2011 Math and Science Partnership Learning Network Conference

MSP: From Partnerships of Innovation to Student Success

January 24 - 25, 2011 • Washington, DC

PAPER SESSION

A First Attempt at Examining the Relationship Between Student Success and Teachers' Participation in a Virtual Learning Environment (PLE)

MSPnet
An electronic learning community for all MSP projects.
www.mspnet.org

TERC
2067 Massachusetts Avenue
Cambridge Massachusetts 02140
617-547-0430

NATIONAL SCIENCE FOUNDATION

CONTENTS

Cover graphic, from left: Yong Zeng, project PI Thom Dunning, and Dave Mattson

This documentation is part of the **MSPnet** project, funded by the National Science Foundation and designed and facilitated by **TERC Inc.**, a not-for-profit education research and development organization based in Cambridge, Massachusetts.

Participant comments have been paraphrased; they are not exact quotes. The contents of this document do not necessarily reflect the views of TERC, the National Science Foundation, or the organizations of any participants.

MSPnet

An electronic learning community for all MSP projects.
www.mspnet.org

Principal Investigators
Joni_Falk@terc.edu
Brian_Drayton@terc.edu

Conference Documentation
Catherine McEver

About This Summary

This documentation of the 2011 Math and Science Partnership Learning Network Conference offers a brief summary of a presentation that took place during one conference breakout session and focuses on questions, answers and discussions during the session.

The abstract for this presentation is posted on MSPnet at the following URL:

http://hub.mspnet.org/media/data/3.pdf?media_000000007047.pdf

More from LNC 2011 on MSPnet

For a summary of LNC plenary session proceedings, as well as video of those sessions and all conference abstracts and PowerPoint presentations, visit:

www.MSPnet.org

SESSION PRESENTATION

ICLCS Overview

Dave Mattson opens the session with an overview of the Institute for Chemical Literacy through Computational Science (ICLCS) project, and notes that the focus of this presentation is on research that wasn't in the original project design but grew out of the professional online environment developed by the project.

The ICLCS project involves the following partners. Project evaluators are Elisa Mustari and Lizanne Destefano from I-STEM.

Institute for Chemistry Literacy through Computational Science

CORE PARTNERS

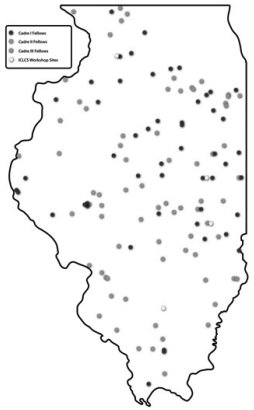
- University of Illinois at Urbana-Champaign
  - College of Medicine
  - Department of Chemistry
  - National Center for Supercomputing Applications
- A-C Central School District #262 in Ashland, IL
- Regional Office of Education #11 in Charleston, IL

The 124 teachers involved in the project are also seen as real partners in this effort, Mattson notes. The focus is on rural high school chemistry teachers from throughout the state of Illinois. Each fellow spends three years in the Institute, engaging in over 100 hours of professional development each year. They come onto campus during the summer and are involved in a graduate-level course during the school year, for which they credit. The virtual professional development environment provides the teachers much-needed support. These are often the only chemistry teachers and sometimes the only science teachers in their entire building, Mattson explains, so the online support has become very important to them.

Program Features

High School Chemistry Teachers from **isolated RURAL areas**

- 49 Cadre I = Summer Institutes: 2007; 2008; 2009
- 56 Cadre II = Summer Institutes 2008; 2009; 2010
- 19 Cadre III = Summer Institutes 2010; 2011; 2012



Represents: 124 Fellows from 120 School Districts

Each Fellow spends **3 years** in Institute:

3, two-week summer Institutes

3, Chem 492 graduate level courses – 3 Credit Hours

Over 100 hours Professional Development (training) **per year** via summer workshops and online support

Learning Network Conference Breakout
Session Number: 3 - 36

Strand 1: Definitions of and research designs related to student success

Authors:
Yong Zeng, Edee Norman Qiziecki, Dave Mattson, Alex Yahja

Presenters:
Yong Zeng, Dave Mattson

Institute Partnership, 2006:
Institute for Chemistry Literacy through Computational Science (ICLCS)

In this presentation, authors examine innovate ways to understand if there is a relationship between student success and their teachers' year-long participation in a technology-mediated professional learning environment (PLE). Initial data analyses indicate a strong relationship between teachers who have contributed to a high percentage of discussion threads during the year, and their students' achievement as measured by a standardized chemistry test. These initial analyses find a linear relationship (P=.002) exists between students' (n=1422) learning gains and their teachers' (n=40) level of participation in the ICLCS professional learning environment. Authors discuss how they are mining data in the PLE to better understand how online environments, such as the one being used in the ICLCS, can positively impact teachers and students.

Goals of the ICLCS

- Strengthen rural high school teachers' and students' understanding of chemistry within the context of 21st Century research
- Increase teachers' use of, and comfort with, computational and visualization tools
- Create a cadre of teacher-leaders who will become advocates for excellence in science education
- Promote institutional changes in the university and school district partners

Dave Mattson

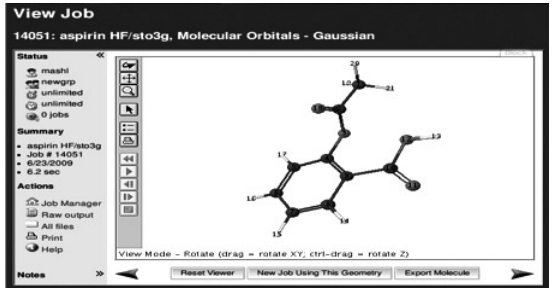
Mattson proceeds with a brief overview of ICLCS goals. In relation to the first goal, the project uses standardized tests from the American Chemical Society. Students take pre- and post-tests, and teachers are tested as well each year as they proceed through the Institute.

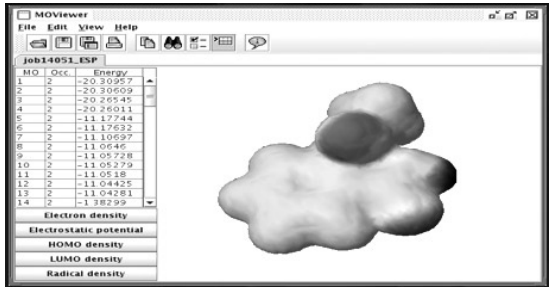
To help achieve the second goal, when teachers come to campus in the summer they are introduced to a range of tools that offer different ways of looking at chemistry through computational visualization. All of the tools are freely available to the teachers and their students. As an MSP Institute project, leadership is a big part of what ICLCS does, Mattson states, and teachers are encouraged to develop as leaders in their districts and in the broader context of education and computational science. Teachers have begun to publish in the *Journal for Computational Science Education* and attend the education component of a supercomputing conference that is held every year. The goal is to help them see themselves as professionals in the computational science education environment. Finally, institutional change is a big part of the effort. That includes trying to get university faculty to adopt these computational tools, and trying to effect institutional change within the districts of the 124 participating teachers.

Mattson offers one example of a computational tool used by the project. WebMO is a Web-based interface to computational quantum chemistry software. You pull up the editor, build a molecule graphically, send it off to the supercomputers, and it returns all of these calculations, Mattson explains. The teachers build curriculum materials around these tools. The Institute introduces them to the tools and trains them in their use during the summers and over the academic year. The teachers then form cross-district teams to develop curriculum around these tools, things they would actually use in their classes. They share what they have developed with the larger ICLCS community and the project makes the curriculum available to

Computational Tool Example: WebMO

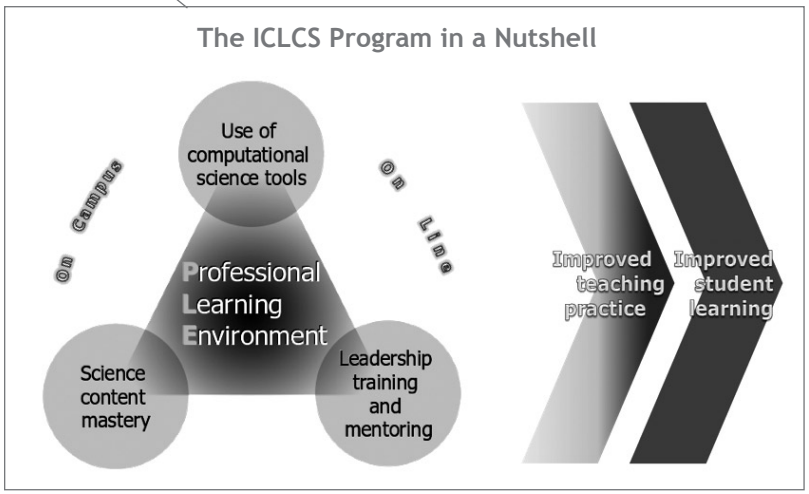
- Web-based interface to computational quantum chemistry software
- Graphical construction of molecules
- Visualization of optimized 3D geometries and molecular properties





the broader STEM community as well.

Below is a diagram depicting the ICLCS program in a nutshell.



Teachers are trained and supported in the use of computational tools. Science content mastery includes science content refreshers every time they get together, based on feedback from the teachers. As each cadre of teachers enters the program they are asked to identify the three biggest areas of chemistry that present them with the most difficulty in understanding, and the three they find most difficult to teach to students. Those teacher-identified content areas are used to build the curriculum used by the Institute. Leadership training and mentoring is also part of the professional learning environment. Another aspect that should be added, Mattson notes, is pedagogy—modeling how to use these tools in a classroom environment.

The professional learning environment is accessed by teachers on campus during the summers, and online during the summers and during the school year. Even during the summer, Mattson explains, a lot of the group partnerships' work takes place online, where they have a place to share documents and discuss what they are doing in terms of curriculum development.

The goal is to improve teaching practice using the tools, content knowledge, pedagogy and leadership, and ultimately the hope is that will lead to improved student learning. A separate paper session at the LNC discusses those outcomes.

One unexpected outcome was the degree to which the teachers valued the online professional learning environment. "These are teachers who are isolated in rural areas," Mattson relates, "and we began to hear from them quotes like this about how valuable they were finding the online professional learning environment." This feedback from teachers was powerful, leading the project to look at the data behind the online environment and match that up with student achievement data. Mattson then turns the presentation over to Yong Zeng regarding the results of that investigation to date.

Role of the Virtual PLE as Perceived by Participating Teachers

"For the first time, I have science colleagues! I have been the only science teacher in my rural high school. The Moodle connection has provided an effective communication tool for sharing ideas, frustrations, and teaching strategies with people who are in the trenches with me. It is easy and extremely rewarding." –ICLCS Fellow

"I feel that the ICLCS program in one year has greatly improved my approach to teach classes and working in education. It has inspired me to start on a Master's degree, which I never thought of doing earlier. I hope this virtual community will be able to continue past the ICLCS program because now that I have peers and mentors to bounce ideas off of, I would hate to lose it." –ICLCS Fellow

Purpose of the Current Study

What are the indicators of teachers' participation in a virtual professional learning environment that are positively correlated with their students' learning gains as measured by a standardized test, and how are the indicators determined?

Is there any relationship between teachers' participation in a virtual professional learning environment and their students' learning gains in the same academic year, and how can this relationship be quantified?

Yong Zeng

Study: Relationship Between Student Success and Teacher Participation in a Virtual PLE

Yong Zeng, a doctoral candidate in STEM education at the University Illinois, has been leading the study that he describes as a small research project that sprang out of the larger project. The project heard from teachers over and over again how helpful this professional learning community is to them. Zeng reiterates the fact that these teachers are sometimes the only science teachers in an entire district and observes, "They are in dire need of communicating with someone else in the trenches."

From the beginning of the ICLCS project, teachers were asked to communicate all the time using the virtual learning community established by the project. The project uses the free courseware system called Moodle and over the years, based on feedback elicited from teachers, project programmers adapted the system to the teachers' needs.

The purpose of the study Zeng is leading is outlined in the sidebar at left.

Study participants and methods are described below.

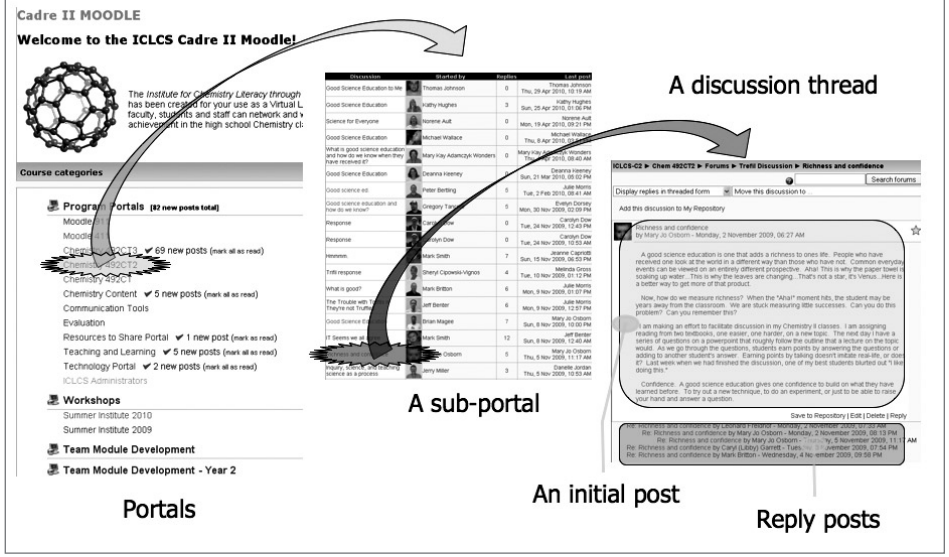
Participants

- Forty teachers and their students participated in the study during academic year 2009-2010
  - Teachers (n=40) participated in the virtual PLE as part of ICLCS program for 12 months
  - Student participants (n=1422) took ACS pre- and post-test before and after their teachers' year-long professional development
- Student success = Students' learning gains

  Measured by a standardized test produced by the American Chemical Society for high school students given before and after the school year

Before talking about data collection and analysis, Zeng offers a brief overview of the virtual professional learning environment. The por-

Virtual PLE through Moodle



tals are what the teachers see when they first log in. The appearance and function of these portals have developed over time based on teacher feedback, and are organized in a way that makes it easy for teachers to access information. For example, if they have resources to share, they go to the "Resources to Share" portal; if they have thoughts to contribute to the discussion about teaching and learning, they go to the "Teaching and Learning" portal. If they have an urgent need, such as a technology breakdown, they post on "Moodle 911," which is monitored by a moderator several times a day so that they get a fairly fast response.

If you go to one of the sub-portals, you see a list of discussion threads, and if you click on one of those discussion threads, you see a page like that at right in the diagram. In this example you see the initial post and the reply thread, with three direct replies to the initial post and two indirect replies.

Zeng then offers a glance at the type of raw data analyzed in this study. "Basically, we log every time they click, every time they view something, every time they log in, every time they respond to a post," he explains. The post contents are also logged, so the study can identify the number of words posted during a specific time period. The table on the right shows a tally of all clicks (actions) by all users (including instructors, mentors and moderators), and by the teachers alone. Over a twelve-month period, there were over 150,000 views by teachers, which means the teachers clicked over 150,000 times. The number of post viewings by teachers is over 34,000, which is very significant, Zeng points out. In total, there were 953 discussion threads over a twelve-month period.

The outcome variable is the students' learning gain as measured by the pre- and

Data Collection/Analysis

- Students' pre- and post-test ACS scores
  - Outcome variable: Student average score gains (Mean = 4.11, SD=4.84)
- Server log of teachers' year-long participation on the ICLCS PLE
  - More than 20 participation measures were derived from the server log, e.g. number of posts, number of viewings, number of words, log-ins, actions per login, total time spent online, number of online days etc.
  - Four participation indicators with high correlation with student learning gains

Pearson Correlation	S_Gain (Student learning gains)
Pct of discussion threads posted [PctThreadPosted]	.490**
No. of post viewings [PostViews]	.464**
Pct of discussion threads viewed [PctThreadViews]	.455**
Pct of significant discussion threads viewed [PctSigThreadViews]	.449**

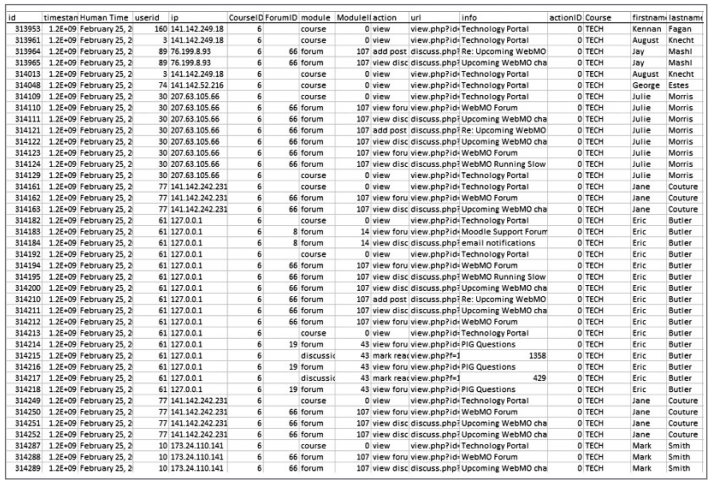
** Statistically significant at .001 level

Raw Data Source at a Glance

- During 2009-10, all users on Cohort 2 PLE logged 390,403 actions, such as adding posts, viewings posts, log-ins, post contents, chats, and document uploads etc.
- Data examined by all teachers:

Actions in 12 months	By All Users	By Teachers
No. of all viewings	196,172	157,033
No. of post viewings	41,941	34,783
No. of threads	1,128	958
No. of replies	3,211	2,742
No. of logins	13,676	10,945
No. of words posted	385,498	326,971

* Teachers logged more than 80% of total number of actions by all users



id	timestan	Human Time	userid	ip	CourseID	ForumID	module	ModuleIi	action	url	info	actionID	Course	firstnam	lastnam
313953	1.2E+09	February 25, 2	160	141.142.249.18	6		course	0	view	view.php?id=	Technology Portal	0	TECH	Kennan	Fagan
313961	1.2E+09	February 25, 2	3	141.142.249.18	6		course	0	view	view.php?id=	Technology Portal	0	TECH	August	Knecht
313964	1.2E+09	February 25, 2	89	76.199.8.93	6	66	forum	107	add post	discuss.php?	Re: Upcoming WebMO	0	TECH	Jay	Mashl
313965	1.2E+09	February 25, 2	89	76.199.8.93	6	66	forum	107	view disc	discuss.php?	Upcoming WebMO cha	0	TECH	Jay	Mashl
314013	1.2E+09	February 25, 2	3	141.142.249.18	6		course	0	view	view.php?id=	Technology Portal	0	TECH	August	Knecht
314048	1.2E+09	February 25, 2	74	141.142.52.216	6		course	0	view	view.php?id=	Technology Portal	0	TECH	George	Estes
314109	1.2E+09	February 25, 2	30	207.63.105.66	6		course	0	view	view.php?id=	Technology Portal	0	TECH	Julie	Morris
314110	1.2E+09	February 25, 2	30	207.63.105.66	6	66	forum	107	view foru	view.php?id=	WebMO Forum	0	TECH	Julie	Morris
314111	1.2E+09	February 25, 2	30	207.63.105.66	6	66	forum	107	view disc	discuss.php?	Upcoming WebMO cha	0	TECH	Julie	Morris
314121	1.2E+09	February 25, 2	30	207.63.105.66	6	66	forum	107	add post	discuss.php?	Re: Upcoming WebMO	0	TECH	Julie	Morris
314122	1.2E+09	February 25, 2	30	207.63.105.66	6	66	forum	107	view disc	discuss.php?	Upcoming WebMO cha	0	TECH	Julie	Morris
314123	1.2E+09	February 25, 2	30	207.63.105.66	6	66	forum	107	view foru	view.php?id=	WebMO Forum	0	TECH	Julie	Morris
314124	1.2E+09	February 25, 2	30	207.63.105.66	6	66	forum	107	view disc	discuss.php?	WebMO Running Slow	0	TECH	Julie	Morris
314129	1.2E+09	February 25, 2	30	207.63.105.66	6		course	0	view	view.php?id=	Technology Portal	0	TECH	Julie	Morris
314161	1.2E+09	February 25, 2	77	141.142.242.231	6		course	0	view	view.php?id=	Technology Portal	0	TECH	Jane	Couture
314162	1.2E+09	February 25, 2	77	141.142.242.231	6	66	forum	107	view foru	view.php?id=	WebMO Forum	0	TECH	Jane	Couture
314163	1.2E+09	February 25, 2	77	141.142.242.231	6	66	forum	107	view disc	discuss.php?	Upcoming WebMO cha	0	TECH	Jane	Couture
314182	1.2E+09	February 25, 2	61	127.0.0.1	6		course	0	view	view.php?id=	Technology Portal	0	TECH	Eric	Butler
314183	1.2E+09	February 25, 2	61	127.0.0.1	6	8	forum	14	view foru	view.php?id=	Moodle Support Forum	0	TECH	Eric	Butler
314184	1.2E+09	February 25, 2	61	127.0.0.1	6	8	forum	14	view disc	discuss.php?	email notifications	0	TECH	Eric	Butler
314192	1.2E+09	February 25, 2	61	127.0.0.1	6		course	0	view	view.php?id=	Technology Portal	0	TECH	Eric	Butler
314194	1.2E+09	February 25, 2	61	127.0.0.1	6	66	forum	107	view foru	view.php?id=	WebMO Forum	0	TECH	Eric	Butler
314195	1.2E+09	February 25, 2	61	127.0.0.1	6	66	forum	107	view disc	discuss.php?	WebMO Running Slow	0	TECH	Eric	Butler
314200	1.2E+09	February 25, 2	61	127.0.0.1	6	66	forum	107	view disc	discuss.php?	Upcoming WebMO cha	0	TECH	Eric	Butler
314210	1.2E+09	February 25, 2	61	127.0.0.1	6	66	forum	107	add post	discuss.php?	Re: Upcoming WebMO	0	TECH	Eric	Butler
314211	1.2E+09	February 25, 2	61	127.0.0.1	6	66	forum	107	view disc	discuss.php?	Upcoming WebMO cha	0	TECH	Eric	Butler
314212	1.2E+09	February 25, 2	61	127.0.0.1	6	66	forum	107	view foru	view.php?id=	WebMO Forum	0	TECH	Eric	Butler
314213	1.2E+09	February 25, 2	61	127.0.0.1	6		course	0	view	view.php?id=	Technology Portal	0	TECH	Eric	Butler
314214	1.2E+09	February 25, 2	61	127.0.0.1	6	19	forum	43	view foru	view.php?id=	PIG Questions	0	TECH	Eric	Butler
314215	1.2E+09	February 25, 2	61	127.0.0.1	6	discussi		43	mark rea	view.php?f=1	1358	0	TECH	Eric	Butler
314216	1.2E+09	February 25, 2	61	127.0.0.1	6	19	forum	43	view foru	view.php?id=	PIG Questions	0	TECH	Eric	Butler
314217	1.2E+09	February 25, 2	61	127.0.0.1	6	discussi		43	mark rea	view.php?f=1	429	0	TECH	Eric	Butler
314218	1.2E+09	February 25, 2	61	127.0.0.1	6	19	forum	43	view foru	view.php?id=	PIG Questions	0	TECH	Eric	Butler
314249	1.2E+09	February 25, 2	77	141.142.242.231	6		course	0	view	view.php?id=	Technology Portal	0	TECH	Jane	Couture
314250	1.2E+09	February 25, 2	77	141.142.242.231	6	66	forum	107	view foru	view.php?id=	WebMO Forum	0	TECH	Jane	Couture
314251	1.2E+09	February 25, 2	77	141.142.242.231	6	66	forum	107	view disc	discuss.php?	Upcoming WebMO cha	0	TECH	Jane	Couture
314252	1.2E+09	February 25, 2	77	141.142.242.231	6	66	forum	107	view disc	discuss.php?	Upcoming WebMO cha	0	TECH	Jane	Couture
314287	1.2E+09	February 25, 2	10	173.24.110.141	6		course	0	view	view.php?id=	Technology Portal	0	TECH	Mark	Smith
314288	1.2E+09	February 25, 2	10	173.24.110.141	6	66	forum	107	view foru	view.php?id=	WebMO Forum	0	TECH	Mark	Smith
314289	1.2E+09	February 25, 2	10	173.24.110.141	6	66	forum	107	view disc	discuss.php?	Upcoming WebMO cha	0	TECH	Mark	Smith

Sample server log

Yong Zeng

post-test administered to 1,400 students. In addition, the study derived over twenty participation measures from the server log, such as the total times they logged in during the past twelve months, the total number of posts in which they participated, the number of words they contribute to a discussion, and the number of online days. At least one teacher fellow, Zeng reports, logged in for 394 days. These measures weren't found in the literature, he explains. They were developed in hopes they would help the project understand the level of engagement of the teachers.

Four of the measures had the highest correlation with student learning. The first is the percentage of discussion threads in which a teacher participated (the number of discussion threads to which a teacher contributes one or more posts divided by total number of discussion threads in 2009-10). There are a total of 958 discussion threads. "If someone posted fifteen or twenty percent on the discussion threads," Zeng observes, "then that person is really deeply entrenched in the discussion." This is a significant indicator of the deepness of involvement of specific teachers, he explains, and it correlated significantly with their students' learning gains at .001 level. When the project got that result they went back and double-checked everything, running the data again because it was a real surprise. This is what a researcher looks for, Zeng reflects, not a validation of hypothesis, but a genuine surprise.

Other indicators also correlated somewhat with student learning gains. The second highest indicator is post views (the total number of times a teacher viewed any posts in 2009-10). This was also something of a surprise, Zeng reports. You might suppose that the number of words a teacher posted would be a better indicator, or the number of posts to which they actually contributed. Instead, the second-highest correlated indicator is the total number of times they view any posts.

The third indicator is percentage of discussion thread views (a teacher's number of distinct discussion threads viewed divided by the total number of threads in 2009-10). The fourth indicator is percentage of significant thread views (a teacher's number of significant posts viewed, divided by the total number of significant posts of the year 2009-10). Zen explains that to determine a significant thread they utilize a dictionary of chemistry key words and, within every posting, count how many of those key words teachers actually use. It is considered significant because the teachers are talking about chemistry content.

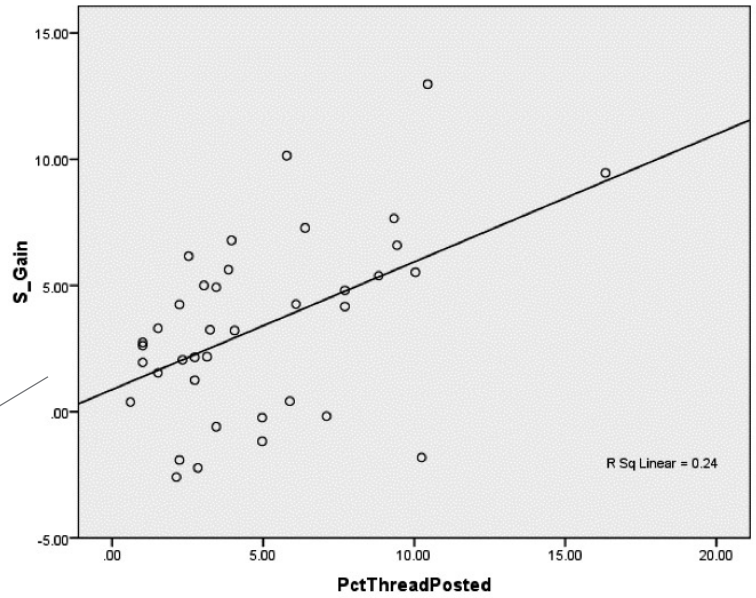
The project did a series of simple regression analyses to find out whether there is a good predictor that can be used to predict student success, using the data about teacher participation in the professional learning environment. Among those studied, the model including the variable [PctThreadPosted] best accounts for the variance in the student learning gains on the ACS tests. The regression analysis on the variable [PctThreadPosted] generates the linear

Series of Simple Linear Regressions on Students' Learning Gains

Learning gains were regressed on each participation variable in turn. The best model used [PctThreadPosted] as the independent variable:

S_Gain = .876 + .506 * PctThreadPosted

The regression line is shown in the scatter plot here



model of student learning gains shown above. The linear regression equation (or line of best fit) is depicted graphically above right. The reported adjusted R square indicates that the student learning gain model accounts for 21.9% of variance in students' learning gains in the ACS tests in year 2009-2010.

If you look at the dot to the farthest right on the x-axis, it represents a teacher fellow who participated in a little more than 15% of all 958 discussion threads. That teacher's students gained about 9 percentage points in pre- and post-testing on the ACS test.

If you look at the dot to the farthest left on the x-axis, it represents a teacher who did not participate in any discussion threads (other than perhaps one or two required postings). That teacher's students' learning gains are close to zero.

Zeng wraps up the presentation by reviewing study conclusions and next steps in terms of future research. The study will be replicated with the new group of teachers in cohort three who are entering the project to see if the findings and linear regression models apply to the new cohort.

While this study is a correlational analyses and doesn't imply causal relationship, the goal is to obtain a new grant to do a new study to explore the existence of such relationships. "We are all

Conclusion/ Future Research

- Among more than 20 participation measures, four were chosen because of the high correlation with student learning:
  - Pct. of discussion threads posted
  - No. of post viewings
  - Pct. of discussion threads viewed
  - Pct. of significant discussion threads viewed
- There exists a linear relationship ($p<.005$) between teachers' participation in the virtual PLE and their students' learning gains as measured by the ACS tests.
- Future Research:
  - Replicating this study with the new cohort of teachers;
  - While the result of the correlational analyses does not imply causal relationship, it indicates potential existence of such relations, which will be explored further in future studies;
  - Exploring the underlying factors all these indicators measure, e.g. need for cognition;
  - Strategies of highly engaged participants on virtual PLE, etc.

Acknowledgements

- Thanks to Drs. Elisa Mustari & Lizanne Destefano at the I-STEM for providing the student pre- and post-test scores for this study.
- Heartfelt thanks to Dr. Elisa Mustari for reviewing the abstract and providing suggestions to improve this presentation.
- Special thanks to Dr. Robert Mashl for redesigning the PLE diagram and providing the examples of computational tools.
- Last but not least, we thank all the reviewers of our abstract for their insightful and constructive comments.

yearning for that causality," Zeng notes, "and there's a good theory behind it." For example, the more discussion threads teachers participate in, the more they are engaged in the community. This is a kind of enculturation process, Zeng observes. Think of someone less experienced trying to get involved in a conversation with more experienced teachers. Over time, this less-experienced teacher merges into that learning community as part of the whole, and in that process he or she elevates him or herself to a better level of teaching. "This is one theory," Zeng says, "and this is a direction we really think we should explore in the future."

The project would also like to explore some of the underlying factors that all of these indicators are measured against. For example, Zeng explains, there is the need for cognition. There is the possibility that the teachers' level of discussion thread postings has nothing to do with teachers' learning. As individuals, they walked into the program with a higher need for cognition or a lower need for cognition. In other words, "Some teachers just have a yearning to learn," Zeng notes, "so they participate more." This is a possibility that the project wants to explore.

Finally, regarding strategies of highly engaged teachers, it is possible to use participation indicators to separate the teachers into two groups and explore what kind of strategies they use, and perhaps teach those strategies to future cohorts to help them better engage in the conversation.

PARTICIPANT Q AND A

Categories of Types of Postings

- Did you or do you have plans to analyze the types of comments being posted beyond the use of key chemistry words? For example, whether they are help-seeking versus offering information or resources? • Participant
- I think a lot of studies categorize posts using the type of categories you just mentioned. At this point in this current study, we actually just look at the overall participation. As we alluded to in the title of this presentation, this is our first attempt. We will definitely go into those details, such as whether they're seeking help or receiving help or whether they're sharing resources. • Yong Zeng

Prior Technology/Content Knowledge

- Do you have any ways or plans to measure the teacher level of technology proficiency before going into this professional learning environment, or their level of content knowledge in chemistry? • Participant
- We actually do. We give our teachers the ACS test for college students as a pre- and post. • Yong Zeng
- Is that being correlated with how much they participate? • Participant
- The outcome variable we are focusing on here, which corresponds to the focus of this conference, is student success. There is another study we just did on teacher learning, their content gain. • Yong Zeng

Teacher Motivation, Sustained Activity

- I love this presentation. At MSPnet we wonder about the same kinds of questions. How many unique members do you have? • Joni Falk
- You mean teachers? Forty. Forty teachers have created 958 discussion threads in twelve months and have over 34,000 post viewings. • Yong Zeng
- So all of these forty teachers have been really active all year long. How do you sustain that activity? Do you have a notification system so that when something is posted they get notified via e-mail? • Joni Falk
- They can set it up that way in Moodle. For example, if they create an initial post and want to know when people respond to that post, they can use a check-box so that they'll receive an e-mail. • Yong Zeng
- What were the motivators you used to make sure people stuck with it? Was it purely voluntary? • Joni Falk

Further Analysis Planned

- Let me add that Yong and I have data sets that we are in the process of combining, along with information from other evaluators. We do have information about the things you are talking about, including computer proficiency at the beginning of the project and how that has changed, as well as the extent to which they are using computational tools in their classrooms. We haven't yet put all of that together with the Moodle use, but that is an excellent question: To what extent is their active participation on the Web site affected by their computer proficiency and the extent to which they feel comfortable enough to be using the computational tools in their classroom?

  Also, we are trying this year to see if they can program into how this data is pulled out those categorizations regarding whether you are giving people information, seeking information, and so on. So hopefully all of that will be in upcoming presentations. • Elisa Mustari, I-STEM

Dave Mattson

- During those twelve months they're taking a college credit course and have monthly readings assigned. Those have discussion questions moderated by one of our moderators, so that is happening on the site. However, there are all of these portals that are totally voluntarily, like the "Resources to Share" portal.

  Going back to the first question, this is our first attempt to look at this set of data to understand what the overall participation of each teacher tells us about the possibility of helping them teach better. Later on we will definitely go to those different portals to determine whether their voluntary participation has more validity and maybe correlates a little more with students' learning and their own learning. • **Yong Zeng**

- So a large percentage of those posts are part of the course and part of the grade, and that's the motivation, right? It's part of what they need to do to pass. • **Joni Falk**

- But a lot of their activities aren't associated with the courses they're taking. They're swapping information on how it is that they teach various subjects. • **Thom Dunning**

- But that's how they got there. • **Joni Falk**

- That's right, and that's part of the point, that we're encouraging them to be there for the course and the resources. But while they're there for the course, they're obviously doing other things. It would be interesting to do that analysis of various portals. • **Dave Mattson**

- We really should separate out posts that could be directly linked to discussions that they're required to participate in and ones that have nothing to do with that, those that have to do with how to apply one of the computational tools in their classroom, or they're having trouble with such-and-such, or content-related questions or something of that nature. • **Elisa Mustari**

- We do want to do that. Off the top of my head, though, I would say the percentage of postings that are required are the minority. The summer involvement is part of the course. During the year, it is maybe two readings a month and then working together in these groups on the curriculum development. In terms of how many posts are required for the grade, it's relatively low. • **Dave Mattson**

- And they're a group of motivated individuals to start with. They signed up to do this and it's a three-year commitment, and there is the fact that they are isolated. They've never had colleagues with whom to discuss these issues before in their careers. When they're at the university for two weeks they get to know everybody in their cohort, so they didn't feel at all reluctant to post questions. • **Thom Dunning**

- I think that when you write it up, it's really

important to provide these contextual influences—that they met together face-to-face, that they developed this camaraderie, that it was the course that got them to the site originally. • Joni Falk

Interpreting Negative Results

- Does the graph showing linear regressions of student learning gains (page 9) mean that all of those teachers falling below the zero point on the y-axis had students who actually did worse on the ACS post-test? • Participant

- Yes. • Yong Zeng

- How do you interpret that? • Participant

- I think this is the nature of a social science study. In a perfect world I would like to see all of the dots falling above that zero point. I think there were six teachers who fell below that point and I think the best thing to do might be to talk to those teachers. If we do, we may find out some interesting information. • Yong Zeng

- These are simple linear regressions, so it's just including those two things. An important thing that is missing from this graph that would help to explain a lot is the extent to which the teachers were actually incorporating inquiry lessons and incorporating use of computational tools in their classes. • Elisa Mustari

- Again, in a social science study we are dealing with a lot of variability. • Yong Zeng

Relevance/Applicability to Urban Districts

- I think these are really promising initial results. You've said that part of the attraction is that they're isolated in their schools and districts with no colleagues to talk to. I wonder if you'd see the same results in urban communities, where there are people around them but where teachers might not be as

Sustaining/Tracking Cadres

- It would be interesting to look at sustainability after your first cadre is done. If you can keep the virtual environment up, see if they're still interacting once their formal participation is done. • Participant

- The first cadre is over and so far they're continuing. • Thom Dunning

- In that first cadre there's an example of more than ten teachers who voluntarily formed their own club to get together to discuss ways they can better teach using different techniques. We're really happy about that, and that also relates to what you brought up regarding sustainability. I think for MSP projects overall, that's a tough issue. • Yong Zeng

- It might be hard to sustain as an actual, coordinated meeting somewhere, but might be easier to sustain online. • Participant

- I think our project is really poised to crack that because these teachers, according to our external evaluators, who have been dealing with many learning centers like us, are really responsive when we send any request regarding the professional learning environment. • Yong Zeng

- We recently did a follow-up with cadre one, who are completely done with the program, so they don't have any reason to respond other than that they feel really positive about the program. Some of them are allowing us to continue to test their students using pre- and post-tests, so we can look at what happens after interventions stop and whether there's a hangover. They've also responded to a survey about how their teaching has changed from before they entered the program to now. • Elisa Mustari

Years of Teaching Experience

- I'd be interested in the age or years of experience of the teachers involved. • Participant

- I would say for this group the average teaching experience is probably about seven or eight years. We have some with more than twenty years and the youngest has two or three years. • Yong Zeng

- One very interesting thing is that there was no correlation between behavior in the PLE and the years of teaching experience. Sometimes school districts think that older teachers aren't going to be able to do anything with computers. • Elisa Mustari

- And that's not the case. I think we should publish that also, just to address people's bias towards age. • Yong Zeng

highly qualified or are lost in the shuffle or they don't know how to access resources and help. You might see teachers in urban schools participating just as much as you would in rural schools. • Participant

- That's another possibility we need to explore further. • Yong Zeng

- When we developed this third cadre we thought about doing it with another community, with urban or small urban communities in Illinois. We were asked by MSP to keep it to rural because that's what we were originally slated to do, but that's something we'd like to look at. • Dave Mattson

Future Investigation and Analyses

- I think you have the opportunity to get a little deeper into your own questions that remain. You have two types of data. One is performance on the mandatory questions that you ask, and then there is all of this voluntary stuff. You can look at high performers on the mandatory with high participation on the voluntary, versus low performers on the mandatory with high participation on the voluntary, so you can start to identify just what is going on. Is it that the people who are higher performers and getting better grades are also high participants? Then you can't really attribute it to the participation. If you get low performers who are really making a lot of gains because of high participation, then you might really be able to say something. • Joni Falk

- It is going to very interesting when Yong and I incorporate the data that we've got and look at how all of that relates to what is actually going on in the classrooms as well. • Elisa Mustari