ATE/PPE Project Evaluation
Report on 2014 Workshops
NSF Award 0603271

Submitted
June 2015

Prepared by
Karen Jo Matsler, Ed.D.
Education Assessment and Training, Inc

Submitted to
Tom O'Kuma, Lee College
Dwain Desbien, Estrella Mountain Community College

Table of Contents

Background

The Advanced Technological Education Program for Physics Education (ATE/PPE) is a program for two-year colleges and is supported by the National Science Foundation. The program focuses on the education of technicians for the high-technology fields that drive our nation's economy and involves partnerships between academic institutions and employers to promote improvement in the education of science and engineering technicians at the undergraduate and secondary school levels.[1] The goal of the project is to help high school and two-year college students develop a stronger understanding of science, with an emphasis on physics and its applications in industry.[2] Participants (faculty and teachers) were offered graduate credit in physics at a reduced cost of $60 for attending the workshops through the University of Dallas. The ATE/PPE program is directed by Thomas O'Kuma and Dwain Desbien and supports professional development of college faculty and secondary school teachers by providing workshops focused on integrating technology into the classroom. Since 2006, this Project has conducted 40 workshops and conferences at 14 sites in 12 states. Over 770 participants have attended one of these workshops or conferences, representing 310 different colleges and schools in 41 different states and 2 US territories. This project builds upon an earlier workshop project[3] that held 61 workshops over 15 years.[4]

Participants for the 2014 workshops were recruited using a variety of methods including mailings, list serves, and word of mouth from previous attendees. Applicants were expected to provide statements indicating their interest in the workshop and the expected impact on their classroom teaching practice. Participants were encouraged to bring more than one member from their school or institution to extend the influence/impact of the program. However, individuals were not excluded from participating if they did not have a team attending. Participants were also encouraged to apply for more than one content workshop allowing them to experience multiple areas of technological applications for their classroom. Information for the workshops was posted on the website http://physicsworkshops.org/.

The purpose of this report is to summarize findings of the ATE/PPE project in 2014. During this time period there were three workshops conducted at sites across the nation including Green

---

1 Program Solicitation NSF 07-530, National Science Foundation, Directorate for Education & Human Resources, Division of Undergraduate Education, Research on Learning in Formal and Informal Settings

2 Workshop Information, ATE Project for Physics Faculty. http://physicsworkshops.org/.

3 http://tycphysics.org/default.htm

4 Workshop Information, ATE Project for Physics Faculty. http://physicsworkshops.org/

River Community College, Auburn WA (March 27-29, 2014), Manchester Community College, Manchester, CT (June 26-28, 2014), and Estrella Mountain Community College, Avondale, AZ (November 13-15, 2014).

Each workshop focused on different aspects of technology tools appropriate for a classroom and was led by experts in physics education including members of the business community. Experts included: Tom O'Kuma (Lee College, Baytown TX), Dwain Desbien (Estrella Mountain Community College, Avondale, AZ), Adrienne Battle (Green River Community College), David Maloney (Indiana University), Anne Cox (Eckerd College, St. Petersburg, FL), and David Weaver (Chandler-Gilbert Community College, The workshop instructors are active in Physics Education Research (PER) as well as national professional organizations. The instructors are well known in the physics community and have vast experience in working with teachers and presenting for diverse audiences. In addition, they use the materials presented as a regular part of their own physics course or class and therefore they can model how the materials can be effectively used in the classroom.

Workshops Conducted

- Instructional Strategies for Introductory Physics, ISIP, March 27-29, 2014, at Green River Community College, Auburn, WA.
- Instructional Strategies for Introductory Physics, ISIP, June 26-28, 2014, at Manchester Community College, Manchester, CT.
- Project Based Learning for Introductory Physics (PBLIP), November 13-15, 2014, at Estrella Mountain Community College, Avondale, AZ.

Workshop Descriptions

The workshops targeted different technology tools and therefore allowed participants to attend more than one if desired to get professional development in multiple areas. The workshops used tools available for both Mac and Windows computers and included extensive discussions on how to use the tools and tactics once they returned to their classrooms. A detailed description of the workshops is included in the appendix. All workshops addressed assessment of physics learning and application of research findings in Physics Education Research (PER) as applied to students' learning of introductory physics.

The workshops are intensive over a 3 day period starting around 8:30 A.M. and ending around 9:30 P.M. Breaks and meals are dispersed over the period and participants are encouraged to

take other breaks as necessary. The long hours are due to the project leadership's efforts to minimize the time teachers are out of their classes as well as minimize expenses associated with substitutes, travel, and accommodations.

Instructional Strategies for Introductory Physics (ISIP)

During this hands-on workshop, participants were familiarized with various TIPERs. TIPERs Tasks have been Inspired by Physics Education Research. These tasks are not like traditional physics textbook problems, but rather, require the students to think conceptually about a particular physical situation. They include ranking tasks, working backwards tasks, conflicting contentions tasks, linked multiple choice tasks and others. In this workshop, participants worked with different kinds of tasks, discussed how they might be effectively used in the physics classroom, and learned how to write some of their own tasks. There was an emphasis on the new Sense Making TIPERs although nTIPERs (Newtonian TIPERs) and EM TIPERs were also discussed. Participants also experienced a classroom management technique called modeling discourse management. While this classroom management style was created for a modeling curriculum, it can also be used with most PER based activities or curriculum. Modeling discourse management is an attempt to improve student-student interactions, student-teacher interactions, and classroom discussions.[5]

Project Based Learning for Introductory Physics (PBLIP)

The emphasis of this workshop was Project Based Learning in Very Large Contexts (VLC), in which student teams have 4-5 weeks to construct a project, collect pertinent data, create a technical instruction manual for their device and develop a multimedia presentation about their efforts. Participants worked in small groups on specific VLC projects to allow participants an opportunity to explore how these simulations can be used most effectively in the classroom. During this workshop, participants will became familiar with a variety of simulations available such as Physlets© (physics applets), Open Source Physics resources[6], tools for authoring simulations (Easy Java Simulations), video analysis (Tracker), and PhET simulations.[7] The focus was on helping participants develop the ability and skills to modify, adapt, and construct new materials and to provide a flexible suite of resources appropriate to different levels of instruction.

[5] http://physicsworkshops.org/Fall%202013/Workshop_Description_F13.pdf
[6] www.opensourcephysics.org
[7] http://phet.colorado.edu/new/index.php

Project Objectives

The ATE Program for Physics Faculty was created to provide a series of intensive, focused, hands-on professional and curriculum development workshops/conferences and follow-up activities over a period of three years to physics teachers in two year colleges (TYC) and high schools (HS) who serve students involved in technology-based or technical careers.[8] The workshops were to provide approximately 30 contact hours over a three-day period to limit the time participants would miss class and other duties. The workshops addressed topics, implementation strategies, workforce-related issues and education. Follow up activities included networking via list serve, electronic newsletter, and website interaction.

The activities of the project were designed to help high school and two-year college teachers in the following ways:

- Build and enhance participant understanding and appreciate of the needs of students, educational programs, business and industry, and the workforce in areas dealing with physics and technology
- Provide them with knowledge of and experience with recent advances and appropriate computer technology, ATE supported centers and projects, assessment in student learning, and relevant curriculum materials and activities
- Allow them the opportunity to identify and evaluate the appropriateness of the ideas in meeting the needs of their students and programs
- Provide them with the background and incentive to develop, adapt, adopt, and implement workshop activities and materials into their physics course and programs
- Impact student learning in physics and workforce related applications
- Provide participants ways and ideas for building bridges and developing working relationships between TYC and HS physics and technology programs, and local or regional business and industries[9]

Evaluator and Evaluation Methodology

The proposed evaluation plan for the project focused on workshop quality, classroom implementation and sustainability and impact of the instructional changes. The on site post

[8] ATE Program for Physics Faculty proposal as submitted to the National Science Foundation via Fastlane, provided by Tom O'Kuma project director.

[9] ATE Program for Physics Faculty proposal as submitted to the National Science Foundation via Fastlane, provided by Tom O'Kuma project director.

evaluation of the workshop was compiled by the project leadership. The external evaluation plan used online surveys to document information from participants regarding the impact of the workshop on their classroom teaching and the perceived impact on their students.

The leadership team assisted in the collection of data by having the participants complete surveys before they left the institute. The intent of the paper survey was to determine immediate feedback on how participants felt about the facilities, presenters, and the overall workshop. Results of this survey were collected by the leadership team, tallied, and then forwarded to the external evaluator and are included as part of this report.

Several months after the conclusion of the institute, the external evaluator (EAT, Inc.) contacted all the participants via email and asked them to complete an online survey regarding plans for implementing what they had learned. The survey queried the participants as to how they implemented the knowledge gained from the workshops, problems encountered, and feedback on the usefulness of the sessions. Results of the survey are the main component of this report.

Online responses were sorted by IP address to determine if there were any duplicate responses. If duplicate responses were detected, they were removed from the database before compiling this report.

The leadership team acknowledges that the expectations for the workshops are fairly rigorous. The expectations are:

- That 90% of the participants will exit the workshops with plans to implement activities/materials or teaching strategies from the workshop
- That 60% of the participants will attempt a significant implementation plan and follow through with their plans for implementation.
- That 30% of the participants will sustain the aforementioned implementation after the project's completion.

On-line Survey Participation

The on-line surveys were only viewed by EAT, Inc. to allow participants to freely discuss any issues or problems they encountered. Response rates to the surveys are given in the table below. The highest response rates were from the people who attended the workshops in the spring of 2014. It is likely this is due to the time frame in which they had to plan and implement what they had learned. The attendees for the November 2014 workshop did not have much

time to plan and implement before the report was due. If the trend is approximately a year to implement and get feedback, then the project leaders may want to continue to follow up with these participants in 2015-2016.

Survey Response Rates

	Number of Participants	*Number Responding to On-line Survey*	*Percentage Responding*
ISIP @ Green River Community College (March 2014)	23	19	82.6%
ISIP @ Manchester Community College (June 2014)	18	14	77.8%
PBLIP @ Estrella Mt. Community College (November 2014)	22	8	36.2%

Participant Demographics

The information below was collected from the online surveys, therefore is incomplete since all the participants did not complete the surveys. The information is considered useful and a good indicator of the participant demographics for all except the PBLIP workshop, which had fewer than half (36.2%) of the participants respond at this point.

Participant Gender and Attendance

	Males	*Females*	*First Time Attendees*	*Repeat Attendees**	*Actual Attendees*
ISIP @ Green River Community College (March 2014)	11	8	14	5	23
ISIP @ Manchester Community College (June 2014)	7	7	6	8	18
PBLIP @ Estrella Mt. Community College (November 2014)	4	4	1	7	22

**Note: Attendees did not attend two sessions of the same workshop, but could attend another workshop or one in another year*

Research Questions

The questions addressed in this report are organized around the original questions developed by Momentum Group[10] and include:

1. Did the workshop attract physics faculty interested in strengthening their capacity to better prepare students for a technology-driven workforce?
2. Did the workshops address the professional development needs of the physics faculty? In what ways did the workshops meet the criteria for high quality physics workshops?
3. After participants returned to their classrooms, how many implemented what they learned from the workshop in their classrooms? How many students and courses are influenced by these changes?
4. What activities were implemented in the participants' classrooms and to what extent were the implementations successful? How successful did they feel implementing what they learned? What problems were encountered during implementation?

In addition, the leadership team wanted to determine if the following expectations were met.

- 90% of the participants exited the workshops with plans to implement activities/materials or teaching strategies from the workshop
- 60% of the participants attempted a significant implementation plan and follow through with their plans for implementation.
- 30% of the participants sustained the aforementioned implementation after the project's completion.

Evidence of Results

Question 1*: Did the workshop attract physics faculty interested in strengthening their capacity to better prepare students for a technology-driven workforce?*

Faculty members who attend workshops during the school year are typically self motivated to enrich and enhance their classroom environment. The ATE/PPE workshops solicited participants using various recruitment methods and resulted in a collection of participants from high schools and colleges. A few participants brought colleagues with them from their institution or sent colleagues to different workshops, thereby increasing the probability of being able to implement the information on a larger scale than what would be done by a single person on a campus.

[10] Momentum Group was the original evaluator for the project

There were 21 states (see table below) represented at the workshops. Few of the participants attended more than one institute this year. The fact that the participants were "repeaters" is an indicator of the value of the workshop and the high regard for its impact on the professional growth of the participants. The table indicates how many from a particular college or school attended the workshops and which workshop they attended.

Community Colleges and Schools Represented at the Workshops

College or School	State	Workshop
Alabama State	AL	PBLIP
ALC-West	TX	ISIP
Arlington H.S	MA	ISIP
Chandler-Gilbert Community College-Williams Campus	AZ	PBLIP
Chattanooga State Community College	TN	ISIP
City College of San Francisco	CA	PBLIP, ISIP
City High School	AZ	PBLIP
Cypress Creek High School	TX	ISIP
Cypress Ridge High School	TX	ISIP
Cypress Woods High School	TX	ISIP
Dutchess Community College	NY	ISIP
Edmonds Community College	WA	ISIP
Estrella Community College	AZ	PBLIP, ISIP
Flathead Valley Community College	MT	ISIP
Foothill College	CA	ISIP
Foster High School	TX	ISIP
Gilbert Christian Schools	AZ	PBLIP
Irondale High School	MN	PBLIP, ISIP
Ivy Tech Community College-North Central	IN	PBLIP, ISIP
Joliet Central High School	IL	PBLIP
Joliet Township High School	IL	PBLIP
Joliet West High School	IL	PBLIP
Lee College	TX	ISIP
Lonestar College-Cyfair	TX	ISIP
Madisonville Community College	KY	ISIP
Manchester Twp.H.S	NJ	PBLIP
Mesa Community College	AZ	PBLIP
Middle Georgia State College	GA	PBLIP
Northeast Iowa Community College (NICC)	IA	ISIP
Northern Virginia Community College	VA	ISIP
Phoenix College	AZ	PBLIP
Pima Community College	AZ	PBLIP
Rocky Hill High School	CT	ISIP
Santa Rosa Junior College	CA	ISIP

Skagit Valley College	WA	ISIP
South Seattle Community College	WA	ISIP
St. Johns River State College	FL	ISIP
St. Johnsbury Academy	VT	PBLIP, ISIP
St. Louis Communtiy College- Florissant Valley	MO	PBLIP, ISIP
Suitland High School	MD	ISIP
T.S. Wootton High School	MD	ISIP
Trinity School	NY	ISIP
West Hills College Lemoore	CA	ISIP

***Question 2**: Did the workshops address the professional development needs of the physics faculty? In what ways did the workshops meet the criteria for high quality physics workshops?*

There are multiple indicators useful in determining the quality of a professional development session and how it met the needs of the participants. Questionnaires administered at the conclusion of a workshop indicated the overall attitude of the participant upon leaving. Did the participant feel the experience was worthwhile? Did the participant feel the time was well spent? Does the participant value the information learned during the workshop to the extent that they are willing to try to implement components upon return to their classroom?

The leadership team administered two short surveys at the conclusion of the workshop in an effort to gauge how well the sessions met the needs of the participants, gain insight as to what areas they could improve on, and what areas were most likely to be implemented. The scores in the tables below are averages from the three workshops. A Likert scale was used to determine the level of satisfaction, with 5 being the highest rating for the first 5 items and 4 being the highest for the last 5 items.

Summary of Surveys Administered at Conclusion of Workshops (Average Response)

	ISIP @ GRCC N=22*	**ISIP @ MCC** N= 18	**PBLIP @ EMCC** N=22
The workshop has increased my enthusiasm for teaching.	4.77	4.89	4.82
The workshop stimulated me to think about ways I can improve student assessments.	4.64	4.83	4.82
The workshop has motivated me to implement the ideas I learned into my classroom.	4.86	4.94	5.00
The workshop has increased my interest to incorporate more effective technology and laboratory tools/equipment in my courses.	4.23	4.61	4.68
I plan to continue active professional involvement in workshops like this one and other similar professional opportunities.	4.91	4.94	4.95
The workshop was responsive to my professional development needs.	3.91	4.00	4.00
The workshop was conducted at a level appropriate to my knowledge, skills and interests.	3.77	3.89	4.00
The workshop content was meaningful for my current teaching situation.	3.77	3.83	4.00
The workshop content, instructional strategies, and laboratory work are adaptable to my current teaching situation.	3.68	3.89	3.95
My students would benefit from an appropriate adaption of the workshop content in my classroom/laboratory.	3.82	3.78	4.00

Note: The first 5 questions were ranked 0 to 5; the last 5 questions were ranked 0 to 4.
**There were 23 participants, but only 22 filled out the survey*

Average Ratings for Workshops
Surveys administered by leadership team

	ISIP@GRCC N= 22*	**ISIP @MCC** N= 18	**PBLIP @ Estrella** N=22
Dwain Desbien's Presentations	4.96	4.94	5.00
Tom O'Kuma's Presentations	5.00	5.00	5.00
Dave Maloney's Presentations	4.70	5.00	NA
Anne Cox's Presentations	NA	NA	4.87
David Weaver's Presentations	NA	NA	4.91
Workshop Format	4.83	5.00	4.91
Useful Ideas	4.83	4.89	4.96
Site Facilities	4.96	4.94	4.96
Food	4.26	4.67	4.91
Lodging	4.68	4.71	3.95

Workshop Organization	4.83	4.78	4.96
Workshop Worthwhile	4.91	4.89	5.00
Rate the whole workshop	4.95	4.94	4.96
Did pre-workshop materials help prepare you for the workshop?	4.42	4.27	4.70
Sessions on TIPERs Activities	4.68	4.83	5.00
Session on Modeling Discourse Management Activities	4.45	4.78	4.61
Session on Technology Education and its use in physics	4.33	4.00	4.87
Project work sessions to create own materials	4.73	4.67	4.96
Session on Assessments and Implementation	4.65	4.39	4.57
Increased knowledge of technician and physics education	4.65	4.83	4.70
Post workshop evening interactions	4.69	4.82	4.88

**There were 23 participants, but only 22 filled out the survey*

Respondents to the on-line survey indicated they felt the workshop increased their enthusiasm for teaching and inspired them to implement new activities in the classroom. One of the objectives of the workshops was to facilitate classroom change, which has to begin by motivating the educator. It is recognized that most of the participants were likely attending these workshops due to their desire to be better educators, however even the most dedicated teacher can be uninspired after a workshop. Therefore, it is important to determine if the participants felt the workshop met their needs even though they had attended the workshop several months, or even a year, prior to the administration of the survey. The following table summarizes the online responses from the workshops regarding the question: "To what extent do you agree or disagree with each of the following statements concerning the value of the workshop regarding your efforts to implement changes in your classroom?" The response choices for the surveys were: Strongly disagree (1), Disagree (2), Agree (3), and Strongly Agree (4). For all three workshops, only one of the responses was in the category of strongly disagree and it was the same respondent. There were no other responses, for any of the workshops, that were below agree.

Summary of Online Responses and Overall Average

To what extent do you agree or disagree with each of the following statements concerning the value of the workshop regarding your efforts to implement changes in your classroom?	**ISIP@GRCC** *N= 18*	**ISIP @MCC** *N= 13*	**PBLIP @ Estrella** *N=8*
Attending the workshop increased my enthusiasm for teaching.	3.61	3.77	3.88
Attending the workshop supported my efforts to implement teaching strategies that have been demonstrated as effective into my classes.	3.67	3.69	3.88
Implementing activities/materials from the workshop increased my enthusiasm for teaching.	3.44	3.54	4.00
When I implemented activities/materials from the workshop into my classes, my students were more engaged in learning.	3.39	3.46	3.75
The workshop stimulated me to think about ways I can improve student assessments that I use in my physics courses.	3.56	3.46	3.75
When I implemented formative student assessments with a particular learning activity, the assessment provided me with valuable information about my students' learning prior to major tests.	3.24	3.38	3.25
Attending the workshop and implementing new activities/materials in my classes has increased my interest to continue participating in professional development workshops.	3.72	3.62	3.88
Implementing new activities/materials in my classes has increased my interest to continue participating in professional development workshops.	3.72	3.54	3.75

Question 3: After participants returned to their classrooms, how many implemented what they learned from the workshop in their classrooms? How many students and courses are influenced by these changes?

The table below gives the workshop and how many participants indicated they had already implemented at least one activity they had learned according to the online surveys administered in the spring of 2015[11]. The leadership had the expectation that 60% of the participants would attempt a significant implementation plan and follow through with their plans for implementation. The table indicates that over 60% of the participants attending workshops given in the spring of 2014 implemented what they were taught. The fall PBLIP is not above 60%, but over 36.4%

[11] The appendix contains documentation as to the original implementation plans the participants envisioned at the conclusion of the workshop.

have already implemented the activities in their classroom, which is above the expectation for 30% of the participants to sustain implementation after the project's completion.

The high numbers for the spring 2014 workshops is most likely due to the fact that the participants have had enough time to plan and implement the activities, whereas those attending the November institute were limited in what could be quickly implemented in the next semester. However, the fact that many did already implement the activities is a positive aspect of the workshop in that the activities were simple to implement in a short amount of time. The leadership team will likely follow up on this statistic to see if it increases in the fall of 2015.

Implementation of Activities

Site	**Number Implemented**	**Percent Implemented**
ISIP @ Green River Community College (March 2014)	18	78.2%
ISIP @ Manchester Community College (June 2014)	13	72.2%
PBLIP @ Estrella Mt. Community College (November 2014)	8	36.4%

One item of interest to the project leadership was to estimate the number of students directly by the workshop. The number impacted by implementation of workshop skills is an estimate based on responses to the on-line survey and is reported below. It is understood that all of the participants did not respond to the survey, therefore the numbers indicated would be lower than the actual impact.

Approximate Number of Students in Courses Where Activities Were Implemented

	Number of Students
ISIP @ Green River Community College (March 2014)	1870
ISIP @ Manchester Community College (June 2014)	1291
PBLIP @ Estrella Mt. Community College (November 2014)	379*

**Only 7 participants responded at time of report was submitted*

Since participants came from different states and different levels of teaching (high school, college, etc.), the course identifiers were grouped according to classroom, laboratory or

integrated setting. In the past the information was gathered for specific courses, but the results proved to be of little value since the names of courses and levels were very diverse. The data suggests the materials are most easily implemented in the integrated lab/lecture setting or the lecture discussion, although there is little difference in the three categories.

Courses Where Materials/Activities Have Been Implemented

	Classroom (lecture discussion)	**Laboratory Setting**	**Integrated Lab/Lecture**
ISIP @ Green River Community College (March 2014)	11	7	7
ISIP @ Manchester Community College (June 2014)	7	5	10
PBLIP @ Estrella Mt. Community College (November 2014)	3	4	5

In order to determine the impact on the types of institutes and possibly look for broader implications, the participants responding to the online survey (re: implementation) were asked to identify their level of institution. The institutes were categorized as high school, two-year college (TYC) and four-year universities. There was a fairly even distribution between the high school participants and the two-year college participants if you look at the totals. The biggest difference is that the TYC participants mostly attended the sessions during the spring and the high school teachers attended in the summer (when their school was not in session). It should be noted that the Project does not normally accept applications from university faculty unless they are involved in teacher in-service or pre-service education.

	High School	**TYC**	**University**
ISIP @ Green River Community College (March 2014)	6	11	1
ISIP @ Manchester Community College (June 2014)	10	5	0
PBLIP @ Estrella Mt. Community College (November 2014)	3	5	0

Question 4: What activities were implemented in the participants' classrooms and to what extent were the implementations successful? How successful did they feel implementing what they learned? What problems were encountered during implementation?

Participants identified specific activities from the workshops they implemented into the classroom environment. The table below summarizes the activities mentioned by the participants. Overwhelming favorites include the *TIPERS* and *Ranking Tasks*[12] and how to lead discussions using whiteboards or modeling.

Activities Implemented (Number of Responses)*

	ISIP @ Green River Community College (March 2014)	ISIP @ Manchester Community College (June 2014)	PBLIP @ Estrella Mt. Community College (November 2014)
TIPERs/Ranking Tasks	11	10	
Group Projects, PBL	3	6	5
PhET, OPS	2		
Video Analysis, Tracker			4
Socrative Lab		2	
Whiteboards, Modeling	12	2	2

**Note: Several put multiple uses, so the total number reflects a number greater than the number of respondents*

Some indicated specific projects they had implemented in their classrooms such as:

- "I have implemented 6 student-projects into my engineering physics I course the following semester (spring 2015). One of those projects I implemented I had developed myself during the PBLI workshop I attended in Nov 2014." (PBLI Nov. 2014)
- 'I implemented an activity where students model mass on a spring behavior using an EJS simulation and used that model to determine the force constant of a spring. Additionally, students modified the model to incorporate drag and determine the drag coefficient for an assumed drag model (D = bv)". (PBLI Nov. 2014)
- "I now use Egg Drop with Video Analysis" (PBLI Nov. 2014)
- "I brought home the project idea that I had created to build and collect data on Rocket Stoves". (PBLI Nov. 2014)

[12] TIPERS and Ranking Tasks are published by Pearson and authored by Tom O'Kuma and some of the workshop presenters.

- ‘We stole the magnetic field of the slinky lab. It's great. I'm also loving the promotion of Newton's Third Law, it makes learning proper force diagrams much much easier”. (ISIP Mar. 2014)

Other comments include:

- “We used the modeling method for lab discussions and integrated TIPERs to check for understanding”. (ISIP June 2014)
- “We use the Socrative Seminar as a way to debrief lab”. (ISIP June 2014)
- “I have implemented the use of TIPERs and ranking tasks with my students, which I have found to be very effective regarding student conceptual understanding.” (ISIP June 2014)
- “I now do more open problem solving, where students are not told what to find.” (ISIP June 2014)
- “I have used a lot of the TIPERs activities. I have also used the training we had in writing TIPERs activities to rethink how I structure my assessments.” (ISIP June 2014)
- “I am forever working to improve my Modeling Discourse Management. And I have used pHet sims with chemistry in mind”. (ISIP Mar. 2014)
- “Using questions from TIPERS to analyze comprehension rate of Faraday's law”. (ISIP Mar. 2014)
- “I have used the Tippers extensively, both ones designed in the workshop and ones from the texts I received. I grade them similarly to how was discussed in the workshop by Maloney. I also use the whiteboard and circle up modeling stuff that Dwain does too.” (ISIP Mar. 2014)
- “I now use a "forces as interactions" approach to Newton's Laws. Dwain called it the "system schema", showing interactions. Makes it easy to introduce free body diagrams and Newton's 3rd law.” (ISIP *Mar. 2014)*
- “We used tracker analysis to determine the impulse and force of an object crashing into a paper cone. The students were then able to relate it to the air bags of a car.” (PBLIP Nov. 2014)

Regarding the level of success when implementing the activities from the workshop, none felt they were not successful. Feeling “OK” at successful implementation is understandable, since the methodology and techniques were new. Although the data is self reported and there are no external observations or evaluations to verify the data, the fact that no one felt unsuccessful and

that many felt very successful is evidence of how well the leaders of the workshops prepared them for successful implementation. Since confidence levels are important to successful implementation, the likelihood of the participants continuing to use and implement activities is increased because they felt they were successful. The data below is taken from the online survey when the participants were asked: "How successful overall did you feel implementing what you learned at the workshop?"

Self-Reported Successful Implementation

	ISIP March N=18	**ISIP June** N=13	**PBLIP Nov.** N=8
Very Successful	27.8%	38.5%	50.0%
Moderately successful	61.1%	53.8%	50.0%
OK	11.1%	7.7%	0.0%
Less than I hoped for	0.0%	0.0%	0.0%
Very disappointed	0.0%	0.0%	0.0%
Have not used it yet	0.0%	0.0%	0.0%

In addition to asking if the participants felt successful implementing the new skills, the online survey asked participants: "*To what extent, if any, was your experience with the implementation of this new activity successful?"* They were also asked to write comments on what went wrong, if it did. The only comments submitted were:

- "The first time I implemented it was in an algebra based class. Students struggled (maybe because it was my first time teaching it). Later, it was used more successfully in a calculus-based class. I look forward to trying again in the algebra based class." (ISIP Mar. 2014)
- "I find that students are lazy and don't give information unless you pull it out of them, so this is hard." (ISIP Mar. 20140
- "Obviously, the first run through was not perfect. I'll use it again this semester and hope for better results from my position of more experience." (PBLIP Nov. 2014)
- "I really struggled with this initially, but managed to find a way that fit in my class with my students. I found that students still reject the elimination of lecture, and discovered that two ~10 minute lecture/review sessions during a 90 minute class period provides the right balance for my students. I also could not manage the "circle up" process in my classroom with so many students. The space didn't support it--to the great frustration of the students. Instead, having groups share out seems to work better for me. I make sure to not always start with groups that have the correct answer, so that they have a chance to correct one another." (ISIP Mar. 2014)

Results of each workshop and the correlation to perceived student engagement or resistance is given in the tables below. (Note: numbers indicate number of survey responses for each category).

ISIP March 2014 (N= 16)

	Not at all successful	Slightly successful	Moderately successful	Highly successful
The new activity encouraged students to be more actively engaged than other activities I have used in the past in learning the physics concepts addressed by the activity.	0	1	8	7
The activity addressed the physics content at a level appropriate to my students' background knowledge and skills.	0	2	2	12
The student assessment of learning that I used for this activity provided the formative feedback I need as a teacher.	0	2	9	4
The student assessment of learning that I used for this activity suggests that this activity as is or with slight modifications helps students learn the specific physics content addressed by the activity better than a more conventional way of teaching the concept	0	2	9	5

ISIP June 2014 (N=12)

	Not at all successful	Slightly successful	Moderately successful	Highly successful
The new activity encouraged students to be more actively engaged than other activities I have used in the past in learning the physics concepts addressed by the activity.	0	1	1	10
The activity addressed the physics content at a level appropriate to my students' background knowledge and skills.	0	1	2	9
The student assessment of learning that I used for this activity provided the formative feedback I need as a teacher.	0	0	3	9
The student assessment of learning that I used for this activity suggests	0	0	2	10

that this activity as is or with slight modifications helps students learn the specific physics content addressed by the activity better than a more conventional way of teaching the concept				

PBLIP Nov. 2014 (N=8)

	Not at all successful	Slightly successful	Moderately successful	Highly successful
The new activity encouraged students to be more actively engaged than other activities I have used in the past in learning the physics concepts addressed by the activity.	0	0	2	6
The activity addressed the physics content at a level appropriate to my students' background knowledge and skills.	0	0	2	6
The student assessment of learning that I used for this activity provided the formative feedback I need as a teacher.	0	1	4	3
The student assessment of learning that I used for this activity suggests that this activity as is or with slight modifications helps students learn the specific physics content addressed by the activity better than a more conventional way of teaching the concept	0	0	3	5

One of the strategies addressed at each workshop was the proper use of assessment tools such as TIPERS, Ranking Tasks, and Force Concept Inventory (FCI). The following responses are from the online survey respondents when queried as to whether they had used any of these tools. (Note: Numbers indicate number of respondents indicating they used the assessments as instructed and they could choose more than one)

Assessment Tools Implemented in the Classroom

	ISIP (March)	ISIP (June)	PBLIP (November)
Ranking Tasks	12	13	8
TIPERs	13	13	7
FCI	9	6	*5*

Successes and Challenges

Participants were asked to elaborate on any successes or challenges they encountered during implementation. The biggest challenges were time and the difficult to get students to think on their own. Those that were successful in getting student interactions were very pleased with how it increased their understanding and engagement. Specific comments from the participants include:

- "Students are more engaged, and it is helpful to know the students' background understanding of physics." (ISIP Mar.)
- "Problem keeping academic students "on task". Stayed interactive with students at all times." (ISIP Mar.)
- "They take more time than more traditional stuff, so the challenge is always squeezing everything in. I just cut out less critical stuff and do my best." (ISIP Mar.)
- "Conceptual knowledge was stronger the more TIPERS I used." (ISIP Mar.)
- "The new approaches actively engaged the students." (ISIP Mar.)
- "Even when the exercises seem very simple, it is not simple to them at all, and often gets them to think about something they otherwise would just gloss over." (ISIP Mar.)
- "Time consuming but worth it. I always think Quality vs. Quantity." (ISIP June)
- "Time to change lesson plans, time needed in lesson. Still working on handling the challenge!" (ISIP June)
- "They can learn more from each other than I previously realized." (ISIP June)
- "I was able to design assessments that do an even better job of helping me understand what my students are thinking." (ISIP June)
- "Great warm up, formative assessment and exit ticket activities."
- "TIPERs surprisingly effective for generating discussion." (ISIP June)
- "This method of engaging students entirely transforms the learning environment into an active learning community." (ISIP June)
- "I had to limit use of some strategies to teach required curriculum in time allotted." (ISIP June)
- "Yes. It is a new paradigm and so getting the timing right for discussions was a challenge. On-level students found the TIPERs very difficult." (ISIP June)
- "Initially, students complain about my approach because it challenges them. But after a quarter or two, they got used to it." (ISIP June)

- "I especially found useful the *What-if-Anything-is-Wrong* tasks as well as *Working Backwards* tasks. Students are engaged with the physics conceptually." (ISIP June)
- "Students generally were excited about the project aspect of the course.' (PBLIP Nov.)
- "Students invested more of themselves when they work on a project they can show to the class at the end of the terms." (PBLIP Nov.)
- The collaboration in lecture and lab increased engagement significantly
- Initially it was difficult to get the students started using the Tracker software. "This just took time and practice." (PBLIP Nov.)
- "That they were more engaged in the lab when using this program." (PBLIP Nov.)
- "Students seemed to enjoy the activity though enthusiasm was mitigated a bit since this was the only activity of this type we did during the semester and it came at the very end of the semester." (PBLIP Nov.)
- "The only challenge was getting all of the information into one frame and learning how different objects in the frame behaved. It just took some time to learn the software." (PBLIP Nov.)
- "Students enjoyed the integration of engineering with physics." (PBLIP Nov.)
- "That if I have my plan pretty well formed, I can spend more time observing them and they will work out a lot of glitches on their own." (PBLIP Nov.)

In order to successfully implement new techniques, pedagogy, or activities in the classroom there has to be a level of support from administration and a level of commitment from the participants. Identification of some of the issues related to proper implementation can be useful to the workshop leadership team, particularly if the issues can be addressed during the workshop. Listed below are some of the problems participants reported when they tried to implement their new knowledge and techniques.

- "Some of the tech didn't work reliably. And many of the labs are too verbose for the students. I have had to trouble shoot or drop the tech issues and rewrite many of the labs." (ISIP Mar.)
- "Hard to fit it in." (ISIP Mar.)
- "In a survey, most students say they prefer my lectures." (ISIP Mar.)
- "I need to really harp on them to share the responsibilities of writing, and reporting out." (ISIP Mar.)

- "The number of students & space made 'Circling up" impossible to manage--now I ask groups to stand and share in front of the class." (ISIP Mar.)
- "I did not structure the TIPERS properly in a well, thought-out sequence. With more time, I'd like to pay more attention to sequence and selection of TIPERs." (ISIP Mar.)
- "I always encounter challenges. Some is student motivation, but most is bizarre scheduling that doesn't allow for consistency." (ISIP Mar.)
- "Having and maintaining access to the equipment is always an issue because some co-workers are not professional about caring for the equipment. When possible, I ordered and, yes, I admit it here, hoarded the equipment I needed or I fashioned it out of recyclables." (PBLIP Nov.)

The workshop leaders were interested in knowing if the teachers would continue to use what they had been shown/taught, even if there were difficulties or challenges. To get a sense of participant commitment to implementation, the participants were asked if they would continue to use the things they learned. **None of the online responses reported that they would not continue using the materials from the workshop[13].** Some of the specific comments from participants included:

- "Yes, I continue to try and modify some of the labs they gave me." (ISIP Mar.)
- "Yes. I am working on the activities in the calculus based class and will try again in the algebra based class." (ISIP Mar.)
- "Yes - I am more and more flipping the class so using content like this is valuable." (ISIP Mar.)
- "Yes, and I hope to get in a position where I'm sharing with others." (ISIP Mar.)
- "Yes, I see the value in it, so I am very likely to continue using it." (ISIP June)
- "Yes. I want to include more of the TIPERs this coming year." (ISIP June)
- "Absolutely. I will develop more project ideas to use in my class." (PBLIP Nov.)
- "I plan to develop more activities based on EJS simulations in both my calc-based and algebra-trig-based courses." (PBLIP Nov.)
- "Yes, I will use and expand on them." (PBLIP Nov.)
- "Yes, because once you've got the wheel working, why invent a different one?" (PBLIP Nov.)

[13] This fact brings to question the respondent who marked that they were dissatisfied, perhaps they mistakenly reversed the Likert scale.

Summary and Suggestions

1. Overall, the participants seemed very pleased with the workshop experiences and were anxious to implement the things they learned. Additional comments regarding the workshop experience include:
    - "I think the value of these teacher workshops cannot be touted enough. There are many inferior experiences offered, but these are meaty and worthwhile investments of my time. The planning is impeccable and the leadership is genius! (PBLIP Nov. 2014)
    - "I learned how effective these strategies were in increasing their fundamental/conceptual understanding of physics concepts." (ISIP June)

2. The workshops were well planned and followed the format as outlined in the grant and advertising materials. None of the participants expressed disappointment that this was not what was advertised or expected. All but one of the participants was extremely complimentary of the usefulness of the workshop.

3. The participants felt the activities were appropriate and attending the workshop would benefit their students and increase their teaching proficiency. Participants felt the activities were productive and indicated that they will continue adding new technology and activities to their curriculum as a result of attending this workshop.[14]

4. Participants felt the workshop gave them the confidence needed to implement what they had learned at the workshop. The percentage of participants who implemented strategies was within the expectations of the leadership team. The highest response rates were from the people who attended the workshops in the spring of 2014. It is likely this is due to the fact that they had time to plan and implement what they had learned, whereas the attendees for the November 2014 workshop did not have much time to plan and implement before the report was due. If the trend is that it takes approximately a year to implement and get feedback, then the project leaders may want to continue to follow up with these participants in 2015-2016. The expectations of the leadership team were that:
    - 90% of the participants exited the workshops with plans to implement activities/materials or teaching strategies from the workshop. Of the 62 who

[14] *Average Ratings for Workshops and Online Surveys*

responded to the question, 98% gave their implementation plans. Specific breakdown for each site is as follows: 21 at GRCC said yes, 1 maybe; 18 (all) at MCC said yes; 22 (all) at EMCC said yes

- 60% of the participants attempted a significant implementation plan and follow through with their plans for implementation. The online survey, designed to collect the data related to implementation, revealed that 78.2% from the March workshop had implemented activities, 72.2% from the June workshop had implemented activities, and 36.4% of the participants from the November workshop. It should be noted that the highest implementation is from participants who attended the workshop in the spring of 2014, which gave them more time to procure equipment or make curriculum changes necessary to support the implementation of the new material.
- 30% of the participants sustained the aforementioned implementation after the project's completion. This is also documented in the report and according to responses on the survey; all of those who have implemented activities intend to continue doing so in the foreseeable future.

Appendix
Results from Leadership Post Workshop Surveys
and
Workshop Descriptions

Results from Leadership Post Workshop Surveys

End of Workshop Implementation Plans

The following are responses from the participants on the last day of the workshop. These responses may vary slightly from the online survey, which was done several months after the workshop, but are an indicator of what the participants felt could be implemented in the near future. These responses are not listed in the body of the evaluation report because potentially there could be discrepancies due to what they thought they were going to do and what they did. However, just because they have not done an activity at the time of the report, it does not preclude them from doing it in the near future.

"*Do you plan to implement some of the workshop content in your classes or in other instructional settings? If so, briefly describe one or two features of the workshop that you plan to implement in the near term (i.e. next 3-6 months). Will the activity you implement replace an existing activity or be a new addition to the current classroom or laboratory student work?"*

ISIP @ Manchester Community College (June 2014)

1. Discourse as a large group, (?) dialogue, TIPERs
2. The use of Tipers to stimulate student involvement and self discovery of basic principles. I want to make them think, not memorize. This will help. It will be a replacement for some hw and lecture time
3. I will implement the use of various forms of assessments to allow students to think critically (TIPER,etc) although I've used ranking tasks in the past, I will use more forms like this this coming year
4. Tipers, ranking tasks, discourse management
5. Activites from nTipers and E and M tipers. New additions to classroom activites
6. Tipers, Pair share
7. Introduce the modeling technique into my current college environment & classrooms. Use other tasks besides RT in mechanics courses. Implement some of the assessment techniques
   in the manner described
8. More of the TIPERs I will be teaching new classes so they wont be and addition or replacement but part of my curriculum design.
9. Modeling discourse <-- Replace lab debrief. TIPERs <-- replace some traditional problems/worksheets
10. Discourse method-whiteboards and sharing. Use of TIPERs
11. System schema and hope this will add to my current teaching style to supplement it
12. Use of TIPERs. Redo teaching of forces to upper level physics classes
13. Ntiper questons & assessment food
14. Will be incorporating TIPER questions into class discussion, homework, & tests
15. Group discussion use of TIPERs
16. The circle sharing of ideas/concepts from a classroom activity
17. I will use TIPERs more regularly as into's to labs
18. TIPERs, discourse management style

ISIP @Green River Community College (March 2014)

1. Using the tippers and trying to figure out how to use the group set up with one student class sizes
2. Assessment,TIPER's
3. Change the way I teach kinematics. Use more Tipers and use them in think-pals-share way.
4. The graph technique for 1-D kinematics. Making the class come to a consensus about the outcome of an activity. TIPER's, and working on having coherence between in class work, HW, exams.
5. I'll certainly use the slinky lab, 2D as vectors and forces as interactions.
6. TIPERs materials
7. Plan to implement "Ranking" very soon as well as EM Lab we completed in workshop
8. TIPERs
9. Use of Vectors in solving 2D problems and "circle up"
10. Use of "Tipers" based ideas
11. For sure the group project I helped to create. It will be a new way to assess and discuss student understanding of thermal and phase energy during phase change
12. Work harder to implement discussions w/ larger group circling up. Don't give in to students desire for my class to be more "traditional"
13. Use some of the Tipers in e/m spring qtr and conceptual physics/CSEM in spring
14. I will use TIPERs and "circle-up" with whiteboards as I cut out lecture from my course
15. classroom discussions and use of vectors, TIPERs this semester, more next semester?
16. Incorporate TIPERs materials, Refine use of discourse management, explore using assessments discussed in workshop
17. more student discussions concerning topics implementing more Tipers, I use ranking tasks
18. Group settings, facilitating discussions, less math and more conceptual concepts, add 1D graphical kinematics, "simpler" labs (such as "find the car" activity)
19. moving more between situations into TIPERs discussions
20. some of the waves Tipers created by groups will be very interesting to try. The new Tiper book will also be used.

PBLIP @ Estrella Mountain Community College (Nov. 2014)

1. Plan to use Tracker and EJSS in my Physics, Astronomy, and Engineering courses.
2. Tracker motion detection and analysis. EJS as supplement.
3. Do more in depth approach of more Video Analysis. Start using the model approach, using OSP and EJSS. Applets.
4. Invisibility cloak. Mousetrap. Cameras. More student presentations. Tracker .Bring the bling
5. It is a modification of how I have had students go through the unit on Harmonic Motion. Using EJS(and perhaps Tracker/Logger Pro). Students will build a model of SHM/DHM.
6. I have began a project based unit as part of this workshop that I will use immediately for the current semester. I will continue to develop Tracker and EJSS options for use in class
7. Sharing projects with my peers. Using EJS to simulate and edit to new situations.
8. The PBL discussion has changed my approach to next semester. I will also incorporate more simulations.
9. Incorporate Video/Tracker Program in upcoming units. I may write some simulations for future concepts.
10. My group designed a project and supporting curriculum that will be implemented before the end of the semester.
11. Plan on offering an online Physics course and developing it with Tracker and EJS. Plan on creating simulations using EJS to be used in my face-to-face classes.
12. I'd like to learn more about having students write their own simulations. This would be in addition to current work.

13. Coil gun-new activity. Invisibility Cloak-new activity.
14. May incorporate some of the project based Physics into our Physics fair projects. May use Tracker in class.
15. Video Analysis of student generated videos, particularly regarding conservation of momentum, energy, and projectile motion. Conservation of momentum and energy would be new activities.
16. I will (for the first time) use Video Analysis in my class. Also, great project ideas. I will make mouse trap racers.
17. More of Tracker analysis for the Math modeling component in Pre-Calculus classes. Story-teller Physics projects in developmental education Math classes.
18. I will go back and take a closer look at FCI pre/post data. Analyze the current semester's pre/post data more effectively. Integrate projects in PHY112 more effectively . Align topics and set timelines with existing curriculum. Inspired to challenge PHY121 students more with projects.
19. I will implement a project I developed in next semester's classes. I will also work on adapting some labs/HW to use Tracker and EJS.
20. I plan to use tracker and Video analysis as a part of a PBL for momentum and impulse.
21. I will be using at least 2 projects discussed before end of year. Simulations will become permanent material found on my web page.
22. New variation on what I've done: - Use Tracker to enhance conservation of momentum labs. Present units (topics) in context.project based way

Final Day Comments
PBLIP Workshop
Estrella Mountain Community College
November 13-15, 2014

1. What did you like best about this workshop? (You may list more than one)
    a. The passion of each of the presenters! I really enjoyed PBL day and the time spent developing any own project. Video analysis too!
    b. The high energy of creating and learning! The obvious passion of the workshop leaders and their apparently seamless camaraderie.
    c. Learning how to manipulate EJS. I have wanted to learn how but never made the time. Easy tracker was a great tool to learn how to use, very useful at all levels. Really liked seeing the 6 different projects and presentations. Great tech resources
    d. Project-based physics material that I can incorporate into class immediately
    e. Not only did I get comfort from understanding the landscape of tools/techniques available but I gained substantial knowledge from areas across the landscape.
    f. Getting ideas from other teachers. Re-charging my batteries
    g. The pointers to valuable resources. The instruction on new tools for project based learning. The help in adapting/interpreting for our particular needs. The time/support in trying out new things. The books and demo equipment.
    h. I liked the fresh ideas that I was exposed to. I was educated by "sage on the stage" and I love to be more interactive and collaborative. I've got great new ideas on how to do this
    i. The openness and excitement of the presenters, including their willingness and desire to help us (and put up with us)
    j. The hands on activities were great! It was so fun, did not feel like 14 hour work days at all!
    k. The friendly atmosphere and the interaction with the workshop leader. The new information on OSP and mostly the EJss Applet. The project based learning in groups
    l. Ability to create something I can use. Time to interact w/ colleagues sharing ideas etc.
    m. I collected a lot of great and useful information. Some things I can implement almost immediately and other things will require more planning and preparation. Knowing how to use FCI (pre/post) was especially useful
    n. The workshops were all organized, paced appropriately and content was applicable and relevant.
    o. Getting to know my way around the EJS system better. More great problem based ideas
    p. Working with other physics teachers using projects software that can be transferred back to school
    q. The day 2 projects were a great way to become familiar with some project ideas. I was also very useful to have time to design a project for our curriculum
    r. I enjoyed the problem based learning component the most
    s. The wealth of wisdom thank you
    t. Time to work on actual materials to use in my classroom. I also like to connect with peers to get their ideas
    u. The ability to work with different people, try new things and be able to ask questions while we worked

v. I liked transferring the conceptual models into Java and creating simulations. Also using these situations to then predict an event or assist with a design
w. I learned new things met great people

2. What did you like least about this workshop? (You may list more than one)

a. I will not be using the ejss, but understand others will
b. It actually seemed shorter than three days. We need more time!
c. The weather! (just kidding)
d. the simulation-building session packs so much little details in such a short amount of time such that it is difficult to implement as first-time user
e. The info per time-rate though there are obvious limitations explaining why it needed to be so.
f. Lots of emphasis on Java-I'm not sure I'll get into that
g. The hotel was sketchy. The roommate was not friendly
h. I really liked it! I don't see any negatives
i. It is a lot to process. I do not think anything could/should be done about that, but I regret that I will not be able to use everything I learned
j. I got nothing I did not like!
k. Staying late but worked out fine!
l. The days (Thurs.-fri.) are long but I guess I wouldn't want to miss out on any of the opportunities
m. Personally, I don't like programming. Although I liked the Ejss ejava script programming session it was probably lower on my list of what I was interested in doing.
n. The schedule makes for some long days though the breaks throughout the day made it managable
o. That I want to change everything but I know I should not
p. N/A
q. The schedule was incredibly intensive. Ending after dinner would have been nice even if dinner were a bit later.
r. the long days
s. First day I was not ready to be in front of a computer for so long
t. The Ejss stuff was good, but went so fast it was hard to process
u. Days are a bit long
v. N/A
w. N/A

3.What suggestions do you have to improve this workshop? (You may list more than one)

a. Allow teachers to bring their experience with PBL-"their tricks" Also differentiated the ejss day to allow people to create a list of simulations by topic
b. I would really appreciate a full session (1-2 hours) by Dwain on analyzing the assessment data we get from our pre- and post- assessments. How to set up the spreadsheet, what's important to look at, how to see what the responses indicate, how to adjust or adapt based on the data. (there was little today. Give me more)
c. I thought it ran smoothly and communication was excellent not sure where to improve.
d. a short brain storming session to identify a project we would like to work on afterwards before we leave the workshop in case we'd like on-the-spot feedback
e. Nothing obvious and feasible

f. Activities would be more useful if there were a written page of instructions to refer to. Lots of times I looked away and missed a click then it couldn't catch up during Ejss. On Saturday I couldn't remember exactly what we did Thursday and its awkward to have to go back to the dropbox for instructions while you're trying to do something
g. A common place to resources: Drop box, drive, compadre file folder, paper
h. perhaps it would be good to be able to look at open source (in the generic sense) programs ahead of time to gain a little familiarity.
i. I cannot think of anything
j. Maybe ½ day of sightseeing at our expense
k. Keep up the great work in providing more tech information and new ideas or techniques to introduce in our instruction materials
l. Perhaps a bit more on implementation practical strategies regarding grading etc. within project based classes
m. None- Everything was perfect!
n. Great workshop
o. I love the format
p. Field trip to Maker Faire?
q. No Reponse
r. shorter work days and more time with PBL's would help improve this workshop
s. mix up the 1st day
t. Add time for people to share their existing activities that they currently use at their school
u. Can't think of any
v. Give more time to complete personal projects. I felt a bit pressured
w. Everything was great

4 Are there any other workshops that we should consider offering in the future?

a. Always looking for best practices, best scope and sequences and investigations- I will be taking the modeling workshop soon!
b. A full semester overhaul bootcamp. Lets decide the ULCS, the projects the path to completion, the assessment-along the way and final, the whole awesome process. Could be done for Tracker, EJSS, a combination of all
c. No Response
d. Socratic Teaching workshops (I'd like to participate in organizing it)
e. Problem-based learning
f. Arduino?
g. I would love to take any work shops you give. This was very valuable. Perhaps something on the various "flavors" of active learning in physics and which of them have shown positive results when outcomes are assessed
h. Perhaps a workshop devoted to a teaching modern (quantum, relativistic) physics?
i. More PBL-based workshops
j. Project based learning geared toward calculus based physics classes
k. I'm planning to attend the spring workshop hopefully in WI
l. I have been a part of several of these I hope they are able to continue in the future. (a great use of taxpayer dollars!)
m. I can't think of any. I am sure any topic you decide would be useful.
n. Modeling workshop-especially with topics of rotational motion, light, E &M
o. Excited for more V-python stuff. I missed simulation ranking tasks
p. Bringing in Administrators (college, HS, State ED Dept) to see "how real physics" works and depth not breadth
q. Creating an NGSS based curriculum

r. More PBL's
s. I'll let you know if I think of any
t. None that I can think of
u. Can't think of any off the top of my head but if you come up with some I will attend
v. Blender/V Python- I would like to become efficient using a 3D modeling software
w. Yes please

5 General comments about the workshop pre-materials.
a. They were sent late
b. I really enjoyed the Rabbit Hole story because it relates to real life events, career change, survival that leads to thriving and the learning process the other articles were also relevant just struck different chords.
c. No Response
d. Please send it electronically as well so we can share it with others
e. I liked the Maker intro but didn't receive the other, which seemed useful though I do now understand the message
f. I had seen most of these, but it was nice to have copies
g. Thank you
h. These are great. I hope to get the opportunity to attend others.
i. They were fine
j. Did not get it on time, but Tom was kind enough to email them to me. Thanks Tom!
k. Great and awesome work your all Knowledgeable
l. No Response
m. Great article on the "rabbit Hole" the perfect way to frame this workshop experience.
n. Articles were interesting, thought provoking
o. Makes me understand I need to look at materials such as physics teacher more often
p. Great preface – enjoyed previous TPT articles I had not read
q. No response
r. I liked the materials but I wish the mail would have come sooner
s. No Response
t. Fine
u. No Response
v. None really. I liked reading the preface as it gave us some idea of what we were about to do. Good choice
w. I did not get some of them on-time it might be a local post office issues if so please disregard this statement

Final Day Comments
ISIP Workshop
Green River Community College
March 27-29, 2014

3. What did you like best about this workshop? (You may list more than one)
a. Speakers. Great experience, very informative, very knowledgeable. I enjoyed the friendly atmosphere.
b. It was an friendly and welcoming environment. Group work and activities were great way to have new perspectives of different levels of education. Finding new ways to approach physic
c. I especially enjoyed the sessions on modeling discourse management activities. I am anxious to start applying this in the classroom!

d. Working with other people who are in the trenches. New looks on old material
e. The sample first week of class by Dwain. Technology education session
f. Creating our own TIPER's
g. Wonderful idea: TIPERS
h. As always, the CO-PIs. Also, the format of work time good group of collaborators.
i. Incredible access to PER and excellent educators with extensive experience implementing them.
j. The open discussions on implementation
k. Very intense experience with lots of useful information
l. Materials I could use immediately in class. Interaction with physics instructors
m. The presenters-wonderful teachers with a great deal of offer others. Also enjoyed the choice of participants- comfortable group
n. Tiper activities, De-Emphasis of lecture, New take on homework
o. Discussions of student interactions, learning, and conceptions
p. Interacting w/Dave + other leaders, opportunity to design my own assessment tools
q. Interacting w/other physics teachers who care deeply about their profession and who care working on reforming their classes too
r. The new and exciting ways Dwain teaches us to teach physics and Tom's organization and how the two of them play off of each other.
s. Learn about various ideas and materials Thanks!
t. The vector presentation of motion
u. Many new ideas and the sense that this was not suggested as the only way to run a class. Working problems-being uncomfortable in knowledge. Trying to create our own material. Interaction with peers/ in CC
v. Lab activity, Tipers workshop, hearing how the experts implement things. Teaching kinematics with vectors and charts system schema (could have done more schema activities and fewer tipers)
w. I loved the ideas they presented and the structure of their methods

4. What did you like least about this workshop? (You may list more than one)

a. The long hours. Working until 9:30 is really tiring.
b. I know this was a workshop mostly for community college environment. It is hard to see how can have students in high school on academic level learn the environment of total hands off self learning seemed a little overwhelming for new teacher.
c. Everything was very useful although some were less exciting to learn about than others
d. Non-local food took too long. Friday night work hours were unproductive
e. David's jokes and monotone voice
f. None
g. There were none to be honest!
h. I'll have to get back to you.
i. No Response
j. Nothing I always benefit from all the activities
k. Days are very long by the end of each day I was definitely (?)
l. Length of day-maybe 8-6pm, 3 days. Travel time (to campus, to dinner)
m. Very far from "home" but a wonderful place to visit
n. Eat-sit-Eat-Sit+eat-sit…..ZZZZZ
o. The slinky lab- doing the lab does not help me; discussing student reactions to and learning from the lab is valuable to me.
p. Too hot in the van!!

q. I loved it, but I hated it-all the candy! You should make us suffer and then earn it at the end!
r. The tippers both presentation of them and the tools themselves.
s. N/A
t. Everything was great!
u. a bit long each day
v. Too much time doing Tiper activities ourselves
w. N/A

3.What suggestions do you have to improve this workshop? (You may list more than one)

a. I was really curious to find out how David and Dwain structured their class, how they graded their classes, the kind of exams they used, etc. We got some of that but in would like to see more. I might also be very useful to get in groups and discuss how specifically we would incorporated these ideas into our classes next semester sort of like a session designing our own class.
b. Have a section for high school teachers to be able to implement these types of methods
c. The more activities that require moving around the better. 3 straight days of mainly sitting was a little rough at times
d. For the create your own materials session people who came in teams should be part of the same team
e. Shorter days. Fourteen hour days are rough

f. I like the workshops where we had a few more hands on activites
g. No Response
h. Some way to get people on their feet more often like at the PBL workshops.
i. Peppermint patties (minis)
j. none
k. Maybe an extra day but maybe the day slightly shorter, say 8:30-6:30
l. Same as above
m. Maybe to quit a bit earlier- long days
n. A walk would have helped, an outdoor activity, weather permitting
o. I would love to learn more about classrooms that mix different active learning activities and perhaps use them in “flipped” or hybrid classes w/ online components
p. No Response
q. The only part I had trouble with was getting accurate info about the conference ahead of time. I think it could have been made more clear that the lodging would be free, and that the sessions would run late. The schedule wasn’t posted until a day or two before it started
r. I would have liked more of the problem solving and new techniques for problem solving and eliminate the tippers
s. give final standard answers
t. See above
u. Seems good as is
v. I like leaving with ideas/labs/worksheets I can use right away
w. N/A

4 Are there any other workshops that we should consider offering in the future?

x. Same as above
y. NA
z. No Response

aa. No
bb. More technology education session
cc. No Response
dd. A little more application of ideas/methods towards High School. Workshop specifically geared towards high school teachers
ee. Integrating with other science disciplines?
ff. Strictly on writing assessements
gg. Alps/conceptual activities
hh. Assessment and learning outcomes. How to implement how to get log in for other faculty, administration, funding etc. This would be useful for longer established programs.
ii. Using simulations in class for colleges without extensive materials budgets. Using CSEM/FCI, etc for assessements
jj. No Response
kk. No Response
ll. Assessment! I think it would be exciting to learn about assessment tools in more detail!!!
mm. Video analysis (advanced). Assessment how to write better assessment and evaluation tools not just the conceptual exercises, ranking tasks, TIPERs, etc
nn. Oh yes, but I can't say specifically what, I am happy just to get information!
oo. Keep them coming you are showing me all the things I didn't know at each one of these.
pp. Lab innovation
qq. A small section devoted to use of lab views as an alternative to vernier for colleges that adapt lab view
rr. Specific assessment, running labs
ss. I would like to attend one of your lab workshops
tt. No Response

5 General comments about the workshop pre-materials.
a. No Response
b. Was a little hard to grasp I am a visual learner. However it is a college base format so understand
c. This is a fantastic workshop that has completely changed my outlook on teaching. I hope to have the opportunity for attend future ATE workshops. Thanks!
d. The forces as interactions paper really shifted things for me. It was wonderful.
e. No Response
f. Thank you for all your time and energy ☺
g. Unfortunately none were mailed to be or either I did not receive any
h. Are there any that are more current for some topics? Never mind I'll look
i. No Response
j. Great, read and ponder before the workshop preparation for dicussions
k. No Response
l. Good-great articles to read an advanced schedule would be appreciated
m. Good information
n. No Response
o. Sorry, I didn't get them before the workshop- please send earlier
p. Send out earlier
q. No Response

r. Interesting and easy reads that were informative and helpful but would have liked to get them earlier to spend more time with them. Pre workshop I only had the time to review quickly once.
s. Can they be mailed earlier? Didn't check mail and get the materials.
t. As always, Excellent workshop. Well organized, fully packed with helpful materials and very well presented.
u. Not used much during workshop. Also some have some significant travel an excellent option would be to offer to drop the handouts into a mailing box from USPS (which we would pay for) and mail our material back to home institution.
v. No Response
w. Mail them earlier. I didn't get the readings before I left for the workshop

Final Day Comments
ISIP Workshop
Manchester Community College
June 26-28, 2014

5. What did you like best about this workshop? (You may list more than one)
    a. Working with groups to come up with the solution. This situation put me in student's perspective
    b. Well organized, engaging, relevant/ applicable
    c. Hands-on approach. Realistic approach there is an understanding that all of us are under constraints and it's acknowleged
    d. Group activity & not just sitting w/a lecture
    e. The TIPER question ideas, project, how to use, etc. were excellent. Liked that it was essentially free.
    f. I liked that I was able to see two different ways and styles of strategies Dwain and David. This highlighted that there is more than one way to accomplish the same goals
    g. The time to work on projects. Realized how complicated it was to create "good" questions
    h. Interaction with participants working in groups
    i. 1. The opportunity to interact with other teachers to discuss common questions about physics education. 2. The great interaction between Dwain, Tom, and David. 3. Beer in Dwain's room!
    j. The hands-on activities gave me the opportunity for integrate what I am learning immediately (vs. hearing "about" something)
    k. The group work, lab time, the personalities! Great exchange & presentation of materials/ philosophies etc.
    l. I like everything about this workshop. It is very organized and efficient. The schedule is followed and the presenter's ideas are very useful & specifically like the idea on schema diagramming/building
    m. Connecting w/ other teachers good use of time (so much done each day!) room and prompts for thinking about challenging things, working on the project
    n. Hands on activities practice using & making TIPERs practice lab
    o. Modeling discourse incorporated into a physics setting
    p. Group interactions, "natural" presentation style
    q. New ideas
    r. Peer interactions

6. What did you like least about this workshop? (You may list more than one)

a. I can't think I don't come to my mind. That tells workshop met my expectation.
b. Long days were a challenge, but I realize that is an inherent constraint
c. No response
d. Nothing
e. Would like more time to share ideas that we use in our classrooms with the other participants
f. No Response
g. I wish it ended at 9pm so that I could visit and talk w/ people but when we get back to the hotel close to 10pm, it is hard justifying the staying up to socialize
h. None
i. there is nothing that can be done about it but these are long days
j. That we have to sleep at night (rather than learn more)
k. Assessment session
l. None
m. Presenting the project. Didn't get to work with everyone-might not be possible, but would like the chance to work in groups with as many as possible
n. Naming convention of TIPERs: should be A#-##-TTTT, not A#-TTTT##
o. assessment discussion- this was interesting but not successful when talking about general concepts when talking about physics assessments on memory stick, I felt I could use that info in class
p. The day is a little long. The time went by quickly and unnoticeably but 13 hrs is pretty long
q. Nothing particular
r. The travel time to the workshop

3.What suggestions do you have to improve this workshop? (You may list more than one)

a. More on test preparation & assessment. Methods. Methods/ teaching techniques for calculation based classes
b. No Response
c. More time for us (participants) to discuss implantation strategies would be nice. Sometimes feels like information overload but I like all of the information
d. None
e. No Response
f. Very well run workshop, busy, but I felt like I had enough time to practice with those ideas
g. End the day at 9pm Have a session to talk about the articles specifically
h. None
i. None come to mind this was very well done
j. Perhaps make them one day longer and have more opportunities for hands on work.
k. Don't assume we understand the "educationese" (not all of us have education degrees!) & us of anacornyms
l. I cannot think of any other suggestion to improve this. It looks like the organizers have perfected this
m. I need more time to think about this question- I will email later if I think of things
n. See above more on electrostatic fields & potential
o. No Response
p. None-this was great!
q. Nothing
r. No Response

4 Are there any other workshops that we should consider offering in the future?

uu. Workshops mainly focus on calculus based physics classes. Because students struggle with this
vv. Modeling curriculum EIM
ww. Yes I'm especially interested in the Project Based Learning Workshop
xx. No Response
yy. ?
zz. More on using your ideas and strategies in laboratory activites
aaa. No Response
bbb. If possible, more hands on activities and magnetism
ccc. More information on advanced E+m labs, please. Methods of evaluating the quality of a test question
ddd. Offer more modeling workshop entirely on modeling where participants get to do the modeling for practice and get feedback to improvement
eee. Building "lab" or "exploration" activities anything less hands-on. Physics for the Technologies (HVAC, Welding, etc.) "" liberal arts
fff. More TIPER activities to allow us to practice it and be confident in the implentation
ggg. I would love more workshops focusing on content creation. Would love to work in several groups on multiple projects during a workshop
hhh. Project based curriculum "" assessment
iii. Modeling
jjj. More technology integration
kkk. Similar in future
lll. No Response

5 General comments about the workshop pre-materials.
a. I am sorry I didn't get to read those materials
b. Good, relevant
c. Thank you all so much great workshop. We can tell that you all put a lot time/effort it shows.
d. No Response
e. No Response
f. Thank you. I look forward to trying many of these ideas
g. Really liked the pre-materials. Excellent ideas, wish we talked about them more specifically
h. The workshop was excellent with many tips and techniques for implementations. Thank you for your time an for sharing your experience and expertise
i. Helpful, but I like my students, I put off reading them until the last minute
j. I have already seen/read most of it long before I had signed up for the workshop
k. N/A
l. Awesome! Keep up the great work
m. Useful Thank you!
n. No response
o. Some were mailed after school was out & I didn't receive them before workshop
p. For high school teachers, please send materials to home address. Preferably please send these materials electronically
q. excellent
r. No Response.

Workshop Descriptions

Instructional Strategies for Introductory Physics (ISIP) Workshop

March 27 – 29, 2014 – Green River Community College, Auburn, WA

June 26-28, 2014 at Manchester Community College, Manchester, CT

Workshop Leaders: Adrienne Battle, Green River Community College, Auburn, WA; David Maloney, Indiana University – Purdue University at Ft. Wayne, Ft. Wayne, IN; Dwain Desbien, Estrella Mountain Community College, Avondale, AZ; Tom O'Kuma, Lee College, Baytown, TX

Over thirty years of physics education research strongly shows that the "traditional" lecture-style, passive learning model does not substantially impact the conceptual understanding of most students who take introductory physics. The research also indicates that most students enter introductory physics with common-sense frameworks involving both accurate and inaccurate intuitions about many basic concepts that are taught in introductory physics. For most students, passive learning techniques generally do not involve the students in working to make sense of the concepts and develop an understanding that is more consistent with our accepted ideas of how nature works. Results from physics education research have identified several different active learning techniques that have substantially increased student conceptual understanding in introductory physics.

During this hands-on workshop, participants will become familiar with various TIPERs. TIPERs are Tasks Inspired by Physics Education Research. These tasks are not like traditional physics textbook problems, but rather, require the students to think conceptually about a particular physical situation. They include ranking tasks, working backwards tasks, conflicting contentions tasks, linked multiple choice tasks and others. In this workshop, participants will work with different kinds of tasks, discuss how they might be effectively used in the physics classroom, and learn how to write some of their own tasks. There will be an emphasis on the new Sense Making TIPERs although nTIPERs (Newtonian TIPERs) and emTIPERs will also be discussed.

Another instructional strategy of the ISIP workshop will be Modeling Discourse Management. Participants will experience a classroom management technique called modeling discourse management. While this classroom management style was created for a modeling curriculum, it can also be used with most PER based activities or curriculum. Modeling discourse management is an attempt to improve student-student interactions, student-teacher interactions, and classroom discussions.

The modeling theory of physics focuses the introductory physics curriculum around a small set of models. Participants will learn these models and practice applying them to physical situations. Essential to creating a useful model is to have quality-modeling tools. This workshop will introduce new modeling tools and demonstrate how to use existing tools in more robust ways.

The workshop leaders have many years of experience in developing and refining curriculum for introductory physics students. In addition, and more importantly, the workshop leaders have had extensive experience with the implementation and adaptation of curriculum in a variety of institutions and for many types of introductory physics students along with the training of faculty in using and developing their own curricula for their technology-oriented students. This workshop is designed for TYC and HS teachers who are interested in using technology in lab and their courses to improve teaching and learning in introductory physics courses.

There will also be an opportunity to share and discuss issues relating to teaching physics more effectively (particularly for students enrolled in technician/technology education programs), and how to use various strategies, tools, and tactics to overcome problems and barriers to learning at TYCs and HSs. Important issues such as standards, assessment, diversity, and technology utilization will be addressed at various points during the workshop. Discussion and information on the needs of the technological workforce and its connection with the activities of this workshop will also be presented.

Project Based Learning for Introductory Physics (PBLIP) Workshop

November 13 – 15, 2014 – Estrella Mountain Community College, Avondale, AZ

Workshop Leaders: Anne Cox, Eckerd College, St. Petersburg, FL ; David Weaver, Chandler-Gilbert Community College, Mesa, AZ; Dwain Desbien, Estrella Mountain Community College, Avondale, AZ; Tom O'Kuma, Lee College, Baytown, TX

Physics students enter our classrooms with important skills and knowledge (along with a few alternative conceptions). Furthermore, they also bring expectations about the ways they will (or won't) use physics in their careers or in other aspects of their life outside the classroom. There are many highly laudable efforts that have been made to address the impedance mismatch between students' background as well as the needed exit knowledge and skills for physics courses. We believe a problem-based learning (PBL) format is another effective tool in this mission. This workshop is designed for teachers who are interested in using and developing new authentic learning tasks in introductory physics.

"How can I get my students to think?" is a question asked by many faculty members, regardless of their disciplines. Problem-based learning (PBL) is an instructional method that challenges students to "learn to learn," working cooperatively in groups to seek solutions to real world problems. These problems are used to engage students' curiosity and initiate learning the subject matter. PBL prepares students to think critically and analytically, and to find and use appropriate learning resources (by Barbara Duch on website: http://www.udel.edu/pbl/.)

This workshop will feature the use of one form of PBL, Very Large Contexts (VLC), in which student teams have 4-5 weeks to construct a project, collect pertinent data, create a technical instruction manual for their device and develop a multimedia presentation about their efforts. Participants will work in small groups on specific VLCs projects.

Computer simulations, for example, can provide an interactive and conceptual mode for student understanding. Simulations alone, however, are not necessarily the answer for increasing student understanding. They must be informed by good pedagogical practices and must be adaptable to a variety of educational environments. Thus, this PBAIP workshop will allow participants to explore how these simulations can be used most effectively in the classroom. This often means coupling simulations with various teaching strategies.

During this workshop, participants will become familiar with the variety of simulations available. Participants will work with Physlets© (physics applets) and Open Source Physics resources (www.opensourcephysics.org). Included in this set of resources are tools for authoring simulations (Easy Java Simulations) and video analysis (Tracker). Participants will also become familiar with other simulations, e.g., the PhET simulations (http://phet.colorado.edu/new/index.php) which are research-based, interactive physics simulations. Participants will also develop the ability and skills to modify, adapt, and construct new materials. One of the goals of this workshop is to provide a flexible suite of resources appropriate to different levels of instruction as well as different levels of technological sophistication (from low to high) so that participants can choose what will be most successful in their home environment.

The workshop leaders have many years of experience in developing and refining curriculum for introductory physics students. In addition, and more importantly, the workshop leaders have had extensive experience with the implementation and adaptation of curriculum in a variety of institutions and for many types of introductory physics students along with the training of faculty in using and developing their own curricula for their technology-oriented students. This workshop is designed for TYC and HS teachers who are interested in using technology in lab and their courses to improve teaching and learning in introductory physics courses.

There will also be an opportunity to share and discuss issues relating to teaching physics more effectively (particularly for students enrolled in technician/technology education programs), and how to use various strategies, tools, and tactics to overcome problems and barriers to learning at TYCs and HSs. Important issues such as standards, assessment, diversity, and technology utilization will be addressed at various points during the workshop. Discussion and information on the needs of the technological workforce and its connection with the activities of this workshop will also be presented.

The local host will be Dwain Desbien who has provided strong leadership for an outstanding physics program in a suburban campus in a major city. Recently, the physics program at Estrella Mountain Community College was selected as one of the ten outstanding TYC physics programs visited during the SPIN-UP/TYC project.