A TIME for Physics First

Academy for Teachers - Inquiry and Modeling Experiences for Physics First

Leadership in Freshman Physics, 2009-14

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Teacher Leadership and the Freshman Physics Program

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Mr. Jones attended a workshop where he learned new teaching strategies to implement in his physics course. He tried these strategies, assessed his students, and continued to adjust his teaching to improve student learning. As a result of his instruction, student achievement improved significantly, and his students seemed to have a more positive attitude towards science. He found himself more enthusiastic and positive about teaching. He went home at the end of the day feeling satisfied with his work.

Mrs. Land attended the same workshop, and similar to Mr. Jones was able to improve her instruction to better support student learning. She knew that the teaching strategies she had learned would benefit not only her students, but other students in her school as well. She invited the new science teacher at her school, Mr. Bell, to visit her classroom to observe her teaching. She also offered to help him implement the strategies in his courses. Mr. Bell, grateful for the assistance, eagerly accepted.

Both of the teachers above benefited from the professional development experience of attending the workshop; however, Mrs. Land was able to extend that benefit to another teacher in her school, making a far greater impact through her leadership. Mrs. Land's actions demonstrate just one of the many roles teacher-leaders can play in supporting educational reforms. Teachers rarely see themselves as leaders, but teachers who are committed to their students and to their own professional development can help advance school improvement efforts beyond their own classrooms. An important component of the Freshman Physics program is developing your knowledge and skills so you can serve as a teacher-leader.

Why is leadership important?

Leadership is characterized by a particular type of relationship- one that mobilizes others to improve practice. As such, leadership is a necessary ingredient for educational reforms. Effective leadership provides a catalyst for change, and is necessary for implementing and sustaining curriculum reform efforts. Leaders provide the needed expertise to ensure reforms are successful in achieving their intended effect—promoting student learning. Yet, leadership benefits not only students, but also teachers who serve as leaders. Teacher leadership provides a potential solution to the feelings of isolation and detachment that many teachers experience during their careers. Involvement in setting direction of professional and school improvement can increase the meaning of teachers' work.

Who can be a leader?

ALL teachers have the potential to be a teacher leader; by virtue of the individual's efforts to bring about change in the classrooms and schools, teachers lead by example. By developing the capacity for leadership, one can make a difference beyond one's own classroom through empowering others. Teacher leaders extend their reach through impacting school-wide policies and programs, teaching and learning, and community relations (Danielson, 2007). Teacher-leaders lead within and beyond the classroom, supporting other teachers as learners and leaders, and encouraging others to improve their practice for the benefit of all students (Katzenmeyer & Moller, 2001).

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What role can teachers play as leaders?

Teacher leaders are advocates, innovators, and stewards (Lieberman & Miller, 2004). As advocates, they speak up for what is best for student learning, framing and reframing issues so that student learning is the central focus. As innovators, they act as change agents, implementing new practices. As stewards, they positively shape the profession by contributing to their own professional growth and that of their colleagues. Specific tasks that teacher-leaders take on may include:

- Choosing textbooks and instructional materials
- Shaping the curriculum and building a presence for science in the school
- Designing staff development and inservice programs
- Deciding school budgets
- Selecting new teachers and administrators
- Mentoring new teachers
- Providing classroom support/coaching to peers
- Managing resources for the school science program
- Contributing to the design and assessment of the school improvement plan
- Building relationships within the school
- Building support among parents and the community for the science program
- Encouraging involvement of others in bringing about change
- Participating in professional organizations

However, teacher-leadership is more than simply the skills necessary to complete these tasks—it includes broader competencies, such as being able to elicit and integrate multiple perspectives of stakeholders, and develop longer-term action plans to develop a critical mass for change.

How will being a leader benefit teachers?

Why should teachers want to be leaders—especially when they're already being pulled in many directions? Many teachers choose to become leaders for the chance to make a difference! Research also shows, however, that teachers benefit from serving as teacher leaders. Barth (2001) indicates that teachers can be enriched and energized through pursuing leadership opportunities within the profession. "Rather than remain passive recipients of what their institutions deal to them, teachers who lead help shape their own schools and thereby their own destinies as educators" (2001, p. 445). Teacher leadership can increase personal and professional satisfaction, contribute to a reduction in the isolation teachers often feel, and contribute to further professional growth—all of which positively impacts their teaching. Teacher-leaders become owners and investors in the school, rather than mere tenants (Barth, 2001). Positive working relationships with colleagues and administrators are enhanced as leaders become recognized and respected for the expertise they contribute.

How will participating in Freshman Physics help a teacher become a leader?

Our leadership model is guided by several principles: that leadership is based on a shared vision of effective practice, the assertion that teacher-leadership learning must be embedded in practice, and the realization that in order to become leaders, teachers need a wide range of knowledge, dispositions and skills, which are derived from research, reflection on practice, and shared expertise. Leadership training during the professional development will focus on enabling teachers to serve as intellectual leaders and science advocates at the local, regional and state levels. Coursework in teacher leadership will help you develop an understanding of various models of leadership, as well as build necessary knowledge and skills to serve as a leader. The success of teacher leaders depends, in part, on the nature of their leadership work, which must be valued by their peers, visible within the school, and continually negotiated on the basis of feedback and evaluation of its effectiveness (York-Barr & Duke, 2004). Through developing a personalized leadership plan, you will be guided in evaluating your effectiveness as a leader and further developing your capacity for leadership within your school, district, state and beyond.

References

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What's New in our Physics First Curriculum?

Meera Chandrasekhar, University of Missouri

One of the challenges of implementing a yearlong physics course in 9th grade classrooms has been that there are few choices in choosing a curriculum or textbook. *A TIME for Physics First* has addressed this issue by writing a curriculum, starting with our first Math-Science Partnership project (2005-08) that was funded by the Missouri Department of Elementary and Secondary Education. This original curriculum was based on inquiry and modeling pedagogies, and was designed as a professional development curriculum. In the current NSF project, the curriculum is being revised to be student–oriented, keeping the inquiry and modeling pedagogies intact. We expect that teachers will be able to import the curriculum into their classrooms with more ease.

Writing curriculum is a lot of hard work. Peer teachers, faculty instructors, coach–mentors and participants of the original 2005-08 project put in a lot of work over the three-year period to produce and (repeatedly!) revise the curriculum. The current revision has been made easier by the previous work, but we still find ourselves spending a lot of hours working on it.

The primary architects of the current revision are faculty instructors and peer teachers (all of whom were involved in the previous project): Dennis Nickelson, Brian Foster, Gabe de la Paz, Doug Steinhoff, Dorina Kosztin and Meera Chandrasekhar. They meet once a month on a Saturday to brainstorm ideas, and tap away at the computer in-between. Each unit undergoes several layers of revision. At the end of it all, here's what you can expect in each unit (and this is not a complete list):

- Key concepts are addressed through carefully sequenced labs, practice problems, and reading pages that follow the 5E learning cycle.
- Labs develop concepts – forget that "cheat-sheet" of formulae that people picture when you say the word physics. In this curriculum each formula is developed by conducting a lab and by analyzing the data obtained. Only key formula are developed.
- In keeping with a inquiry and modeling pedagogy, students interact with the materials and design labs in conjunction with the class and the teacher. They then conduct the lab in small groups and analyze the data they obtain to develop the physical concept. Leave that cook-book stuff behind - with the previous decades!
- The curriculum utilizes multiple methods of engaging with a concept: pictorial, graphical, verbal and finally, mathematical representations of concepts are developed. Students learn to travel between representations, allowing students of different learning styles to understand each concept in depth.
- Labs use carefully sequenced questions during the pre-lab and post-lab discussion phases. Student discussion, including the use of whiteboards, is a key feature of the curriculum. Please leave the sage-on-the-stage outfit at home and bring your guide-on-the-side hat with you.
- Along with this fundamental philosophy, the curriculum adds extensive help for the teacher, including
    - A detailed list of objectives and common misconceptions for each unit.
    - Teacher notes for each lab, primarily developed by former teachers; currently under development are notes based on the Educative Curriculum Materials model.
    - Reading pages that include sample problems.
    - Worksheet-style practice problems, and a select set of in-class and homework practice problems.
    - Materials lists for each lab, and a consolidated list for each unit, including recommended numbers for each classroom.
    - Appendix with sample data and additional resources for each unit and for the entire curriculum.

As teachers use this curriculum in the summer academies and students use it during the academic year, we will be collecting edits and revising the materials annually until the last year of the project. The five-year goal is to have a polished curriculum to which all participants of the project have contributed.

Evaluation of A TIME for Physics First

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

Evaluation for A TIME for Physics First is being led by Martha A. Henry and Keith S. Murray of M.A. Henry Consulting, LLC in St. Louis. The evaluators have worked with the project's implementation team in the past, and contributed to development of the proposal for the National Science Foundation grant funding the project.

The evaluators were asked if they could respond to some questions received about their evaluation work for A TIME for Physics First, expecting that others may be asking similar questions.

Q: What exactly do evaluators for a project like this do?

A: External evaluators are an independent team of professionals with education, research, analysis and program management experience who serve as an extra support for the team implementing the project. They monitor activities to help ensure that the plan is followed and challenges met (formative and process evaluation) and they use data collected in various ways to analyze the success of the project in meeting its goals for change (summative evaluation).

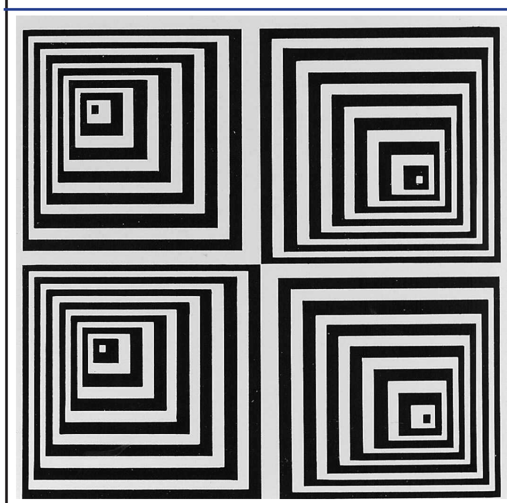
Q: Can participants opt out of participation in the evaluation?

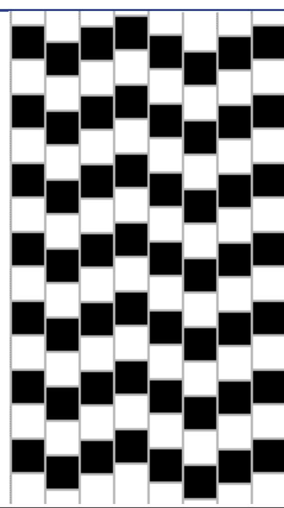
A: NSF requires that each Math and Science Partnership it funds serve as a research project to further understanding in the education field on how to ensure the best possible outcomes among teachers and their students. NSF also requires that an external evaluator – someone outside the implementation of the project – develop and carry out an evaluation plan to assist the project's efforts. Participation in the evaluation is a condition of participation. However, evaluation activities have been designed for minimal time and effort so as not to impede the work of the project.

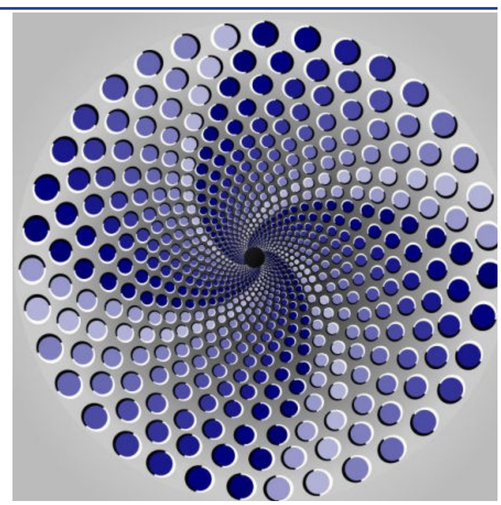
Q: Why are there two cohorts starting at different times and can I request to be in one or the other?

A: As a federal research project, A TIME for Physics First had to be developed in a way that allows the types of evaluation and research likely to analyze the real effects of what occurs. The cohort design, a "random-assignment, delayed-entry control group design of two cohorts of teachers," permits comparison of the two cohorts in a way for statistical analyses. The project's focus on teacher leadership development, how best to support teachers year-round, and what impact occurs on student achievement requires this kind of approach. Teacher participants have to be randomly assigned to the cohorts to help ensure that the two groups are as comparable as possible and that other confounding effects are minimized. Since it is a research project, teachers cannot just be assigned where they want.

If you have any questions about the evaluation for A TIME for Physics First, Marty and Keith would be happy to talk with you. Write them at mahenry@mahenryconsulting.com or keithsmurray@mahenryconsulting.com, or call them at (314) 353-8905.







Brain Benders

Dorina Kosztin, University of Missouri

Use all the letter pairs in the Choice Box to fill in the answers to the clues about energy, work, and power.

1 V E		C I			
2	E R		L		
3	D I		T		
4 S O		D			
5 C O	N S				O N
6	C L		R		
7	R K				
8 K I			C		
9 T E		E R		U R	E
10 C H		I C			
11 C R			D		
12	S T	R O		D	

1. Another name for speed
2. Energy that is heat energy
3. Energy that can exist without matter
4. Energy that moves waves of pressure
5. Non-loss of energy
6. The sun obtains energy from this source.
7. Energy is the ability to do...
8. Energy of motion
9. Molecules move faster when the "9" is higher.
10. Energy is the result of a chemical reaction
11 and 12. Energy can neither be "11" nor "12"

Choice Box:

TI	**AL**	**TI**	**MA**	**AN**	**ER**
RA	**NE**	**LO**	**NU**	**EM**	**AT**
EA	**TH**	**EA**	**UN**	**TY**	**YE**
DE	**TE**	**WO**	**MP**	**VA**	

Fast Facts:

Grant start date: September 1, 2009
Grant period: 5 years
Funding Agency: National Science Foundation
First summer academy: Summer 2010
First Meeting for all participants: April 17, 2010
Target Participants: Ninth grade science teachers in Missouri school districts
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