



# Math and Molecules Matter

An Indiana Teacher Quality Improvement Project  
2009–2011

Jill Robinson and Catherine Brown, co-PIs

# Key Activities of MMM

## Applied Content (Nanoscience and Supply Chain Math)

Dr. Jill Robinson IUB Chemistry

Dr. Leslie Gardner U Indy Math

## Project Based Learning

The PBL Academy facilitated by SE Indiana PBL practitioners

## Community and Career Connections

Local employers, EcO15 staff, IUB P-16 Center staff, Community Agency staff



# Evolution of Math and Molecules Matter and the PBL Academy

2009 – *Math Matters* (NGA grant and I-STEM)

➤ 52 participants

2010 – *Math Matters* (EcO<sub>15</sub> and ICHE funded)

*Molecules Matter* (ICHE funded)

➤ 84 participants (13 for credit)

2011 – *PBL Academy* (includes *MMM*)

(EcO<sub>15</sub> and ICHE funded)

➤ 215 participants (18 have indicated for credit)

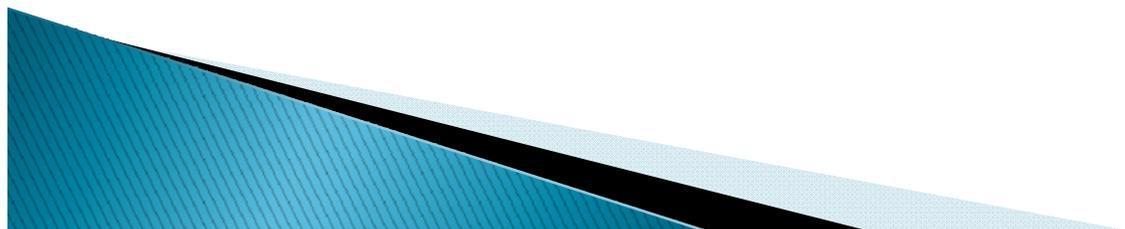


# Who Participates?

2010

- *Molecules Matter* 14 science teachers participated in 10 days of work on the IUB campus with Dr. Jill Robinson and others from science departments at IUB
- *Math Matters* 17 math teachers participated in 10 days of work at Columbus Signature Academy

All secondary teachers from Switzerland, Jefferson, Bartholomew and Monroe Counties

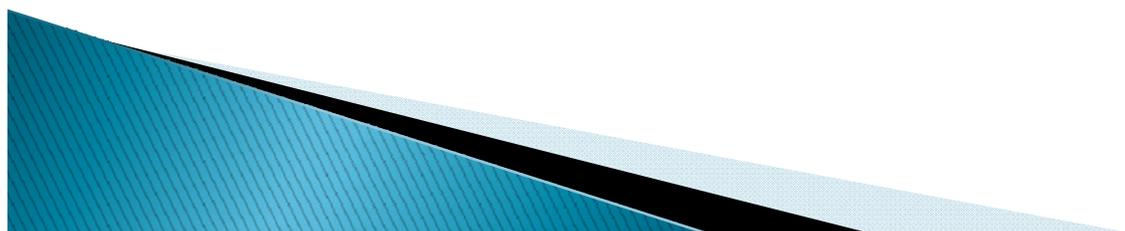


# Who Participates?

2011

- Molecules Matter 18 science teachers participated in 4 days of nanoscience work on the IUB campus
- Math Matters 15 math teachers participated in 4 days of supply chain math work on the IUB campus
- MMM 40 science and math teachers will participate in 5 days of PBL in June and 2 follow-up days in fall

All secondary teachers from Switzerland, Jefferson, Bartholomew, Monroe, Lake, Brown and Randolph Counties



# Community Partners are Fundamental

- help demonstrate the authenticity of each project by grounding them in an actual need or process of a local employer or organization
- strengthen the connections between the classroom and the community
- [Examples from Math Matters 2009 and 2010](#)

–and from Molecules Matter 2010



From: Cummins Electronics, Inc.

To: Chemistry and Electronics Students at Columbus North High School

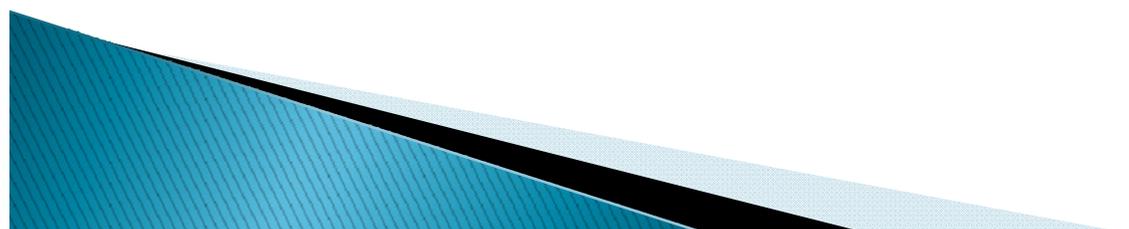
Cummins Electronics, Inc. is a local company that specializes in electronic prototypes. We have recently become aware of the potential to inkjet print nano-sized particles of silver on paper. We currently purchase our circuits from companies that use techniques such as lithography, vacuum processing, physical vapor deposition, plasma etching, or chemical vapor deposition to print electronic circuits. These processes are too time consuming and expensive to be feasible on a small scale. We are very excited about the possibility of inkjet printed circuits as a relatively low cost alternative for small scale production. Inkjet printed circuits would allow us to design, produce and test a wide variety of electronic circuits in the field.

We are asking your help in doing some preliminary investigations into the feasibility of producing silver nano particles and using them in the inkjet printing of electronic circuits. Any procedure that can be developed for safe use in a high school laboratory is more feasible for us as a small, local company as compared to our trying to downscale massive industrial applications. Additionally, if we choose to expand our business in this direction, having students familiar with the development and application of this process would provide us with a local talent pool for potential employment.



## The Growing PBL Community in SE Indiana

	Currently	After the 2011 training*
number of teachers	103	263
number of schools	48	100
number of districts	23	39
% who teach in traditional schools	86%	94%
secondary / primary split	64% / 36%	56% / 44%



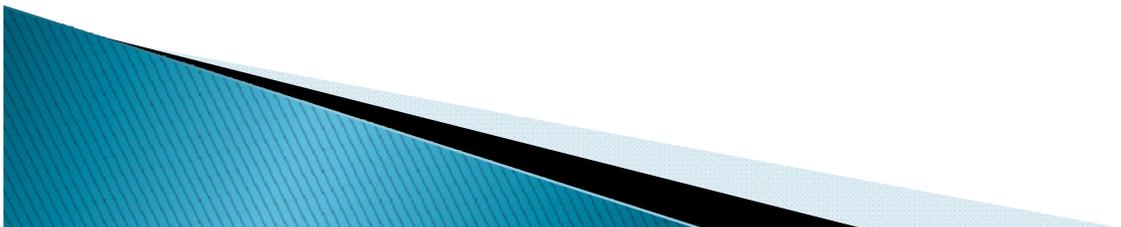
## Ongoing Support for the *MMM* Community

- ▶ **Websites :**

<http://pbl-academy.indiana.edu>

<http://mathmatters.indiana.edu>

- ▶ **DOE Learning Connections community**
- ▶ **PBL Coaches Cadre**
- ▶ **Local Critical Friends Groups with coach**



# What difference does MMM make?

- ▶ The Madison Junior High 8<sup>th</sup> Grade Story
- ▶ Acuity –Problem Solving Skills increased on average 18% in each PBL classroom
- ▶ ISTEP- Preliminary Scores show that 8<sup>th</sup> grade math went up between 17-18% from last year's 8<sup>th</sup> grade students and between 15-16% from where these students were last year as seventh graders
- ▶ Discipline referrals – WAY down!
- ▶ [The story in the Madison Courier](#)



## CEEP evaluation of *MMM* will include student data:

Collect student achievement data from IDOE or school websites, or directly from school personnel. Key student achievement outcome measures that will be gathered shall include: attendance, course completion or failure information, discipline referrals, ISTEP+ and end-of-course assessment scores, and graduation rates.

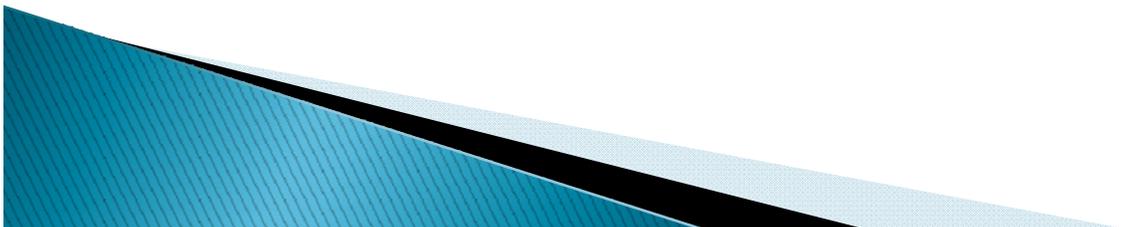
Data will be collected at the student level for at least two school years to establish the baseline of performance prior to introduction of the M<sup>3</sup>. Effort will be made to quantify the impact of M<sup>3</sup> on student achievement.

Data report will be produced in January 2012, or at the end of the 2011-12 school year, if a no-cost extension is granted to the M<sup>3</sup> Initiative by ICHE.



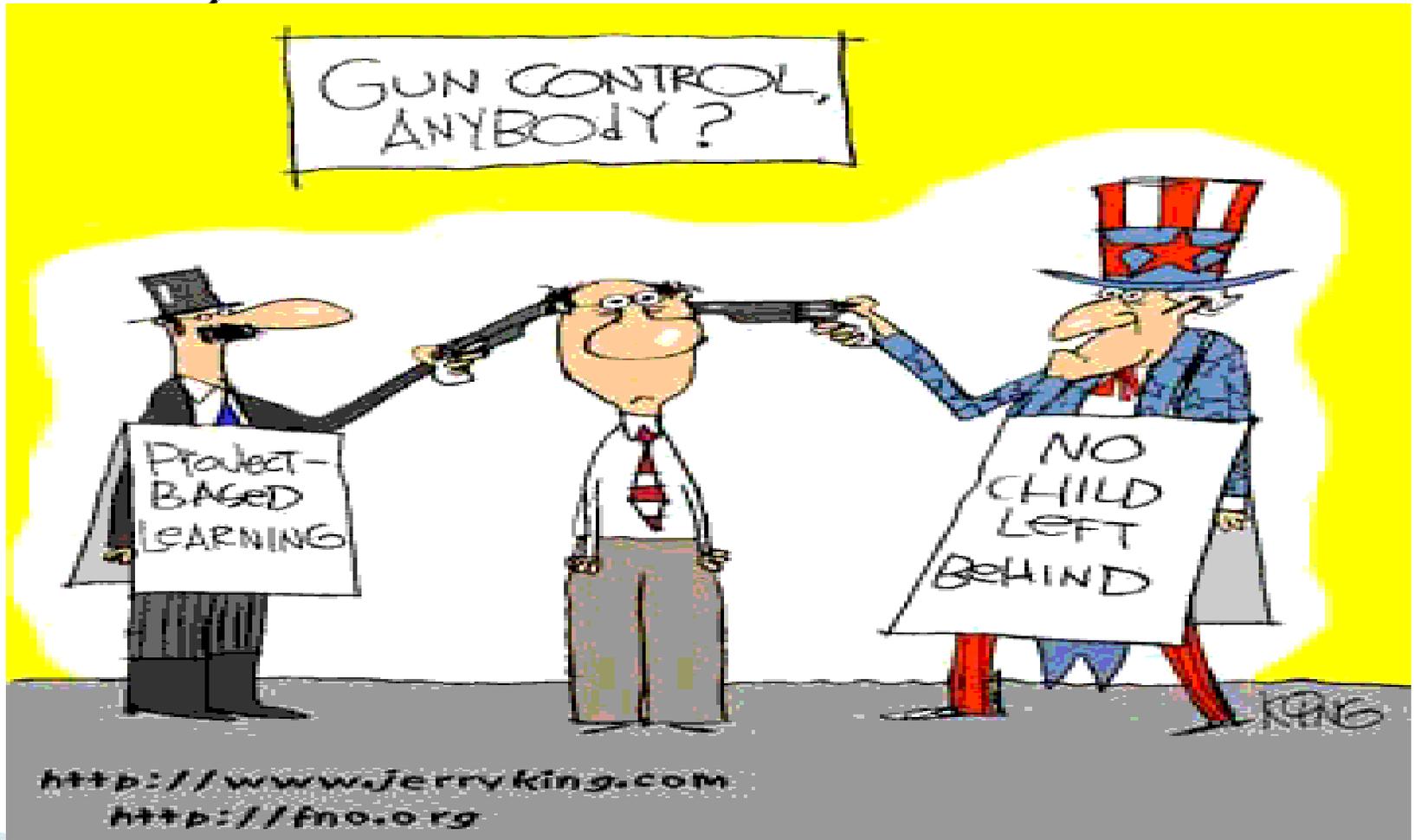
# What difference can MMM make?

- ▶ In SE Indiana, about twenty percent of high school students do not graduate, and only 17% of the region population has earned at least a BS degree.
- ▶ Thus *MMM* directly targets teachers of students with low aspirations. PBL engages students not only in learning subject matter through meaningful, authentic projects, but also opens their eyes to the possibilities of the future.



# The PBL Academy

*Advancing Project Based Learning in every classroom*



# Thank you

- ▶ To be continued... hopefully.

QUESTIONS?

COMMENTS?

FUNDING?

