal of the Franklin Institute (1976), the Wolf Prize in Physics (1982), the Nobel Prize in Physics (1988) and the Enrico Fermi Prize given by President Clinton in 1993. ☯



Prof. Leon Lederman speaks at the Academy

Physics First Participation Yields Gains for Teachers and Students

Keith S. Murray, M.A. Henry Consulting, LLC

Is A TIME for Physics First making a difference? Analysis of pre/post test results from teacher fellows participating in the A TIME for Physics First program have shown large gains in content knowledge for both summer sessions that have occurred, and their students last year experienced comparable gains in content knowledge acquisition for those units analyzed.

The gains experienced are statistically significant to a high degree for both teachers and students ($p < .000$). While it is still early in the analysis process and additional units are being taught and tested, early results certainly demonstrate the capacity of Physics First to deliver results over the course of a lesson.

These analyses offer the best way to understand and improve the benefits of the program. The evaluators thank administrators and teachers at participating schools for their cooperation in the evaluation process. We ask for continued support in ensuring that student pre and post-tests for Physics First are delivered and returned as required. Larger numbers equate with greater confidence as necessary ongoing analysis occurs. ☯

From Math Teacher to Physics Protégé

Melissa Reed, Webb City R-7

I found the Physics First program to be a fabulous and exciting experience. It is the perfect program for any Math/Science teacher. I have a bachelor's degree in mathematics and teaching certification in Math 5-12 and Science 5-9. Teaching math has been my passion for ten years with an additional teaching assignment in freshman science for four years.

In summer of 2006, I was invited to participate in the Physics First academy as a math teacher. I was the math representative and acted as "liaison" between the Math and Science departments at Webb City High School. As a math teacher, taking part in the academy for one week was enlightening and educational. I found that I used many of the connections between Physics First and the Integrated Math I and Physical Science classes that I was teaching. I discovered that I enjoyed and appreciated the beauty of Physics First more than I had imagined. I also realized that the math in Integrated Math 1 was not only complementing Physics First, but that the math from Physics First was going to help the math program!

In May of 2007, my teaching assignment changed to Physics First only and I was appointed as a delegate to the Physics First Academy - as a Protégé science teacher. As a Protégé, I was instructed in Modeling and Socratic dialogue in the teaching of physics. Our class learned the content that we would be teaching the following school year - Uniform Motion to Astronomy. I began to see all that had been missing in my Physical Science curriculum - that it was not deep enough to truly benefit my students.

I am delighted with my new teaching assignment and with my opportunity to be involved in the Physics First program. As a teacher, my background in math leads me to be very comfortable in teaching physics. I believe that any math/science teacher who sees the program can't help but be impressed and want to know more. I believe that the teaching of Physics First will help my students advance, excel and achieve much more than they ever did in physical science. ☯

The Protégé Class

Brain Benders

Dorina Kosztin, University of Missouri

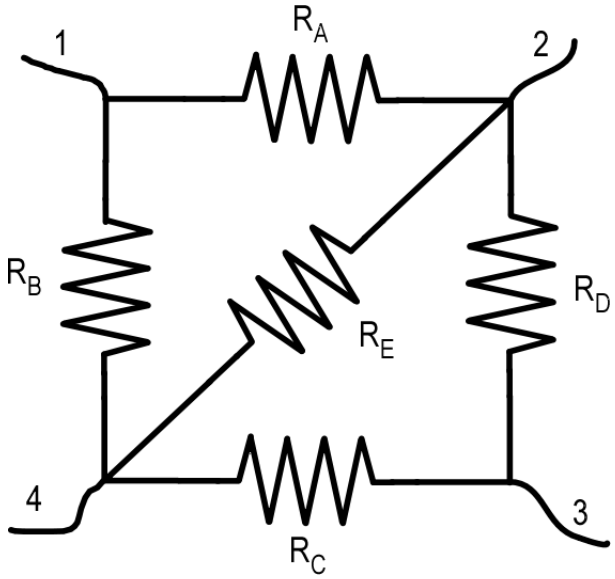
1. Astronaut Astrobatics
Can an astronaut who is motionless – that is, it is not rotating – reorient herself in any direction she wants?

2. The Wall Ahead
You are driving too fast along a road that ends in a T-shaped intersection with a highway. There is a concrete wall directly ahead on the far side of the highway, and no car is visible in either direction. What should you do to avoid hitting the wall – steer straight at the wall and fully apply the brakes, or turn left into a circular arc as you enter the highway?

3. Race Driver
Professional race drivers increase their speed when going around a curve. Why?

4. Spider Circuit
Construct an activity or a problem for your students using the circuit below. The five resistors have equal values; 1-4 indicate wires that connect to the circuit at different points.

Note: The classic circuit, called the Wheatstone Bridge,is used by electricians to this day.



Physics First is Electric

Glenn Owens, Coach Mentor

We learned a bunch of brand new terms,
A battery is like a pump.
If you make it do too much,
It just won't have the umph.

Plot voltage against current
And then calculate the slope
That value will be resistance,
At least that's what we hope.

We used Logger Pro to record our data
And put it on the screen.
Then we studied it and studied it
Trying to decide just what it means.

The light bulb lights, but is it bright
Or does it just glow pale?
The way to test objectively
Is to use Brian's Brightness Scale.

The best thing we have learned so far
The day before we all go home
Ampere depends on Volta
And that agrees with Ohm. ☯

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5. Turning the Corner
As an automobile turns the corner, the front wheels travel arcs of different radii, and so do the back wheels. Exactly how does the automobile accomplish this feat? Do any of the wheels slip?

6. Seeing Around Corners?
Why can we hear but not see around a corner?

7. Balloon in a Car
A child holds a helium filled balloon by a string inside a moving automobile. All the windows are closed. What will happen to the balloon as the car makes a right turn or stops suddenly? Which way will the balloon move?

Want Answers?? If you wish, you may send your answers by e-mail to Sarah Hill. We'll post the answers on the website at a later date. ☯

What is A TIME for Physics First?

A TIME for Physics First is a partnership among school districts, institutions of higher education, state and regional educational centers, businesses and non-profit organizations. The project is formulated to design and implement a professional development curriculum for teachers so that they may teach a year-long Physics course in 9th grade classrooms. The project's long-term goals are to increase the number of highly qualified physics/physical science teachers, increase the proficiency of students as evidenced by standardized state tests, and to increase students' interest and success in science/engineering degrees. The program includes a summer academy and academic year support.

The project is funded by the Missouri Department of Elementary and Secondary Education Mathematics and Science Partnership High School Science Reform Grant (2005-2008).

Leadership Team:

Columbia Public Schools (CPS):

- Ms. Sara Torres, Lead District PI and Project Director

University of Missouri, Columbia (MU):

- Prof. Meera Chandrasekhar, Lead Institution of Higher Education PI, Department of Physics and Astronomy
- Prof. Dorina Kosztin, Department of Physics and Astronomy
- Prof. Mark J. Volkmann, Department of Learning, Teaching and Curriculum
- Prof. James Tarr, Department of Learning, Teaching and Curriculum

Missouri State University, Springfield:

- Prof. Mani K. Manivannan, Department of Physics, Astronomy and Materials Science

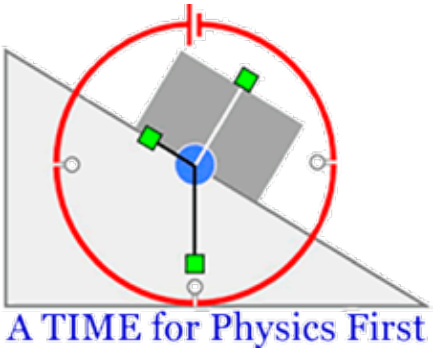
Project Administration:

- Ms. Sarah Hill, Program Coordinator, Department of Physics and Astronomy, MU
- Ms. Molly Delgado, Bookkeeper, CPS

Evaluation:

- Dr. Marty Henry, M. A. Henry Consulting, LLC
- Dr. Keith Murray, M. A. Henry Consulting, LLC

Ever wonder what our logo means? It includes a ramp, an object on the ramp, a force diagram, an electrical circuit, the primary colors of light, and a clock - representing several physics concepts addressed in the Physics First program. Oh, and it represents a model too! ☯



Physics First: Participating Districts

Original Partner Districts

Columbia (Lead) – 16*
Carthage R9 - 2
Hazelwood – 7
Frances Howell – 1
Ferguson Florissant – 3
Mehlville – 9
Morgan R2 – 1
Perry County – 3
St. Vincent – 1
Webb City – 1
Hickman Mills – 4
Archbishop O'Hara HS – 1

Other Districts

Salisbury R4 – 1
North Kansas City – 6
West Platte – 1
Poplar Bluff R1 – 2
Aurora R8 – 2
Ava R1 – 1
Willow Springs – 1
Kirkwood - 1
Camdenton – 1
Hannibal – 1
Adair Co. R2 – 1
Cole Co. R1 – 1
Dora R3 – 1
Elsberry R2 – 1
Keytesville R3 – 1
Ralls Co. R2 – 1
Windsor C1 – 1

2007 Attendance:

72 Science Teacher Participants
(50 Year 2, 22 Protégés)
12 Math Teachers
14 Administrators

*Numbers indicate total number of science teachers from district

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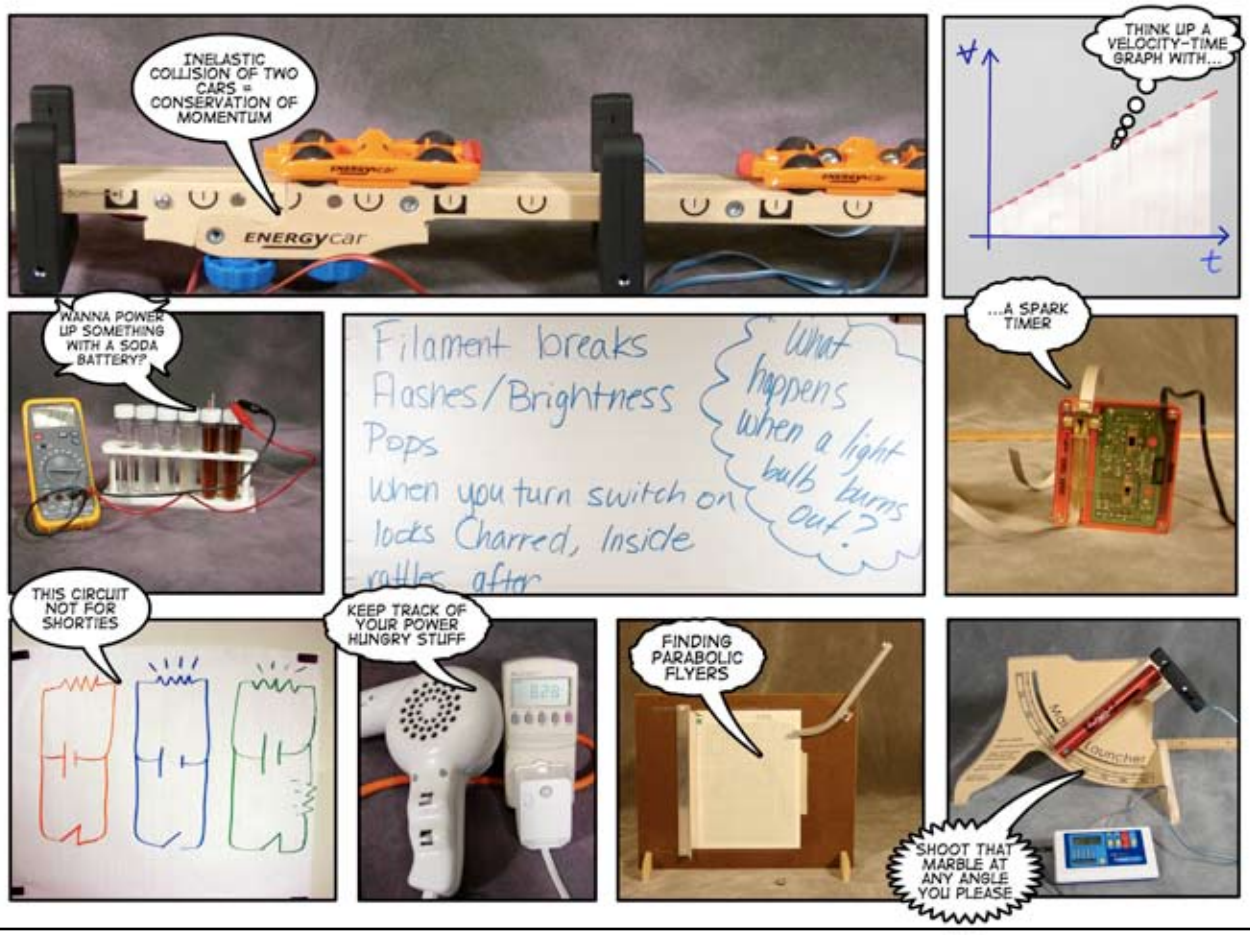

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