Panel: Secondary Teacher Programs

Gail Burrill
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March 24, 2011

Panel overview

We will describe three distinct but closely related mathematical experiences for secondary teachers:

- PROMYS for Teachers (Ryota)
- Focus on Mathematics study groups (Al)
- PCMI Secondary School Teachers Program (Gail)

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Common theme: Participants in each of these programs experience mathematics as mathematicians do.

PROMYS FOR TEACHERS (PFT)

Ryota Matsuura
St. Olaf College

March 24, 2011

Arnold Ross once said...

"To Think Deeply of Simple Things."

But Dick Askey corrected him...

"To Think Solidly of Simple Things."

What is PfT?

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PfT is a professional development program for secondary mathematics teachers, consisting of the following components:

- A six-week summer "immersion experience" in mathematics (elementary number theory).
- Academic year workshops that connect the immersion experience to teachers' work in the classroom.

A very brief history of PfT (and FoM)

- 1957: The Ross Mathematics Program
- 1989: PROMYS (for high school students)
- 1991: PROMYS for Teachers
- 1999: Academic year workshops added to PfT
- 2001: PCMI mathematics content course
- 2003: Focus on Mathematics (study groups)
- 2009: FoM Phase II (research program)

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- perform experiments and grapple with problems,
- formulate, test, and revise conjectures,
- develop theories that bring coherence to observed results,
- express understanding using precise language.

(Just to name a few.)

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- Uses and seeks relations between multiple approaches.
- Generates own data to support hypotheses.
- Understands connections between various areas/threads.
- Reduces a difficult problem to an easier one.
- Attempts difficult problems.

A typical day @ PfT

(Monday through Friday, 9 AM – 5 PM or longer)

- Morning lecture (by Glenn)
- Work with other teachers on the **daily problem set**.

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Key: Such features of the PfT problems sets lead to the participants' deeply meaningful engagement with mathematics.

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- Model the pedagogy of “questioning answers”
- Provide daily written & verbal feedback on problem sets
- Meet weekly to discuss the progress of each teacher

Morning lecture (by Glenn)

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A typical day begins with a morning lecture, attended by all PROMYS participants. Features of these lectures include:

- “Summarize” the work done in problem sets rather than introduce new material.
- (As Bill said) “Nice putting together of the flow of ideas [from the problem sets].”
- Having already struggled with the ideas on their own, the lectures make sense and are meaningful.

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- Motivated by a problem set question, she wanted to know which primes are sums of two squares.
- She classified primes into two groups that she called Group A (sums of squares) and Group B (not SoS).
- Working with her counselor, she set off on a week-long (at least) investigation of these primes.

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- "Numbers in each group go up by multiples of 4."
- $(p-1)/2$ is even for p in Group A, odd for Group B.

  Note: This became our new definition of Groups A and B.
- For p in Group A, -1 is a square in $\mathbb{Z}_p$.
- Group A primes can be factored in $\mathbb{Z}[i]$.

(And a few other interesting conjectures – some were true, some were false.)

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Note: A year later, as a returning participant, Anne was still referring to these primes as “Group A” and “Group B.”

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