A TIME for Physics First

Academy for Teachers
Inquiry and Modeling Experiences for Physics First

Leadership in Freshman Physics, 2009-14

A TIME for Physics First

NEWSLETTER: Vol 5, No.2, August 2012

Welcome to our New Evaluators!

Meera Chandrasekhar,
Department of Physics and Astronomy,
University of Missouri

As of June 2012, A TIME for Physics First has a new evaluation team: Christi Bergin, Paula McFarling and Bridget Murphy, from the Assessment Resource Center (ARC) at MU (http://arc.missouri.edu/). For over 75 years, the Assessment Resource Center (ARC), a part of the University of Missouri (MU), has helped hundreds of clients answer important questions. ARC provides practical assessment and evaluation resources for clients in education, non-profit organizations, government and business. ARC staff frequently work with MU faculty on research, evaluation and classroom testing projects. Among the many assessment projects managed by ARC is work conducted with the Missouri Department of Elementary and Secondary Education on P-20 assessments, including the alternate assessment for the Missouri Assessment Program (MAP-A) and provision of the *College BASE* exam for teacher education candidates.

We are delighted to welcome Christi, Paula and Bridget to the A TIME for Physics First team.

Christi Bergin is an associate research professor at the Assessment Resource Center, University of Missouri (ARC). She has an Ed.S. in program evaluation and research, and a PhD in child development, both from Stanford. She teaches child development and has written a textbook on child development for teachers. She has won a

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teaching award at MU. She specializes in socio-emotional well-being of children; particularly in helping teachers discipline in ways that promote strong teacher-student relationships and students' development of self-control. She has been an evaluation consultant for over 30 years, in California, Illinois, Ohio and Missouri. She has worked on several national projects for high-risk, impoverished youth. She hails from Chico, California but has been a "Missourian" for 10 years. Her role in the project is to manage the evaluation.

Paula McFarling is a senior coordinator at ARC. She earned a B.S. in Elementary Education and an M.A. in Family Studies from the University of Missouri. After teaching at the elementary and college levels, Ms. McFarling has worked in program evaluation and market research for over 15 years, managing a diversity of projects including evaluations of teen tobacco usage in Missouri, child care needs in Boone County, and LSTA-funded programs within the Missouri State Library. She was an eMINTS evaluator for over three years. In this project, Ms. McFarling serves as a member of the evaluation team, coordinating data collection.

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Bridget Murphy is a research coordinator at ARC. She earned an M.A. in Sociology at Kansas State University. She has experience working on a wide-range of evaluation projects, including analyses for a multi-year project pertaining to NCLB and Missouri's MAP test. Her primary role in A TIME for Physics First will be managing, analyzing and reporting on survey and achievement data. As the mother of a 9th-grade physics student in the Columbia Public Schools, Bridget is especially pleased to be involved in this project.

Glimpses of the 2012 Summer Academy, C1 and C2 Fellows

Evaluators' Corner

Christi Bergin, Paula McFarling and Bridget Murphy, ARC

We are glad to have the opportunity to work with A TIME for Physics First, and hope the evaluative information we provide will contribute to the learning experiences for both current and future students. We have been educating ourselves on the project, getting to know the project team, reviewing previous evaluation activities, and updating the evaluation plan. We were especially pleased to spend some time with teachers, coaches and mentors at the Summer Academy, and appreciate everyone who took the time to answer our questions and allowed us to observe their sessions.

We have a number of evaluation activities planned for students, teachers and administrators for all Physics First buildings for this academic year. We have made a concerted effort to collect data in a way that minimizes impact on classroom instructional time; however, we recognize and appreciate that you will make adjustments to accommodate our requests for information and we appreciate your willingness to do so. As the school year kicks off, we have two important data gathering needs from Physics First fellows:

- Teachers should be collecting student assents and parent consents from their students. Only those students who have granted their assent and have parental consent are eligible to take part in survey and/or testing activities. Although teacher, school and district cooperation is a requirement of acceptance into the project, we want to remind everyone that student participation is voluntary; students or their parents or guardians may opt out of participation in the evaluation component at any time.
- Sometime during the first two weeks of class, teachers need to administer the student content pretest and return answer sheets to the Assessment Resource Center. Instructions for administering the tests have been posted on Sakai. We ask that answer sheets be returned to us by September 29, 2012. To avoid having to mail the sheets, fellows are welcome to deliver them to us at the September follow-up meeting in Columbia.

We look forward to a productive year ahead! Please feel free to contact any one of us with questions or concerns.

Unexpected Successes of Coaching and Online Mentoring

Sara Torres, Consultant

A TIME for Physics First in Missouri has created a multi-faceted support system to assist teachers in implementing change in content and pedagogy. An important feature of the teacher support system is the monthly face-to-face coaching and online mentoring. The primary function of the coaches and mentors is to help teachers reflect upon their lessons and discuss student learning. In addition, they discuss concerns and/or needs regarding the lesson, as well as their classroom and implementation needs, including content, classroom management and pedagogy.

To prepare the coaches and mentors for their role, they participated in Cognitive Coaching workshop. The coaches and mentors utilize the Cognitive Coaching techniques during their monthly conversations to help teachers take action toward their goals while simultaneously helping them develop expertise in planning, reflecting, problem solving and decision-making.[1] Through these conversations, the project has seen the teacher support system provide unexpected successes of connecting teachers to resources and guiding them to share their expertise with others.

Every week, coaches were online to provide mentoring and support to teachers in the project. While online, coaches read the blogs, discussion forums, and review the resources on Sakai. Occasionally, during the reflection visits, teachers raised concerns and/or questions that a coach/mentor could not address. In that case, the coaches guide teachers to specialty blogs, discussion forums, and tools on Sakai for self-help. Many of the teacher issues and concerns are

highlighted in a blog or a discussion forum that the teacher had not had time to read. Frequently, teachers thank their coach/online mentor for guiding them to a resource or connecting them to peer Physics First teachers and/or Professional Learning Communities that helped them with a concern/need.

Another unexpected success of the coach and online mentor support system is the brainstorming activities that they conduct with the teachers in regards to the share-a-thons. Throughout the academic year, teachers are expected to facilitate two share-a-thons during two of the three follow-up sessions. Focusing on teaching and implementing the curriculum, teachers are, occasionally, at a loss about what to share with their colleagues. As they share their lessons and the modifications and strategies that they have used in teaching physics, the coach/mentor takes note of those topics. As the time draws near for a follow-up session, the coach/mentor brainstorm with each teacher topics that they can share with their colleagues. Many times, the teacher may not recall a modification to a lesson that proved to be successful or use of unique simulations to strengthened students understanding of a concept. These are the topics that other teachers want to hear and learn about so that they can have success too.

It is not necessary or important to know the "answer" when coaching/mentoring teachers; it is more important to listen, question, paraphrase, probe and guide teachers to available resources that will enable them to be self-empowering. The coaching and online mentoring in the project has guided PF teachers toward becoming more resourceful, informed and skillful professionals. Teachers are developing leadership skills through the conversation process with the coaches and online mentors – a success story for Physics First!

1. Costa, A. L. & Garmston, R.J. (2002). *Cognitive Coaching: A Foundation for Renaissance Schools,* 2nd Edition. (p. 13).Christopher-Gordon Publishers, Inc .Massachusetts.

Hosting the Hovercraft Funfest

John and Willi Willenberg, Mentor & spouse

Right: Kevin Hummel, Willow Springs and Jerry MacLean, Lone Jack, spent the entire evening cutting large wooden circles. Below: John Clapp, Hickman Mills, and Mentor John Willenberg discuss why they have extra parts.

This was the second summer academy for Cohort 2 Fellows. With new units to learn in only four weeks, everyone was feeling the stress of being in class and more significantly, being the student rather than the teacher. Everyone, I thought, was looking for a little relief, and that opportunity presented itself on a hot summer evening at our home – and my lovely wife and partner, Willi, agreed. My sister and brother-in-law live next door and offered to let us use their wonderful well-shaded shop. Sarah Hill and Physics First provided all the "fixins" for a great picnic dinner, with BBQ prepared by PF's own smokin' grill-master, Shawn Hayden, who did all the grilling. After stocking up on good food, we prepared to build 4-ft diameter, 18-volt battery-operated leaf blower-powered hovercrafts that would be used in Physics First buildings statewide.

Thirty Fellows from 22 schools assembled hovercrafts in three hours. Camaraderie, collaboration and selfless participation by everyone made that possible. Glenn Owens and I spent an afternoon between Home Depot and Lowe's, selecting and purchasing the necessary materials then hauling it all out to the house. Glenn, Marsha Tyson and I started early that day, creating ten workstations and prepping all other materials.

Dr. Meera and the NSF grant provided funding for all the supplies bought to create the hovercrafts that would be taken back to districts. An assembly line process began to emerge as people found the niche they wanted to fill. Kevin Hummel and Jerry MacLean cut all the 4x4 foot 5/8 inch thick plywood into four-foot diameter circles. Because of that, Kevin was the last to build his hovercraft. Many people pitched in to help and Kevin's was built in only twenty minutes. By 9:30 p.m. tools were put away, yard cleaned up and people were leaving after having tested their creations. "What are we building next summer?" was heard over and over again into the night as each Fellow strolled to their cars. What, indeed?

Although this was a good time, this is serious business and has wonderful applications in Newton's Laws of Physics.

Katie Schottmueller, Ferguson-Florissant, and John Gilbert, Salisbury, assemble a Hovercraft.

Joe Pistone, Hickman Mills, looks pretty pleased with his Hovercraft, doesn't he?

Cohort 1 "Topics," Academy 2012

Doug Steinhoff, Peer Teacher

For those of you who were studying for the Praxis, or those of you working in Cohort 2, you really need to see what we did in our "Topics" program. The program was designed to take all the things learned in the Physics First program and run with it. We took a close look at many different aspects of teaching physics.

We began by looking at Universal Design Learning (UDL) presented by Cathy Thomas. This presentation showed us that learners take all shapes and forms. Designing a curriculum that fits everyone does not result in an effective curriculum. We must keep in mind that our students have different ways of absorbing information. Just like you wouldn't design a three-story house for a wheelchair-bound person, we cannot design a curriculum that only addresses one type of learner. Ms. Thomas showed us ways to re-structure our curriculum to encompass more of the differentiated learners that we are all faced with each day in our classes. After that, we took a tour of Townsend Hall and learned some really cool ways to use the SmartBoard and similar devices. We discovered ways to use these and other technologies such as videotaping and video analysis to help us teach more efficiently and effectively. One example was making a Smartboard video and using it for sub plans. Now even the most incompetent sub can provide a great lesson. But that's only the beginning! These recorded lessons provide students with another avenue to understand difficult concepts while at home, study hall, or elsewhere. We also discussed the importance of Formative Assessment. As educators, we become really good at reading students faces and expressions to identify those that have grasped a concept, and different cues for those that are "lost." We also are pretty good at verbal cues. When a student says, "Oh yea, I get it now," we know that it's time to move on to the next objective. Yet, when we provide the next assessment, we discover that they really didn't understand the concepts we "thought" we had thoroughly covered. This is where Formative Assessment comes in. We identified several simple, quick and to-the-point strategies to get down to who really knows it, and who doesn't. This of course informs us that we need to either re-teach, or move on.

After these discussions, the teachers started putting things together. We had a vision. Our vision was to examine our PF lessons and see if there were ways that we could enhance them to fit the needs of <u>all</u> our students, and to incorporate some kind of strategy to see if they've actually learned the concepts we teach. Kathy Ray discovered a way to produce an electronic and interactive textbook for her special-ed students that included links to vocabulary and videos that re-taught the slower students, or provided enrichment for those that had achieved mastery at the content. Jim Cibulka spent a lot of time putting together open-ended questions via video. His videos of cars, bowling balls and even himself driving through a stoplight were incredible! The videos have leading questions that really get at the heart of what we teach, and incredibly engaging! After watching a few Dan Meyer (prolific videographer, doctoral fellow at Stanford in curriculum design and teacher education) videos, I'm hooked and I guarantee that they will be used in my classroom. Steve Yonke, Vanita Blanton, Ellen McCray and Paul Schaefer all worked on re-designing some of the units to make them more student-friendly as well as a lot more enlightening for the students. Elizabeth Dyer put together a program to help her students understand difficult concepts and turn them into a much easier to understand platform, and provide enrichment problems/activities for the students who needed it. But, I don't want to give away everything they've done before you have a chance to see it. They've all put their work on the Sakai website and you need to be sure to check them out. I promise that you'll find something there to use in your own class that incorporates different media for teaching, different learning styles, ability levels that also provides enrichment for those students that are ready to move on. Keep in mind that they worked hard to develop these projects and were working against the clock during the academy. Developing projects like the ones this group did takes a lot of time. These teachers really understand differentiated learning and the value of having alternative sources of media and content that can help student more easily understand the concepts that we are all trying to get to. Isn't that what good teaching is all about?

THE PHYSTEC PROJECT FOR TOMORROW'S OUTSTANDING PHYSICS (TOP) TEACHERS

Karen King, Department of Physics and Astronomy, University of Missouri

As Cohort 1 Fellows enter their last year with the project, many have expressed concern about the long-term sustainability of training new physics teachers in their districts. Discussing this challenge in the last few days of the academy, new ideas for teacher-led training workshops and collaborations started to take root. Mike Hall (Jefferson City) and Ann Wallenmeyer (Springfield) will be leading a conversation on this topic at the September 29 follow-up meeting. Meanwhile, a newly funded MU program, Tomorrow's Outstanding Physics Teachers (TOP Teachers), targeting *pre-service* physics teachers, may also help sustain future training.

MEETING THE DEMAND

Physics is among the top four fields (including chemistry, math and special education) that face teacher shortages in districts across the country and in the state of Missouri [1,2]. This demand is likely to grow as more districts adopt the Physics First science curriculum; indeed, we have already seen substantial growth in the enrollment numbers of Missouri high school students. The TOP Teachers program, funded by the Physics Teacher Education Coalition (www.phystec.org) award, will help relieve this shortage by attracting more college students to physics education degree programs. The $300,000 award, distributed over three years, is poised to make a big impact on physics teacher development.

Institutions with PhysTEC funding are generally quite successful at building their teacher preparation programs. Figure 1 demonstrates a sampling of universities that have seen large gains in their number of new physics teachers, with MU's goals shown for comparison.

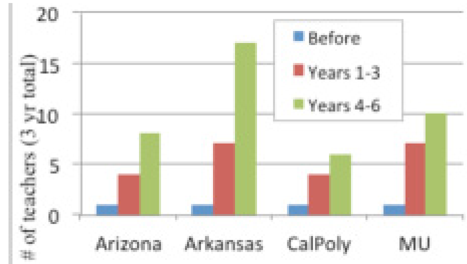


Figure 1. Number of physics education majors, before, during, and after funding. MU's goals for the funding period and beyond are shown in comparison to three PhysTEC institutions.

THE TOP TEACHER PROGRAM AT A GLANCE

TOP Teachers have flexible entry points into a choice of degree programs, and are supported substantially with opportunities for scholarships, community building activities, professional networking, and integrated mentoring in their induction years (see Figure 2). As a key component of the PhysTEC

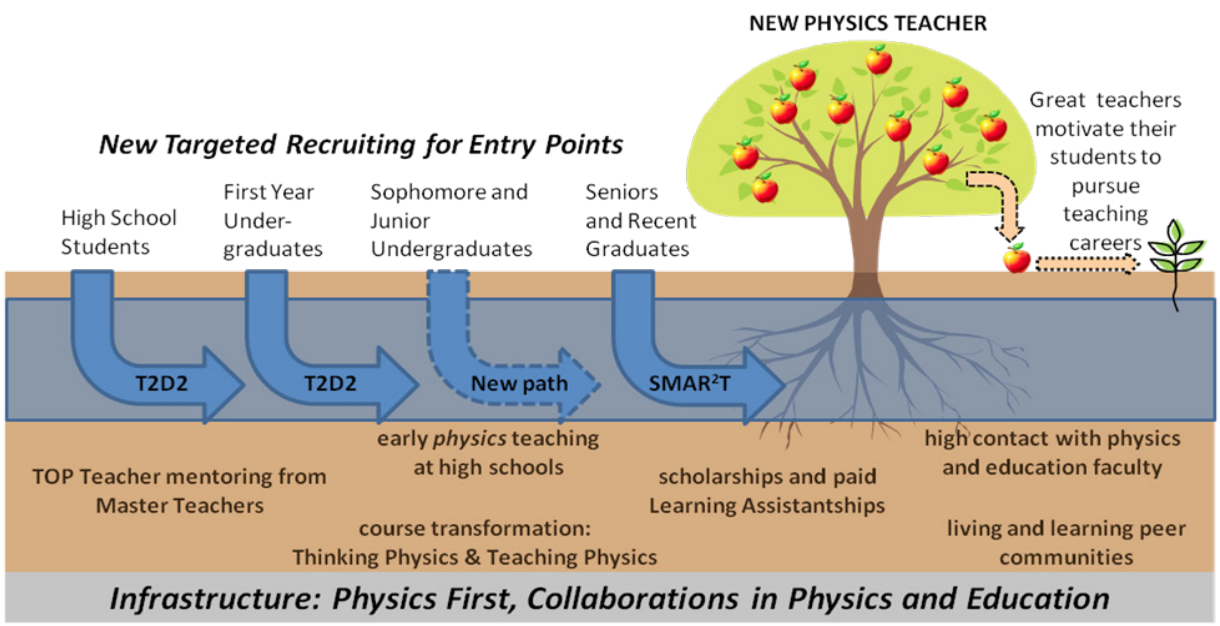


Fig. 2. TOP will add new recruiting tactics with multiple entry points into existing degree programs: Tomorrow's Teachers with Dual Degrees (T2D2), post-baccalaureate certification (SMAR^{2}T) and a new path. Once in the program, future teachers are cultivated through new stimulating experiences, community building and incentives, supported by existing physics education infrastructure. Graduates are mentored for 3 years as a TOP Teacher.

project, Doug Steinhoff (Columbia Public Schools) is serving as our Teacher-in-Residence, overseeing the Learning Assistant program (offering increased early teaching experiences), co-teaching a new physics pedagogy course, as well as leading many of the recruiting and community building activities.

The TOP Teachers project will help students navigate three possible physics education degree programs to choose the right fit:

The **dual BS degree** in physics and education (Tomorrow's Teachers with Dual Degrees, (http://t2d2.missouri.edu) is a good choice for students who are beginning their studies (prospective students, first- and second-year undergraduates) and who want the value afforded by a full physics degree. This degree choice has substantial support, with opportunities to obtain $11,000 Noyce scholarships, as well as paid summer internships.

The **BS in secondary education** with a physics emphasis is an excellent degree option for students who are further along in their undergraduate studies or who wish to explore more general education courses. The reduced physics requirements allow students flexibility, yet at the equivalent of a BA in physics, students gain deep content knowledge for a solid foundation in teaching (http://education.missouri.edu/TDP/index.php).

The **MS in science education**, also called the Science and Mathematics Academy for the Recruitment and Retention of Teachers (SMAR2T, www.smar2t.missouri.edu), offers an entry point for students who have already earned a BS in physics or engineering, and later become interested in teaching careers.

How can PhysTEC help Physics First?

We envision the new program as a great opportunity to partner with Missouri physics teachers and help fill new physics openings with highly qualified candidates. A new course in physics-specific pedagogical content knowledge (PCK) will feature the Physics First modeling and inquiry techniques, preparing new teachers to implement the ninth grade curriculum. We're also quite interested in learning how else the PhysTEC project might help support Physics First teachers and their school district, and look forward to initiating these discussions this year.

How can you help support TOP Teachers?

Having the support of experienced in-service teacher leaders such as Physics First Fellows will be invaluable to the success of our TOP Teachers. From advising the growth of the MU PhysTEC program, collaborating with us on recruiting and outreach events, to helping your students network and mentoring new teachers, there are many ways that you can take a leading position in this important initiative:

- Join our Teacher Advisory Group. We plan to meet three to four times per year to collaborate, share ideas, discuss recruiting opportunities, and ways that we can support your needs. Please contact Karen King (kingkar@missouri.edu) if you would like to be in this advisory group.
- Bring students to STOM. The TOP Teacher program has funding to bring up to approximately 20 high school students and their teachers to STOM each year, as a way of connecting them to other science educators and students. If you have a student (past or present) who you think might be interested in physics teaching, please bring them to STOM! We'll send you more information on this in the coming month.
- Send students to "Physics for a Day." This spring, we'll hold an open-house day at MU, pairing prospective physics students with current physics majors so that they can experience the MU program first-hand.
- Invite us to visit your school. We plan to recruit directly from Missouri high schools. Doug Steinhoff will be contacting you to see if you are interested in having us visit your classroom. We will work with you to see how to best make this visit fit your needs. For example, if you are interested in demonstrations, we may be able to arrange having physics majors bring and perform demonstrations to your students.

If you'd like more information about the program or if you would like to be involved in any way, please contact Karen King (kingkar@missouri.edu) or Doug Steinhoff (DSteinho@columbia.k12.mo.us). We welcome your ideas and leadership in helping us continue to train highly effective physics teachers across the state of Missouri!

[1] T. Hodapp. (2010, October 21). Critical Issues Facing the Physics Community. www.phystec.org. Available: http://www.phystec.org/presentations/101021_hodapp.pdf

[2] (2010, December). Missouri Teacher Shortage Areas. http://dese.mo.gov. Available:

http://dese.mo.gov/divteachqual/teachrecruit/documents/Shortage_Areas.pdf

Galileo - First Modern Scientist

Kari Bumgarner, Sparta High School

Galileo Galilei was born in February 1564, in Pisa, Italy. He became famous well after other big names in science such as Socrates, Plato, Aristotle and Copernicus. So why is Galileo given the recognition of being the first modern scientist? A look at his contributions to the body of scientific knowledge and his actions for shaping a scientific process that would increase the accuracy of measurements and credibility of ideas will help us answer this question.

Galileo lived in a time when philosophical thought was the predominant basis for scientific beliefs and common understanding. This manner of self-thought discovery led to many misconceptions. A key example was the belief that ice as a solid was more dense than water. Ideas such as this did not "sit well" with Galileo. He constantly questioned his instructors even to the point of having a reputation for being argumentative. Galileo pushed for science to be systematic, emphasizing the importance of accurate, repeatable experiments that tested a hypothesis using observations – not merely thought. Using a method of testing, and either keeping and modifying or abandoning a hypothesis depending on data observed, led Galileo to overcome many misconceptions.

A simple example of how Galileo pressed for observation-based science can be seen in his disproving the ice-density misconception. Galileo argued that since ice floats, it must be less, not more, dense than water. Others claimed that its shape kept it afloat. Galileo then challenged the scientists by placing different shapes of various materials in water and observing their ability to float. After many trials, it was obvious ice must be less dense. This was the first major step away from thought and towards a systematic science. The idea of repeatable, observation-based experimentation with accountability is why many people consider Galileo the "First Scientist."

Although this is a very simple example of how Galileo changed the face of science, he made prolific advances in our understanding of science. His achievements ranged from understanding trajectories to his most significant idea that the Sun, not the Earth, is the center of our universe; a proclamation that led to him living the rest of his life under house arrest. His influential ideas and his methods of observation and experimentation will never be forgotten. These techniques drastically altered the methodology of science and paved the way for the knowledge and technology we have today.

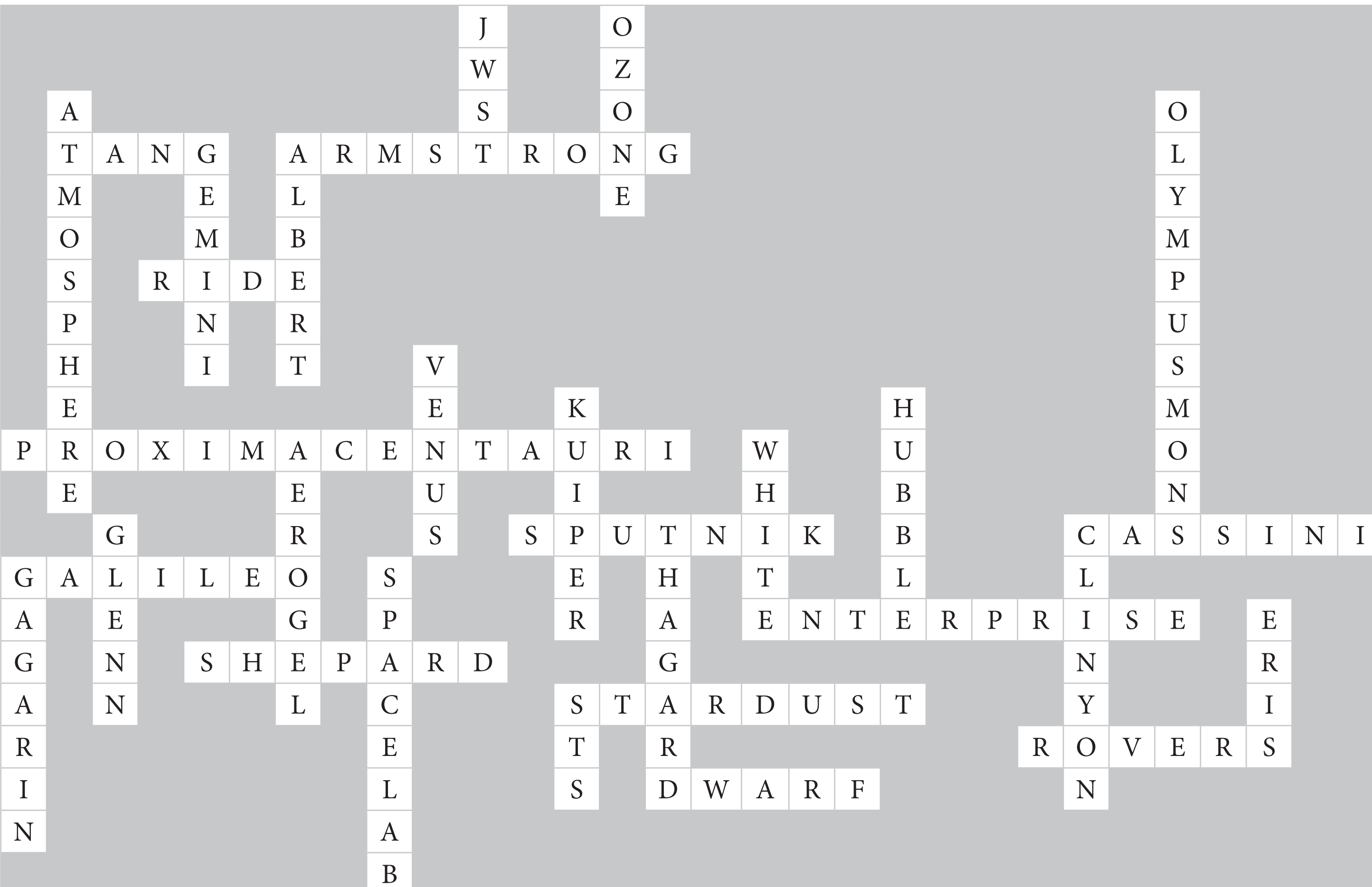
Administrators come to the Academy, Summer 2012

Anne Wallenmeyer, Springfield Public Schools

The ten administrators attending the Administrator Academy in June participated in a variety of activities informing them about the learning and work that goes into implementation of Physics First in their district. These activities involved whiteboarding, observing Physics First fellows, discussing concept overlap with math teachers, and talking with mentors and coaches about what Physics First looks like in the classroom. The networking and collaboration that took place throughout all of the activities was considered to be a valuable component of the academy. Administrators had several take-aways from the academy. First of all, they have a greater appreciation for the commitment and work required by Fellows to implement Physics First. Second by comparing their ideas and the Fellows' ideas, they have a better understanding of the administrator's role in supporting and sustaining Physics First in their district. Finally, they have an understanding of how the grant organization provides not only professional development, but web-based and face to face support through coaches/mentors, especially during the academic year.

As the academy drew to a close, the topic of sustainability was at the forefront of everyone's thinking. Some of the ideas that were discussed included satellites across

Solution to April 2012 Brain Bender



the state to support the work of Physics First, universities including modeling pedagogy in all science education methods classes, maintaining a web-based support system for teachers, avenues of professional development in Physics First (and beyond) for current participants and new teachers, and a statewide networking system of information about school districts participating in Physics First.

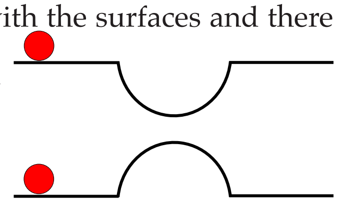
Administrators and District Liaisons, please continue the conversation with us during District Liaison meetings scheduled throughout this year!

Brain Benders

Dorina Kosztin, University of Missouri

Marble Race

As shown in the figure below, two identical marbles start with the same speed and roll along the two horizontal tracks. One track has a dip and the other one has a bump of the same shape. Which marble will win the race to the other end of the track? The marbles never lose contact with the surfaces and there is no loss of energy due to friction.

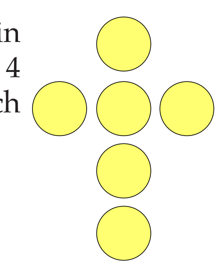


Trapped on Ice

A person is standing in the middle of a frictionless icy surface of a lake. How can he move to get to the shore? How can anyone land up in such a place in the first place?

Coins in Row and Column

Move only one coin so that there are 4 coins along each line.



Mathematics Teacher Academy

Dorina Mitrea, Department of Mathematics, University of Missouri

The third edition of the special one-week academy for mathematics teachers in conjunction with the Physics First Summer Academy was held June 4-8, 2012, on the MU campus. Attendees from Physics First high schools in Missouri had the opportunity to work collectively as a group and to attend Physics First classes with their science teacher colleagues. In the process, mathematics teachers familiarized themselves with key components of the Physics First curriculum and pedagogy, analyzed the mathematics used in the Physics First curriculum, engaged in discussing implications for the mathematics curriculum of the Physics First course, explored in group discussions their role in implementing the Physics First curriculum in their respective schools, started planning adjustments to their mathematics curriculum that could help with the implementation of the Physics First curriculum, established the basic working parameters for an on-going collaboration with their science colleagues (as it relates to the Physics First course), deepened their mathematics content knowledge and their problem solving skills, and had the chance to meet with administrators to bring forward their suggestions regarding ways in which administrators may help facilitate the collaboration that needs to take place between the mathematics and science teachers at the schools implementing the Physics First course.

Mathematics teachers at the 2012 summer academy were given the assignment to write letters to mathematics teachers who were unable to attend the academy, with the goal of providing insight into the needed collaborative effort between the mathematics and physics teachers implementing Physics First in their schools. Below are a few of their letters:

Mike Bostwick:

A week spent considering the Physics First curriculum our students experience as freshmen has helped me to reflect on my role as a math teacher. In particular, I thought repeatedly of the common question math students ask: "Why do I have to learn this?" Students leave our classes with new skills and new understanding that…what? What is it that we hope students can <u>do</u> with

all of this math we've taught them? After reflecting on this question this week, I believe the answer is best left as a variable; students should be able to take the abstractions of math and apply them to whatever they can find. Their physics class is just one of many possible applications of the math we teach. This has implications for how we teach. Students' understanding must be FLEXIBLE. If students' understanding of slope is tied inexorably to y and x and they can't formulate slope more generally in terms of any dependent and independent variables, we have failed. This is merely one among many possible consequences of inflexible understanding of math. You will receive a packet describing some of the ways we can be flexible in our presentation of algebra concepts to aid students learning the Physics First curriculum. I suggest this is just a start. If students are to have real answers to the question, "Why do I have to learn this?" we must teach so that students are able to find as many applications as possible.

Becky McCurdy:

When I first found out that the freshmen at my school would be taking Physics First, I really didn't think it would affect me. Participation in the Physics First Math Academy has shown me that I couldn't be more wrong. The most profound effect that Physics First has had on me and my classes is a greater understanding of the real-life application of the mathematics content. This doesn't mean that it's all benefit and no "give." For this to be the most beneficial to the students, BOTH teachers (math and Physics First) must work together and "tweak" their curricula to align when possible. This means moving concepts that are not fixed if it will help the other class, using common language, and using variables and examples from physics. It doesn't involve a lot of change but I believe we can see a large reward in the mathematics classroom!

Christopher Hawkins:

As a first year teacher I thought this academy was great for myself and the other math teachers here. This academy made me aware of the discrepancy between math and physics throughout the overlapping topics in the subjects. Being here makes me want to change the order of topics as well as the wording and variations of topics. I want to work with my Physics First teacher to make sure we are able to double team certain topics to make sure the students understand in multiple ways. I know there are certain aspects of math where we do not want to change, however we need to change, i.e. the xy-plane could change sometimes and stress the fact it is an independent variable and dependent variable plane, mn-plane. I believe all math teachers should be in this academy because this academy will eliminate the confusion and frustration between math and physics.

Austin Miller:

I was terrified at the beginning of this week as I have no experience in physics. However, from day one, I have slowly developed a sense of how important it is for us to bridge the gap between the math and physics disciplines. The similarities between math and physics allow for easy implementation and integration of the two. A slight change of language, utilization of specific problems, and a basic sense of the physics curriculum combine in easy ways to support our fellow physics teachers while they support our mathematical discipline. Working physics into the math curriculum has been a bit of work but it has also been fun and provides the real-world context that our students often strive for within our classrooms. I highly suggest having a simple conversation with physics teachers within your district to see how easy collaboration and support can be to provide and optimal learning experience for your students.

Kim Hurst:

After attending the Physics First Academy for two years my best piece of advice is to network with your colleagues. It is important to talk with Physics First teachers about what they are teaching in class and ways you can help them in your Algebra class. Also, talk with your fellow math teachers and come up with ways to connect Physics First to Algebra.

One of the best things you can do for students is to collaborate with your Physics First teachers. Each teacher offers instruction a little differently and may want you to help them in different ways. Communication is the key to a successful implementation of the program.

More math teachers' letters can be found on the Math Teachers tab on SAKAI.

Fast Facts:

Grant period: September 1, 2009 - August 31, 2014
Follow-up sessions: September 29. 2012, February 9, 2013 (snow date Feb 16) and April 20, 2013

Funding Agency: National Science Foundation
Target Participants: Ninth grade science teachers in Missouri school districts

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Editorial Board:

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