

Annual Report for Period:02/2004 - 02/2005

Submitted on: 11/17/2004

Principal Investigator: Tucker, Alan C.

Award ID: 0230847

Organization: Math Assn of America

Title:

Preparing Mathematicians to Educate Teachers

Project Participants

Senior Personnel

Name: Tucker, Alan

Worked for more than 160 Hours: Yes

Contribution to Project:

Name: Moore, Lawrence

Worked for more than 160 Hours: No

Contribution to Project:

Dr. Moore's role has been reduced because website knowledgeable staff at the MAA headquarters and at the U Arkansas PMET office have been able to handle the initial website work fo the PMET project. His role may increase later in the project.

Name: Madison, Bernard

Worked for more than 160 Hours: Yes

Contribution to Project:

Name: Dubinsky, Ed

Worked for more than 160 Hours: Yes

Contribution to Project:

Name: Lewis, William

Worked for more than 160 Hours: Yes

Contribution to Project:

PMET regional coordinator and co-leader of Nebraska workshop

Name: Narayan, Jack

Worked for more than 160 Hours: Yes

Contribution to Project:

PMET regional coordinator and co-leader of Potsdam workshop

Name: Oliver, Dale

Worked for more than 160 Hours: Yes

Contribution to Project:

PMET regional coordinator and co-leader of California workshop

Name: Lien, Magnhild

Worked for more than 160 Hours: No

Contribution to Project:

PMET Regional coordinator

Name: Heaton, Ruth

Worked for more than 160 Hours: Yes

Contribution to Project:

PMET regional coordinator and co-director of Nebraska workshop

Name: Hirst, Holly

Worked for more than 160 Hours: Yes

Contribution to Project:

PMET regional coordinator and co-director of North Carolina workshop

Name: Royster, David

Worked for more than 160 Hours: Yes

Contribution to Project:

PMET regional coordinator and co-director of North Carolina workshop

Name: Stackelberg, Olaf

Worked for more than 160 Hours: No

Contribution to Project:

PMET regional coordinator

Name: Klarreich, Naomi

Worked for more than 160 Hours: No

Contribution to Project:

PMET regional coordinator

Name: Groman, Margaret

Worked for more than 160 Hours: No

Contribution to Project:

PMET regional coordinator

Name: Pearson, Mike

Worked for more than 160 Hours: Yes

Contribution to Project:

Project Manager at MAA Washington headquarters

Name: Pearson, J Michael

Worked for more than 160 Hours: Yes

Contribution to Project:**Post-doc****Graduate Student****Undergraduate Student****Technician, Programmer**

Name: Trzeciak, Tami

Worked for more than 160 Hours: Yes

Contribution to Project:

Project administrator at the PMET project office at U Arkansas

Name: Hetzel, Sandy

Worked for more than 160 Hours: Yes

Contribution to Project:

Project administrator at PMET Workshop Office at Kent State

Other Participant**Research Experience for Undergraduates**

Organizational Partners**Other Collaborators or Contacts**

PMET project personnel have collaborated with leadership of, or made presentations of meetings of, the American Mathematical Society, the American Statistical Association, the Association of Mathematics Teacher Educators, Educator Trust's National Association of System Heads, Project Kaleidoscope, and the New York State Department of Education and the Ohio Board of Regents.

Activities and Findings**Research and Education Activities: (See PDF version submitted by PI at the end of the report)**

Nine summer workshops for mathematics faculty to prepare them to educate future teachers.

Minicourses at the MAA's 2004 summer MathFest and the annual joint MAA/AMS national meeting in January 2004.

PMET panels presentations were given at nine meetings-- MAA sections, national meetings of AMTE and NCTM and MET conferences in Michigan and Alabama.

Findings:

PMET is finding widespread interest among mathematics faculty in reworking courses for future teachers and adoption of the MET Report recommendations. In the initial round of 40 PMET mini-grant proposals, 6 were from research universities, 2 involved community colleges, 2 were from HBCU's and the rest were split between colleges and comprehensive universities.

Training and Development:

The 2004 PMET summer workshops trained 167 mathematics faculty to provide better mathematical instruction to future teachers.

Outreach Activities:

Collaboration with quantitative literacy initiative-- pending NSF proposal with Madison as co-PD. Collaboration with the NSF CLT at Georgia/U Michigan to co-sponsor activities for mathematics faculty who teach future teachers.

Journal Publications**Books or Other One-time Publications****Web/Internet Site****URL(s):**

www.maa.org/pmet

Description:

The PMET website has extensive information about PMET and its activities. In the coming year, materials for math professors from PMET workshops and other resources and website links will be added to make the PMET website a one-stop source for resources to enhance mathematics instruction for future and practicing teachers.

Other Specific Products**Contributions****Contributions within Discipline:**

PMET's goal is promote improved mathematical education of teachers and raise the attention given to the mathematical education of teachers

in the mathematics community. The PMET summer workshops and minigrants are supporting efforts by mathematics faculty to improve teacher education in their departments. PMET conference presentations, minicourses, and panels are increasing the visibility of mathematics education in coordination with other interested parties.

Contributions to Other Disciplines:

Contributions to Human Resource Development:

Improving the mathematical instruction in K-12 classrooms is perhaps the most important way to strengthen the future Science, Math, Engineering and Technology workforce in this country. International comparisons highlight the weakness of mathematical education of American students. Employers cite the superior quantitative skills of workers in other Asian countries, along with lower labor costs, as a major incentive for exporting technology-based jobs to that part of the world.

Surveys consistently indicate that the U.S. public believes that a highly qualified teacher is by far the most important factor in improving K-12 education.

Contributions to Resources for Research and Education:

See earlier comments about website resources.

Contributions Beyond Science and Engineering:

Improving the mathematical education of teachers is critical to improving the mathematical instruction in schools which is critical to helping the U.S. maintain a workforce that is technical competitive in the 21 century.

Special Requirements

Special reporting requirements: None

Change in Objectives or Scope: None

Unobligated funds: less than 20 percent of current funds

Animal, Human Subjects, Biohazards: None

Categories for which nothing is reported:

Organizational Partners

Any Journal

Any Book

Any Product

Contributions: To Any Other Disciplines

PMET Second-Year Annual Report

The goal of the project, Preparing Mathematicians to Educate Teachers (PMET), is strengthening the mathematical education of America's teachers as recommended in the 2001 CBMS report, *The Mathematical Education of Teachers*. The primary lever for PMET in achieving this goal is to assist college and university mathematics faculty in providing better courses for future K-12 teachers. This past summer, PMET ran nine workshops for 167 mathematics faculty. One of the workshops was the second year of a workshop that met first during summer 2003, and four of this summer workshops will have follow-up sessions in summer 2005. There were also minicourses at national and sectional MAA meetings.

The 'bottom line' for this project, like any collegiate education project, is making a permanent, positive change in how students are taught and learn. A follow-up survey last winter of participants in the initial PMET workshops in summer 2003 produced very heartening results. Fifty-six percent of the participants report making "a great deal" more use of group work and collaborative learning in courses for future teachers, with an additional 39% reporting 'somewhat' more use. Most participants reported evidence of improved learning by their students. Likewise, more than half reported making major changes in the way they taught mathematics topics to future teachers.

Another goal of the PMET workshops is to make the participants agents for change in their departments, that is, to share what they learned in PMET workshops. Fifty out of the 60 responding participants reported having productive interactions with fellow faculty. Some offered seminars or short workshops for their colleagues about workshop material.

An extensive series of workshops and mini-courses for college and university faculty is the central PMET activity. Another significant component of PMET is a series of minigrants to faculty at individual institutions to rework existing courses for future mathematics teachers or to create new courses for future teachers. The initial call for minigrant proposals occurred last fall for projects to start in spring 2004. In this first round of minigrants, 22 proposals were funded for a total of \$89,000. Two other PMET components -- information and resources dissemination and regional networks—have also been active.

This report is in seven sections, one for each of the major PMET components following an initial section on organization and ending with sections on evaluation and budget.

PMET Organization

The PMET project office is at the University of Arkansas, Fayetteville. The office is run by PMET co-project director Bernie Madison under a PMET subcontract from the MAA. Tami Trzeciak is the PMET project coordinator at this office, assisting Madison. The PMET workshop office is at Kent State University. The office is run by PMET Workshop Director Ed Dubinsky under a subcontract from the MAA. Sandy Hetzel is the workshop and mini-course coordinator, assisting Dubinsky. The MAA Washington Headquarters provides administrative support for financial matters, e.g., processing and disbursing most expenses. The key staff

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assisting PMET in Washington are Michael Pearson, MAA Associate Director for Programs, and Gretchen Magno.

PMET maintains an attractive, informative website (see www.maa.org/pmet) with information about the various PMET programs and a handbook for workshop directors and regional coordinators. Extensive information about workshops in the coming summer is given. Applications for workshop participants and for minigrants are available online there. The website includes information about all minigrants, including their latest progress reports. The website also has a variety of useful links for faculty to use as resources about the mathematical education of teachers. The website serves as a communication center for PMET leaders: various documents are posted there concerning operating workshops and mini-courses and with a password, the leaders access the information. An extensive handbook has been developed along with templates of various forms needed by workshop directors and applicants for the different PMET programs and all are available on the website. The Fayetteville office is maintaining the website, which includes collecting and sorting resources for posting and maintaining a calendar of events relevant to the mathematical education of teachers. The office is also managing all the mini-grant proposals, reviews, and records of each project and coordinating the activities of the PMET National Advisory Committee. The Kent State office manages all the administration of the workshops and mini-courses, including managing the Workshops Advisory Committee.

The PMET National Advisory Committee (NAC) had its annual second meeting in April in Dallas. NAC was generally happy with the operation of workshops and the impact that they appear to be having on workshop participants. One concern of NAC members was whether workshops should have greater focus, given their limited length. For example, a workshop might focus on learning number and operations in elementary grade mathematics. However, there already is considerable focus in workshops. The minutes of the April 2004 NAC meeting are attached as Appendix I of this report.

Faculty Development Workshops

The summer workshops are the central feature of the PMET Project. Four workshops were held in summer, 2003 in the first year of the grant. This year, the following nine workshops were held with a total of 167 participants.

Summer 2004 PMET Workshops

For faculty preparing future elementary teachers:

June 13-19, at Humboldt State University, Arcata, CA.

Leaders: Phyllis Chinn, Dale Oliver

(part 1 of two-summer program, this workshop will have a second session in summer 2005)

June 13-25, at Kent State University, Kent, OH.

Leaders: Michael Battista, Olaf Stackelberg

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July 11-17, at State University of New York-Stony Brook, Stony Brook, NY.

Leaders: Kathy Ivey, Alan Tucker

August 1-7, at University of Nebraska-Lincoln, Lincoln, NE.

Leaders: Ruth Heaton, James Lewis

For faculty preparing future middle school teachers:

May 30-June 6, at Appalachian State University, Boone, NC.

Leaders: Holly Hirst, David Royster

(part 1 of two-summer program, this workshop will have a second session in summer 2005)

June 20-27, at Bowling Green State University, Bowling Green, OH.

Leaders: Thomas Hern, Barbara Moses

(part 1 of two-summer program, this workshop will have a second session in summer 2005)

For faculty preparing future high school teachers:

June 6-18, at State University of New York at Oswego, Oswego, NY.

Leaders: Jack Narayan, Steve West

(part 1 of two-summer program, this workshop will have a second session in summer 2005)

June 6-18, at State University of New York at Oswego, Oswego, NY.

Leaders: Jack Narayan, Steve West

(part 2 of two-summer program)

June 21-July 2, at University of San Diego, San Diego, CA.

Leaders: Magnhild Lien, Perla Myers

Reports from each of these workshops are appended to this report. Evaluation of the workshops are contained in the evaluation section and offers a very flattering assessment of the quality of the workshops, as reported by the workshop participants. As noted in the evaluation section, almost all the problem areas noted in the first year workshop assessment were much improved in summer 2004 workshops.

For Summer, 2005, the following 12 Workshops will be held.

Summer 2005 PMET Workshops

PLACE.	LEVEL.	CO-DIRECTORS	DATES
Second Summers			
Oswego.	Secondary Level.	Co-Directors: Jack Narayan, Steve West.	June 12-24
North Carolina A&T.	Middle Level.	Co-Directors: Holly Hirst, David Royster,	June 5-12
Bowling Green.	Middle Level.	Co-Directors: Thomas Hern, Barbara Moses,	July 10-17
Arcata.	Elementary Level.	Co-Directors: Phyllis Chinn, Dale Oliver,	June 20-26

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Repeats of 2004 Workshops

San Diego. Secondary Level. Co-Directors: Magnhilde Lien, Perla Myers. June 20 – July 1
Kent State. Elementary Level. Co-Directors: Mike Battitsta, Olaf Stackelberg June 12-24

New Workshops

Clark, Atlanta. Elementary/Middle Level. June 5-12
Co-Directors: Sandra Rucker, Barbara Ferguson.

Park City. Secondary Level. Co-Directors: Patrick Callahan, William McCallum. July 10-16

Oswego. Elementary Level. Co-Directors: Kathy Ivey, Jack Narayan. June 12-24

Southwest Indian Polytechnic Institute. Elementary. July 17-29
Co-Directors: Joan Goodman, Bernie Madison.

Texas Southern. Secondary Level. Co-Directors: Joan Evans, Kathy Ivey. July 11-22

Univ. of Alabama. Secondary Level. Co-Directors: Holly Hirst, David Royster, May 22-29

Note that in 2005, PMET will be moving beyond the five regions that were the focus of the initial two rounds of summer workshops, with workshops in Alabama (Univ. of Alabama), Georgia (Clark Atlanta), New Mexico (Southwest Indian Polytechnic Institute), and Utah (IAS Park City Institute). We had indications of interest in holding a PMET workshop at other universities and groups outside the five regions. We hope to satisfy these requests in the fourth year of summer workshops. NOTE: As indicated in the Budget section (below), reduced expenditures for workshops and other PMET activities should enable us to have a number of additional summer workshops in the fourth year of the grant.

Workshop Publicity: Publicity and recruitment of participants for these workshops are conducted through articles in MAA publications, web announcements, trips to MAA Section meetings, messages on various email lists and personal contacts. The number of participants met the minimum number we felt necessary for a reasonable program, but we would like it to be higher. We will increase our publicity and recruitment efforts for Summer, 2005.

Workshop Programs: The programs of the 9 workshops in 2004 were varied and extensive. All workshops conducted demonstration classes with undergraduates preparing to be teachers so that participants could have a common experience on which to base their considerations of how students think about mathematics. Participants collaborated with workshop faculty to design the sessions, then observed the sessions conducted by workshop faculty and discussed in detail what they had observed. Topics in the demo classes included arithmetic with fractions, decimal and rational numbers, algebraic and symbolic reasoning, probabilistic and statistical thinking, geometry, the concept of function, proof and precise communication.

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Other workshop activities engaged in by some or all of the workshops included: studying the mathematical issues arising in K-12 teaching; discussions of the mathematical knowledge needed by K-12 teachers; work on mathematics content courses for teachers including capstone courses; study of theories of learning; teaching statistics; observation and discussion of pedagogical strategies; considerations of the similarities and differences between elementary, middle and secondary mathematics education; use of manipulatives and technology in the classroom; reading and discussion of curriculum materials such as the NCTM Standards, the MET report and the book of Liping Ma; consideration of the mathematics that arises out of the building and construction industry; interactions with local K-12 teachers; work on mini-grant proposals, and preparations for Intervening Year Projects (for the two-summer workshops).

Technology in Workshops: All of the workshops made extensive use of various forms of technology including sophisticated calculators, generously provided on loan by Texas Instruments, and the World Wide Web. The evaluation section notes that participants this past summer felt that there was better connection of technology with the overall workshop goals than in the first year.

Workshop Follow-up: It seems to be a generally accepted principle (and there is some evidence) that workshop experiences are much more likely to have long-term, lasting effects if there is follow-up activity. Of course, PMET two-summer workshops with their intervening year projects have a built-in follow-up. Workshop Directors of both one-summer and two-summer workshops are conducting other follow-up activities and will continue them throughout the academic year. These activities include mid-year reunions and listserv conversations. The second summer of the 2004 Workshop in Arcata will be open to all participants in any Elementary level PMET Workshop.

The evaluation section involves a survey of follow-up impact of the PMET workshops from summer 2004. The results, discussed briefly in the beginning of this report show an impressive impact on the subsequent teaching of workshop participants.

More detailed information about the summer 2004 workshops, such as lists of participants and guest speakers and daily schedules of activities, can be found on the PMET website at www.maa.org/pmet/workshops.html.

Summer 2005 Workshops: Planning is well along for the eight new scheduled workshops for next summer. Together with the four second summer workshops, there will be a total of 12 in 2005. The workshop directors will hold a three-day planning meeting in mid-November in Atlanta. Local planning for each program is progressing, and draft schedules of activities exist.

Diversity. The PMET Workshop program is reaching out to several special groups. In 2004, six of the workshops featured presentations by Robert Moses, Founder and Director of the Algebra Project a program to raise the floor of achievement and preparation for college by students from under-represented minorities, specifically, African-American students. Although the 2004 workshops had a small number of minority participants, this is not enough to make a contribution to the problem of under-representation. We are taking specific steps to address this issue in 2005. Three of the workshops next summer will be at traditionally African-

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American serving institutions: Clark Atlanta, Texas Southern and North Carolina A&T. Three of our workshop Directors are African-American and we expect to invite a number of presenters from minority populations.

In addition, we are holding a Workshop at Southwest Indian Polytechnic Institute, a college that serves Native American students. The program for this workshop will focus heavily on Ethnomathematics.

Finally a different kind of diversity is reflected in our attempt to increase the participation of faculty from major research mathematics departments. To do this, we are holding a Workshop hosted by the Institute of Advanced Studies' Park City Mathematics Institute.

Minicourses. PMET project leaders offered minicourses at the 2004 national MAA meeting at Phoenix and the 2004 summer MAA MathFest at Providence as well as at the MAA Texas-Arkansas and Southeastern sections and at a collegiate mathematics education conference at Tuskegee University.

Mini-grants

The initial round of PMET mini-grant proposals were received on October 15, 2003. The RFP set the range of funding for mini-grants at \$2000 - \$5000, although in reality, virtually all mini-grant proposals asked for the maximum of \$5000. Forty proposals were received from institutions in 23 different states:

Ten applications from California;

Three applications from Pennsylvania;

Two applications each from Colorado, Maryland, Michigan, Nebraska, New York, and Ohio;

One application each from Alabama, Arkansas, Connecticut, Georgia, Iowa, Illinois, Kansas, Minnesota, Missouri, Oklahoma, South Dakota, Tennessee, Texas, Virginia, and Washington.

Two proposals were from HCBU's, two proposals involved two-year colleges, and six proposals were from institutions with doctoral mathematics programs. Of the rest, half were from comprehensive universities and half were from colleges. While it was anticipated that most mini-grant applications would come from summer 2003 workshop participants, half of the applications involved no workshop participants.

Each proposal is given three reviews, one by a regional coordinator, one by Madison or Dubinsky, and one by Tucker. Tucker coordinates the final assessment of each proposal, based on its three reviews. The Management Council has the final say on how many awards are made and to whom. Decisions about the initial minigrant awards were announced in mid-December, 2003 (after the first year PMET progress report had been submitted).

Because the number of mini-grant proposals deemed meritorious of funding exceeded the mini-grant budget of \$75,000, the Management Council recommended we fund proposals at \$4000, instead of the typically requested amount of \$5000. The total amount awarded was \$89,500. Since there were no minigrant expenditures during the first year of the project (this \$89,500 will be spent

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during the second and third years of the project), this excess total award should not cause a budget problem.

I. Proposals to be funded (\$83,500)

A. Revise and/or create mathematics courses for elementary teachers

1. Augsburg College (MN), T. Bibelniaks.
2. Bowie State Univ. (MD) C. Brooks.
3. Calif. State Univ. – Chico, W. Fisher.
4. Calif. State Univ. – Northridge, J. Zeitlin.
5. Calvin College (MI), J. Koop.
6. Edinboro Univ. of PA, P. Lasher.
7. Metropolitan State College (CO), D. Gilmore -- *Borderline- will receive only \$2500.*
8. Northern Iowa Univ., D. Thiessen.
9. Oglethorpe Univ. (GA), J. Geiger.
10. St. Joseph College (CT), E. Lioutikova.
11. Tabor College, F. Brenneman.
12. Univ. of Alabama, C. Laurie.
13. Univ. of Memphis, A. Hoffmeister-- *Borderline- will receive only \$2500.*

B. Enhance program for preparing secondary mathematics teachers; capstone course

14. Calif. State Univ. – Los Angeles, W. Bishop.
15. Plattsburgh State College (NY), M. Morrow.
16. St. John Fisher College (NY), E. Johnson.
17. South Dakota State Univ., C. Larson.
18. Southwestern Univ. (TX), C. Sawyer.
19. Union College (NY), L. Ray.
20. Univ. of Maryland Eastern Shore, D. Okunbor.

C. Help future elementary teachers upgrade math skills to teach in middle schools

21. Calif. State Univ - Stanislaus, M. Vanisko.

D. SPECIAL: Support regional conference on mathematical education of teachers—given \$2500

22. Grand Valley State Univ. (MI), C. Beckman -- Organizers seeking funding from several other sources to cover \$17,000 conference budget.

II. Proposals given seed grant of \$1500 and encouraged to resubmit next year

1. Calif. State Univ. – Hayward, K. Callahan – early planning stage for redesign secondary math teacher program.
2. California State Univ.- Sacramento, D. Orey – preliminary stage of using Hispanic cultural insights to redesign foundations of elem. school mathematics courses.
3. Colorado State Univ. – Pueblo, H. Soto-Johnson – foundations of elem. school math course building on new tyc's courses in this area; resubmit with the tyc's MET courses.

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4. Univ. of Nebraska – Omaha, J. Rech – create the first foundations of elem, school math course; also want to see Intermed. Algebra revised for future elem. teachers

III. Proposals not funded, with reason:

1. Christopher Newport College (VA), S. Kostaki-Gailey – a one-shot event: 4-day workshop for h.s. math teachers and spec. ed. teachers on teaching Algebra I.
2. East Stroudsburg Univ. (PA), M. Freitag – plans to re-work the one math course for elem. teachers, but revision already funded by state grant.
3. Elizabethtown College (NC), C. Graber – too limited: modify college geometry course.
4. Humboldt State Univ. (CA), S. Moskowitz – inappropriate: fund math ed. consultant visit.
5. Lincoln Land Comm. College (IL), R. Monke – too general: teach Mathematica to practicing K-12 schools.
6. Missouri Western State College, J. Poet – too limited: revise college geometry course.
7. Ohio State Univ., V. Ferdinand – buy TI-73's for use in courses for future elem./middle school teachers: teachers should own such calculators, not just use them in classroom.
8. Oklahoma State Univ., J. Wolfe – inappropriate: supplement NSF grant by paying for participation of two school teachers in grant effort.
- 9.-11. San Diego State Univ., S. Klass -- K. Payne (#18), N. Maxon (#19) – inappropriate: all requested laptop computers and calculators to present course they developed with NSF grant at an off campus site.
12. Univ. of Arkansas, L. Cleveland – too little: develop one module of measurement.
13. Univ. of Washington, V. Warfield – inappropriate: fund math fairs for future teachers
14. Youngstown State Univ. (OH), A. Burris – too limited: teach faculty to use manipulatives.

Interim progress reports for each of the funded minigrants can be found on the PMET website, www.maa.org/pmet.

The second round of minigrant proposals have just been received at the time this second progress report is being submitted.

Regional Networks

The core members of the PMET regional networks are expected to be the project directors of PMET mini-grants along with many of the PMET workshop participants. Along with promoting collaboration and interchanges among faculty interested in the mathematical education of teachers, these networks were also intended to provide a collective voice for mathematics faculty to develop dialogues with state departments of education about the mathematical education requirements for teachers as well as school mathematics instruction.

The New York PMET network is closely linked to a SUNY-wide network in mathematics teacher education. This group has had two conferences, each attracting around 60 attendees. A steering committee of the network has developed guidelines for strengthening the mathematical preparation of teachers in New York. The Provost of the SUNY system has endorsed the guidelines, which address both the quantity and quality of mathematics preparation, and sent them to local SUNY

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campus heads for their comments. The New York regional coordinators, Jack Narayan and Steve West, have publicized PMET in a variety of regional settings. For example, in fall 2004, they gave a 4 hour mini-workshop at SUNY Mohawk Community College and at the fall meeting of the adjoining New Jersey MAA Section; they will give a similar workshop at another community college in January 2005. They publicized PMET at fall 2004 MAA Seaway Section in Canesius College. West is promoting PMET at the fall meeting of Assoc of Math Teachers of New York State meeting (which includes many collegiate mathematics educators).

On January 2004, the California Mathematics Teacher Educator Network met for a day of dialogue on issues involving the mathematical preparation of teachers. (The agenda for this meeting may be found at <http://www.csufresno.edu/mathed/b9.html>.) This group consisted primarily of California State University faculty. Under the encouragement of PMET regional coordinator Dale Oliver, the group decided to expand to include all mathematics teacher educators in the state under the title of the California Association of Mathematics Teachers Educators (CAMTE). Oliver and several PMET workshop participants are part of the CAMTE planning group. The CAMTE planning group organized a teacher educator mini-conference in conjunction with the California Math Council - South on Nov 5-6 in Palm Springs. (The mini-conference program may be found at <http://www.cmc-math.org/pscamte>.) There is still some organizational work to be done, but this mini-conference format is likely to occur every year - alternating between North and South meetings of the California Math Council. The CAMTE mini-conference should be an ideal context for PMET mini-grant recipients to present their work.

The Ohio region efforts only got started this year because Ohio did not have its first PMET workshop until this summer, and workshop participants were seen as a critical component in the core membership of regional networks. Olaf Stackelberg is the Ohio regional coordinator. He gave talks on the PMET program at: i) the Mathematicians Writing for Elementary Teachers meeting Nov 13-14, 2003, at Ohio State University; ii) at the Ohio Mathematics Education Leadership Council at the March 3, 2004; iii) the Ohio Section MAA meeting, March 26-27, 2004, in Cincinnati; and most importantly iv) at the Ohio Board of Regents meeting in Columbus, April 1-3, 2004. He is working with a subcommittee of the Ohio Section MAA about ways to formally involve the Ohio Section of maintaining the PMET network in Ohio and surrounding states for long after the PMET grant ends.

Jim Lewis, a PMET state coordinator for Nebraska, has just been awarded a Math/Science/Technology Partnership grant for rural Nebraska schools. Lewis' MSTP project will be developing a network to link mathematics faculty to school mathematics teachers in a more far-reaching, comprehensive fashion than PMET could ever hope to do. The North Carolina network is less well developed and now consists just of participants at the summer 2003 and 2004 workshops.

PMET has a related objective of fostering a greater involvement of mathematicians in school mathematics instruction and in mathematics standards being set by state education departments. Several of the regional PMET networks are working with state university systems and state Boards of Regents. For example, in New York, recent State Education task forces to critique and rework the state school mathematics standards have included regional PMET coordinators.

A major step in this direction occurred last summer at back-to-back workshops sponsored by NSF at Park City, Utah. The first involved state mathematics supervisors meeting with mathematicians and mathematics educators to discuss efforts underway in many states to revise state mathematics standards (that drive the state mathematics tests, mandated by the No Child Left Behind Act). The second workshop involved just (research) mathematicians and was to formulate advice to state mathematics supervisors in response to concerns raised at the previous meeting. Members of the PMET Management Council played a leading role in the second workshop. That second workshop was the first time in over 30 years that a group of mathematics faculty had been funded to discuss school mathematics. A statement of What is Important in School Mathematics Instruction emerged from this workshop and is expected to be widely circulated.

Information, Resource Dissemination and Collaboration

The project leaders have publicized PMET at a variety of conferences and presentations inside and outside the MAA: Presentations were made at the NCTM and AMTE national meetings and, eight other conferences, many MAA section meetings. They ranged geographically from the MAA Southeastern Section to the MAA Pacific Northwest Section (meeting in Alaska). The PMET website is getting over 1,000 hits in many months.

Connections at the local level with state university systems and state departments of education were discussed above in the regional networks section. Through Ed Dubinsky, PMET has made connections with Bob Moses' Raising the Floor project growing out of Moses' highly praised Algebra Project. Moses made presentations at most of the 2004 PMET Workshops. Next summer, PMET will sponsor a workshop for faculty from research universities jointly with the Institute for Advanced Studies' Park City Summer Institute. PMET will be working closely with Jim Lewis's new MSTP project in Nebraska. PMET has co-sponsored a conference in Michigan with the U Michigan-U Georgia Center for Learning and Teaching and expects to co-sponsor another next spring. This Center is focusing on teacher professional development in mathematics and PMET will be publicizing forthcoming materials from this Center at its workshops next summer. Bernie Madison has been a leader of the Quantitative Literacy movement that spans school and college education.

Second-Year Evaluation Report (report prepared by the PMET project evaluator, Dr. Peter Ewell, Vice President of the National Center for Higher Education Management Systems)

As the PMET project ends its second year, the principal evaluation activity continues to be centered on the effectiveness of the summer Workshops. But the process of gathering information about mini-grants and the regional networks is also beginning. Evaluation of the Workshops is being conducted in two areas a) the design and conduct of the Workshops themselves and, b) the impact of the Workshops in terms of effectiveness. Information for the first is collected through a Feedback Form completed by each participant on the last day of the Workshop. Information for the

second is collected through a follow-up survey of participants conducted the following spring, and this follow-up will be continued in subsequent years for all Workshop participants.

Design and Conduct of the 2004 Summer Workshops. Participants in the 2004 Summer Workshops were extremely positive in their reactions to the Workshops. The opportunity to interact with other participants was seen as the most favorable aspect of the Workshops and overwhelming majorities also, in general, believed that the Workshops were well organized. Demonstration class sessions were seen as especially valuable and, although several suggestions for improving these sessions were offered for individual workshops, participant reactions showed an overall improvement in the conduct of demonstration class sessions over the 2003 Workshops (which were also favorably reviewed). Sessions on technology showed particular improvement over the 2003 Workshops, where many participants had reservations about how these sessions were conducted. In particular, participants valued the opportunities provided to work with the technology hands-on and over a longer period of time in the 2004 Workshops. Guest speakers were generally seen as interesting and engaging, but participants were not always clear why they were included and in many cases would have liked more time to interact with them informally. Finally, like last year, many participants thought that some of the longer Workshops were too long and wanted a bit more time for reflection and informal interaction.

Specific suggestions for improvement reported for multiple Workshops included:

- Providing participants with homework assignments or readings before the Workshop in lieu of covering some material during the Workshop itself. This applied most frequently to reading assignments for the Liping Ma book and the MET Report.
- Providing participants with handouts for all sessions.
- Providing more specific guidance about how to link Workshop content with participants' own teaching situations and experiences. Frequently, this was mentioned in connection with technology, where participants often would have liked more concrete discussion of how to plan lessons and classes to incorporate the demonstrated technology.
- Providing more information on the PMET Mini-Grant opportunity earlier in the Workshop (or perhaps even before the Workshop in the form of a mailing) so that participants could be thinking concretely about what they might propose.

As was the case in the 2003 Workshops, participants also completed a "Reflective Exercise" that asked them to think about what they learned and how they will apply Workshop lessons in their teaching. The Exercise asked each participant to choose a particular course that he or she planned to teach in the coming academic year. For this targeted course, it then asked each participant to relate particular topics addressed in the Workshop to the design and pedagogy of the targeted course, and asked them to describe any specific changes that they were at that time considering making in the course. As was the case in the 2003 Workshops, last summer's participants provided detailed responses to these questions. The most common planned changes reported included a) more work in groups, b) more writing and oral recitation asking students to explain their work, c) more time spent on fewer topics covered in depth and, d) more "hands-on" active learning

activities. These plans will be followed up on through an individualized survey sent to participants early next spring.

Acting on the advice of the PMET National Advisory Committee, a new question was added to the Reflective Exercise this year asking participants about the extent to which the Workshop deepened their own mathematical understanding in any of the content covered. Most participants provided positive responses to this question, but their responses tended to concentrate on pedagogical understanding rather than mathematical understanding *per se* (and many mentioned connections between the two). But more than a few did report deepened understanding of particular mathematical topics and reported that these changed their thinking about how to teach these concepts in useful ways. The majority of these comments were about the understanding of fractions. As one participant reflected, “[instructor’s] problem of fractions in Base 4 really pushed my thinking...I’ve worked with whole numbers and different bases and looked at patterns to teach negative exponents, but never tried to write fractions in other bases...it’s always valuable to be put in ‘the learner’s seat.’”

Follow-up on the Effectiveness of the 2003 Summer Workshops. A survey of participants in the 2003 Summer Workshops to determine impact was conducted by email in April 2004, using questions developed separately for each Workshop after reviewing its topical coverage together with participant reactions obtained through the Feedback Form. Drafts of these questions were reviewed by the Workshop leaders and modifications made as needed. In addition, every participant was asked two to five individualized questions based on his or her own responses to the Reflective Exercise completed at the end of the 2003 Workshops. In the Follow Up, each participant was reminded of his or her own response to the Reflective Exercise. Each was then asked about the extent to which the noted changes were made and about how they thought these changes affected student learning.

60 responses out of a total of 72 Workshop participants were received, for a response rate of 83.3%. Responses to the Follow Up were thoughtful and frequently extensive. Detailed reports for the Workshop Leaders were compiled and participants were asked somewhat different questions tailored to the content of each Workshop. But some general findings for all four 2003 Workshops were as follows:

- Most participants reported greater emphasis in their teaching on group work and collaborative approaches such as “think/pair/share” (33 of 59 reporting “a great deal” and 23 more reporting “somewhat”). Most also reported greater emphasis on requiring students to explain their reasoning when working problems—for example, through writing in and out of class, asking for oral explanations in class, and group discussion (26 of 41 posed this question reporting “a great deal” with 10 more reporting “somewhat”). Many who were already using these techniques also noted that the Workshop helped them understand more fully *why* these techniques were effective or worthwhile. The primary difficulty reported was not having enough class time to incorporate such activities.
- Virtually all participants also reported that they had followed through on the “promises” they made to themselves about changing their teaching on the Reflective Exercise completed last summer. In the few cases where they did not, they were frank about the

difficulties they encountered or noted that this was still something that they needed to work on. While their responses addressed different things that they planned to do, the overall level of engagement displayed by participants when they were posed these individualized questions was extraordinarily high.

- Although all four Workshops addressed the use of technology in some way, fewer participants reported significant changes in their teaching to incorporate more technology (10 of 41 posed this question reporting “a great deal” with a further 23 reporting “somewhat”). This was particularly the case for Video Clips of teaching situations (where only one of 41 reported “a great deal” and 11 “somewhat”). In part, this appeared to be a resource issue in that participants could not obtain the needed equipment or resources.
- A bit more than half of participants (31 of 59) said that they had made major changes in the way they approached teaching the particular mathematical topic or concept they selected in their Reflective Exercise. Of these, all but one believed that their students learned more as a result of the changes made. For evidence of this, they primarily cited student performance on homework or exams. But some noted more specific changes in the way students responded to questions and problems (e.g. more complete responses and explanations, responses that indicated more basic understanding, etc.). Some also noted evidence based on the testimony of colleagues who visited their classes. Many participants also changed their assessment criteria to reward not just “right answers” but also appropriate explanations and representations.
- Well over half of participants (35 of 60) reported interacting with other participants in some way since the Workshop. In some cases this was due to participation in a formally-organized Workshop follow-up activity, but many of these exchanges involved talking to participants at other institutions and sharing materials.
- More than two thirds of participants (41 of 60) reported consulting resources and materials (books, websites, etc.) referenced in the Workshops during the year. While most of these responses were limited to reading or occasional consultation, many also noted that they used specific assignments or exercises drawn from these resources in their own classes this year.
- More than three-quarters of participants (50 of 60) also reported that they were able to start conversations with their peers about improving pre-service mathematics education for teachers. Some offered seminars or short workshops for their colleagues upon their return from the Workshop in the fall. Others attended the Workshop as part of a team, so were able to continue working together. Many reported encountering other participants at national meetings and continuing their conversations. But while some progress was reported here, many noted that changing faculty attitudes toward the importance of this topic remains a challenge.

Detailed responses provided by Workshop participants help fill out these summary statistics. For example, one participant reported, “after a couple of days...I had a student ask me if we were only going to do ‘word problems’...another asked if we were ever going to do ‘a page full of calculations’...this seems to be unlike any math course they have ever had before, given their

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previous beliefs of what it was like to ‘do math.’” Workshop participants also said that they had changed how they are teaching particular mathematical concepts. These covered a wide array of topics—from greater emphasis on the concept of “the whole” in interpreting fractions, through materials for teaching algebraic reasoning, to particular approaches to teaching topics in measurement and geometry.

Others reported they are much more aware of the need to instill in their students an understanding of the mathematical knowledge that K-12 students need at every grade level to be successful. One noted, “even in Beginning Algebra I spend more time discussing the various meanings of a fraction...it helps my students gain a deeper understanding of something they felt they had already ‘learned.’” Finally, participants reported that they thought students learned better after these changes. One said that for the first time her students “were able to make the connection between fractions, decimals, and percents without my making it for them.” Others cited differences in how students worked on problems—both with respect to the explanations they provided of their own reasoning and the representations they used to construct their answers. On the latter, one noted, “units no longer disappear at the beginning of the work only to mysteriously reappear as part of the solution.”

Evaluation of Other Aspects of PMET. Additional evaluation activities began this year as described in the Evaluation Plan prepared in June 2003:

- Mini-Grants. With a first round of mini-grants funded, a template for gathering information about their perceived effectiveness was developed to be completed by the Regional Coordinators after their site visits. In addition, as outlined in the grant proposal, interviews with a subset of five mini-grant recipients will be conducted annually, beginning later this fall. Interview questions will address the specific purpose of each mini-grant and the extent to which it is being accomplished. Questions will also address recipients’ perceptions of the mini-grant award process and the degree to which the more general purposes of the mini-grant program—raising departmental awareness, stimulation of additional institutional funding or activity, or extension of changes to other courses not targeted by the mini-grant—are being achieved. Regional Coordinators will also be interviewed later this fall as the Networks become more established.
- Surveys of Mathematics Departments. A short electronic baseline survey of MAA departmental liaisons was conducted in May and June of 2003. This process worked well logistically and can be repeated annually using contact lists supplied by MAA. Working with the Regional Coordinators, all departments on the MAA contact list in the targeted states will be surveyed to determine their levels of awareness and participation in PMET national and regional activities. The first of these surveys will be conducted in 2005.

Budget

The PMET project has been holding costs down with the goal of being able to offer additional workshops in the last year (2006). While PMET is a national effort, it planned in the first two years to focus all workshops in five targeted regions. As word of these workshops got around,

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a number of institutions and groups of faculty in other regions expressed interest in hosting PMET workshops. Five of the eight new workshops in 2005 will be in new regions, but several other workshop requests were turned down. As this unmet demand became apparent during this second year of the PMET project, the project leaders started looking for ways to reduce costs to free up funds for additional workshops in the fourth year. NOTE: The twelve workshops that have been scheduled for the third summer (2005) are all that we can handle in one summer.

The primary cost, as well as the primary activity, of the PMET project is summer workshops for mathematics faculty. Workshop directors have been careful with costs and been able to hold the most workshops under budget, saving over \$100,000 in this area. The technology component of the project is being run at much less cost than anticipated because of website skills of the PMET office administrator at Little Rock and a reduced annotated bibliography. Money budgeted for consultants to visit and advise individual departments is being saved to run additional workshops. There have also been major savings in stipends for regional coordinators, who have co-directed most of the workshops and took their summer compensation mostly from the budgets of workshops they co-directed. The initial round of mini-grants did not get started until the second year because we wanted to wait until after the first round of workshops (since workshop participants were expected to be a leading source of good minigrant proposals. Finally, it took time to recruit staff for the Little Rock and Kent State offices so that one-third of the subcontract funds for these sites were not spent in the first year. Final figures for the first year revealed expenditures to be \$260,000 under budget and it is anticipated that this year's expenditures will be about \$150,000 under budget. With these savings, we should be able to offer several additional new summer workshops in the fourth year while staying within the overall project budget. Note that the original budget only had money in the fourth year for the second summers of two two-summer workshops (started in the third year).

Appendix I: Minutes of Second PMET National Advisory Committee, Dallas, April 30, 2004

Attending

NAC -- Richard Askey, Richelle Blair, Dale Oliver, Richard Schaar, Annie Selden, Zalman Usiskin, Irvin Vance, Hung-Hsi Wu. **PMET Personnel** -- Alan Tucker (co-Director), Ed Dubinsky (Workshops Director), Peter Ewell (PMET Evaluation), Sandy Hetzel (Workshops Coordinator), and Tami Trzeciak (Project Coordinator).

Unable to attend

NAC -- Ronald Graham, Kati Haycock, Jeremy Kilpatrick, Richard Scheaffer, Tina Straley.
PMET Personnel -- Bernard Madison (co-Director), Michael Pearson (Project Manager).

Alan Tucker opened the meeting at 8:30 am welcoming attendees and conveying Bernie Madison's regrets that he is unable to attend. Alan stated that the goal of this meeting is to produce something useful to guide PMET efforts. The discussion then approximately followed the prepared agenda, as below.

- A. Introductions
- B. Discussion of Reports
 - PMET Evaluation
 - Workshops & Mini-courses
 - Mini-grants
- C. Awareness Activities
 - Headlines and Resources on web site (<http://www.maa.org/pmet>)
 - Panels
 - Mathematical topics project
 - Annotated bibliography
- D. Cooperation / collaboration with other groups
- E. Networks
- F. Next Meeting of the NAC
- G. Review of action on previous recommendations from Advisory Committee

PMET Project Evaluation

PMET Project evaluation is under the direction of Peter Ewell, Vice President of NCHEMS (National Center for Higher Education Management Systems, website <http://www.nchems.org>). Peter has been the evaluator for another NSF-supported MAA project that Bernie directs, Supporting Assessment in Undergraduate Mathematics (SAUM). Peter's evaluation in that and other projects has been both helpful and formative. The evaluation helps keep us focused on the project; it highlights what is important.

Peter commented on his evaluation report, emailed earlier to NAC members and included in the meeting notebook. He stated that evaluations of PMET, and especially the PMET workshops, pose a special challenge because the real impact of the project on student learning in K-12 classrooms is impossible to investigate within the relatively short life of the project. PMET leadership may want

to consider how to design a study beyond the life of the project. While the long term goal of PMET is to eventually influence student learning, the more immediate goal in evaluation is to measure the impact that the workshops have on the participants when they return to their colleges and universities. There has been a high cooperation rate in the participant surveys (for the 2003 workshops) and in the detail given on changes that the workshop participants make in their own classes after a workshop. There were fewer responses and shorter answers from the Nebraska workshop, but all others gave detailed information (see Mid-Spring Follow-Up Survey Results). Participants said that the workshops reaffirmed their beliefs about changes needed in teaching mathematics to future teachers. Most participants have fulfilled promises they made during the workshops regarding “how” they teach. The detail they provided indicate that these changes are real. We will also want to get a handle on the structural variations in the workshops, what works, and create a balance. Peter is still receiving reports and updating responses. Alan stated that the evaluations are a powerful tool for follow-up and reference. Some NAC members felt it was difficult to interpret comments from workshop participants without knowing their backgrounds. Ed stated that participants came from both 2-year and 4-year colleges, but none from research institutions.

Workshop participants were least happy with the technology component of the workshop, had fewer resources for this, and felt it might have been a ‘bolt-on’ addition to the workshop. Ed agreed the technology aspect was weak; there was not enough time to set it up. Some participants understood why/how the technology works, others needed to be convinced. Evaluations currently have less follow-up on the technology aspect and we may want to explore it further. Richard S. commented that most research on the use of technology for mathematics has been done at the secondary and high school levels. The appropriate use of technology leads to better prepared students, higher than average students – that’s why Texas Instruments is interested in this. Many pre-service teachers do not have the technical background and need to learn about the technology. The length and structure of the workshops was discussed, as well as the design, intention and content of the workshops. Are participants paid a stipend? No, but there is also no charge for the workshop or housing. Perhaps there would be greater interest if they were paid, even a token amount. Ed commented that money is not the only issue; length of workshops is an issue -- 7 days is not adequate, sometimes even the extended 2-summer workshop is not adequate. Many among the larger community of professors are not ready to make the effort to support or attend lengthy workshops.

The workshop leaders and co-leaders pick the topics, but these are not clear in the workshop syllabus—there is a temporal schedule (general topic/schedule/speaker), but not an intellectual schedule. There may be multiple points of view: Are speakers consistent, is there a plan? What themes are being worked out?

[There was a discussion of pedagogy versus mathematical content.]

Wu: For prospective teachers, there are "teaching problems" and there are problems with learning the mathematics. The latter is the more serious of the two. The lack of growth in teachers' mathematical knowledge goes to the heart of what goes wrong in the school classrooms. Note that mathematical competence is not the same as knowing how to teach, and this applies to both university instructors who teach pre-service teachers as well as school teachers. Right now, our university courses for teachers do not always teach the right kind of mathematics to our teachers. Usually the mathematics in those courses are too far removed from what teachers need in their

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classrooms, both in terms of the selection of materials and the level of abstraction. Teachers end up not having anything to fall back on when they are on their own.

Richard S.: Just as all of us come from different backgrounds, the workshop leaders and participants don't all have the same background. There are many different inputs –how do we get the desired outputs? Develop a course and/or workshop with uniform input.

Richelle: As the National Advisory Committee, we provide leadership. We could identify the goals/outcomes of the workshops and give the workshop leaders freedom to reach those goals in a manner they choose.

Zalman: Would the PMET Leadership, with the assistance of the Advisory Committee, benefit in discussion with the Regional Directors on the content of the workshops; is there any plans to bring the Workshop directors together as a group, and possibly with the Advisory Committee?

Ed: Half of that is done—the workshop leaders meet together as a group once a year; for all of them to meet with the NAC might be impractical considering the number of people involved (thirty or more). I want to make the workshop leaders more aware of your decisions and I could keep the Advisory Committee better informed.

Alan: In cooperative learning, the goal is to be 'engaged' and the workshop evaluations show that both the workshop leaders and participants are engaged. We need to provide a framework so that the mathematics sticks. We need to de-program dysfunctional learning while at the same time teaching the right way.

Richard A.: Teachers have to understand and use the mathematics and apply it to really understand it.

Alan: This is the challenge as teachers of teachers.

Ed: It is an interesting and difficult question to evaluate: Do they learn it the first time? In order to understand mathematics, you have to use it. These are real world problems. How can we get our participants, and their students, to develop a better understanding of mathematics?

Richard A.: In Liping Ma's book, the Chinese teachers cycle through the courses so they don't always see the same thing, they have a better understanding of what they teach. Get Liping Ma involved in a workshop.

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Questions from NAC regarding workshop evaluation:

1. Do we know how many participants are attending from the same colleges? That information is available but has not been pulled out of the data. (Alan: that's important.)
2. How much of the goal of the workshops is pedagogical, how much is mathematical? Are the workshops labeled "pedagogy" or "content?" Both together are important. The workshops focus on both pedagogy and mathematical content, but at different degrees between the workshops. Could we ask this question before a workshop—to set a baseline for measurement?
3. Who are the participants –what is their mathematical background? Are the participants attending workshops, the ones intended in the PMET proposal? Are they who PMET wants to attract?
4. What are the demographics of the workshops –are most participants commuters or residents? How far away are they coming from to attend?
5. Could we ask the participants "are you teaching differently... per the mathematics and/or the pedagogy?" Yes, and we got some of that. There were some examples in the assessment criteria.
6. Are the evaluations specific to each workshop? Yes, the forms are tailored for each workshop although there is some commonality. We need, and would like, suggestions on questions to ask about topics.
 - a. What mathematics covered at a workshop have influenced what you teach?
 - b. What mathematics that was not covered would you like to see covered in a workshop?
7. Can we pull out of the evaluation the comparison of short workshop versus long workshop and which are more effective? To prove why the longer workshop is better?
8. No money is offered to participants to come to the workshops – would they work harder, or stay longer, if it was?
9. Are participants weak in some areas of mathematics? Is that what they need? The pedagogy and mathematics go together --- look at mathematics for 'what' -- there are many areas of mathematics.
10. What would be helpful in all workshops? Make sure the components are there, set goals and make sure they are met.

Workshops

The April 2004 Report on Workshops and Minicourses was sent to NAC members prior to the meeting and also included in the meeting workbook. Ed Dubinsky, PMET Director of Workshops and Mini-courses, reported on the number of applications for the summer workshops for 2004. As of the latest count, we have 168 applicants, there are some duplications, people applying to more than one workshop. We sent out 144 letters to the applicants asking them to accept or decline attendance at specific workshops. As of April 29, 50 committed and 6 declined. The Ann Arbor workshop (not PMET) is the same time as our Kent State workshop and this caused a conflict for some applicants. Ed felt that both the preparation and response, in terms of applications to workshops, was better than last year.

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There was more discussion about paying participants to come to workshops, paying them for their time. Participants do put a lot of effort and personal time into the workshops. The amounts do not have to be large, but it might help. This is not currently being done, but may be looked at for year 2005 workshops, but we'll have to talk to NSF since it has to do with budgeting and project cost structure. Many colleges do pay travel expenses.

At the previous NAC meeting, we spoke about getting a prestigious research institution involved. Next summer a workshop will be held at the IAS Park City Summer Institute. Can the Advisory Committee suggest how to get workshop participants from research colleges? Poster sessions and panels at AMS and MAA Section Meetings were suggested. Regarding diversity among workshop participants: gender diversity is good, but race / ethnicity diversity is low. We are working on having a workshop at an HBCU in Houston (Texas Southern University). Joan Evans has signed up for a current workshop and has requested to lead the workshop in Houston. There are several universities serving Native American students, and we will look into perhaps holding a focus group at a tribal college. Other suggestions from NAC regarding participant diversity: Host workshops at HBCUs in Washington, D.C., Maryland and Atlanta.

What is the diversity in the presenters at workshops--what kind of schools, as well as faculty?

Ed: We are achieving diversity in presenters by having presentations at 5 workshops by Bob Moses (referred to in the following paragraph.) Bob's work is with failing schools and the populations of those schools is roughly the same as the population diversity with which PMET is concerned. Regarding the types of schools: many participants came from 2-year colleges, others from 4-year colleges, but none from research institutions.

Several PMET workshops this summer will have a presentation by **Bob Moses**, founder and president of the Algebra Project. [The Algebra Project is a national mathematics literacy effort aimed at helping low-income students and students of color (particularly African-American and Latino/a students) successfully achieve mathematical skills that are a prerequisite for full citizenship in today's technological society.]

Suggestions from NAC for presenters? Canadian mathematician **John Mighton**, of Toronto, who contends that that any child can be brilliant with the right teaching. Mr. Mighton founded the educational charity JUMP (Junior Undiscovered Math Prodigies) to tutor children in math -- the program is offered in inner-city Toronto schools. He has a book titled *The Myth of Ability: Nurturing Mathematical Talent in Every Child*. Another suggestion is University of Texas at San Antonio mathematics Professor **Manuel P. Berriozabal**, who was presented the Mathematical Association of America's Yueh-Gin Gung and Dr. Charles Y. Hu Award for Distinguished Service to Mathematics. [Dr Berriozabal is founder of the acclaimed Pre-freshman Engineering Program at the UTSA, an academic enrichment program designed to assist middle and high school students, especially minority and women students, to achieve a higher level of competence in mathematics and science.]

Wu: Is the content of workshops "mile wide, inch deep?"

Zalman: The MET document asks prospective teachers to take more courses than most departments have offered, so notion of breadth is important.

Ed: Some things in workshops I strongly suggest and other things I insist on: demonstration class, components regarding mathematics, significant component regarding technology, statistics.

Alan: Could the NAC give guidance as to how statistics might be better presented in a workshop?

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NAC Suggestions: Rotate topics, spread them around between workshops; consider having workshops that are focused on one mathematical subject, for example, geometry.

Richelle: I think it is the role of this committee to decide and tell the workshops.

Richard S.: Be more stringent on incoming criteria, specify what the outcomes should be.

Alan: It is good to have a 'theme' but include different points of view. Is there a list of the workshop presenters? [These are available from the different workshop web sites; Tami will gather the current information, create a word document and email it to committee.] Ask guest speaker(s) to address specific and/or same topics within a theme.

Ed: Topics to focus on? Zalman: Narrow topics (numbers and operations, fractions) versus broader topics (geometry and algebra), and broader still (elementary mathematics). Ed: We've done that, and are doing it; we are just not announcing it.

Alan: What are the themes of the different workshops this summers?

Zalman: The workshops provides exposure to things related to mathematical topics.

Ed: The main goal of demonstration classes is to provide a common experience in which the participants can begin to investigate how future K-12 math teachers think about mathematics, the difficulties they have and ways in which those difficulties might be overcome. The participants also have an opportunity to interview the teachers doing the demo class.

Other suggestions from NAC regarding workshops: define the focus of workshops, pay participants a stipend for part 2 of the two summer workshops, coordinate guest lecturers.

Mini-courses

Ed: The PMET Mini-courses held at major mathematical meetings are four-hour programs which may be useful in encouraging people to come to workshops. We're not sure of the value of mini-courses and would appreciate guidance from this committee. Typically, the fee to attend a mini-course is paid by the person's department. Mini-courses in 2003 were held at MathFest in Boulder, Colorado, and in 2004 at the MAA-AMS Joint Meetings, and at the MAA Southeastern Section meeting in Clarksville, Tennessee. We've been turned down to do a mini-course at the 2005 Joint Meeting next January. Do we know how many workshop participants first went to a mini-course? We do not have data on that but the MAA does; we've not correlated names from mini-courses with names in workshops—we should check that, find out the feedback from the MAA. What is covered in a mini-course? Rather than a 4-hour commercial for workshops, perhaps it should be more of a pedagogical session. Dale: Usually people come to a mini-course with an agenda to learn something; the value in this is to speak to others, to learn what is happening in the mathematical education of teachers. Annie: if no mini-course in 2005, can you present in the exhibit area? Alan: Yes, and we do that at all meetings. Other suggestions regarding mini-courses: Look at who presented in the workshops, perhaps a mini-course could be a sample of the best presenters. Have back-up guest lecturers, coordinate mini-course with a major theme.

Mini-grants

Alan briefly reviewed the Mini-grant Report (sent to NAC members prior to the meeting and also included in the meeting workbook). Follow-up visits to mini-grant recipients' will begin in the 2nd year of the mini-grant projects. Workshop participants who were awarded mini-grants are working toward a systemic change at their colleges at a greater level than anticipated. The time frame for the

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next round of mini-grants is the same as the last: Application deadline October 15, decision on awards December 15. Mini-grant guidelines are on the PMET web site.

Mini-grants are primarily symbolic, they reward effort and provide recognition. We will follow-up on the effect of mini-grants. Peter: what are some questions we could ask of a sample of mini-grant recipients in an interview?

So far, in the PMET project, we are under budget—so it is possible that PMET may continue to 2006 for a number of reasons. We have some flexibility with this. We are looking to have money to give an additional workshop next year, possibly trade off with mini-grants. Discussion and comments: Perhaps we can hold workshops with that money, or pay people to attend, or make the financial part of workshops neutral for participants by paying for their travel. NAC: Collect data, ask workshop participants if their travel is paid for / reimburse by their college, ask if they have a travel budget.

Awareness Activities

PMET Panels were held in 2003 at the MET Summit II and the ASA Teacher Education Conference. Panels in 2004 have been held at the MAA-AMS Joint Meetings, the AMTE Annual Conference, NCTM annual meeting, and also at MAA Seaway Section Meeting. Panels are planned for the MAA Metro New York Section Meeting May 2, 2004, and the Pacific Northwest MAA Section Meeting in Alaska, June 24-26.. Richelle will arrange for a PMET panel at the AMATYC meeting in Orlando, November 2004.

Comments from NAC regarding resources listed on the PMET web site <http://maa.org/pmet>: Add a link to a study by Raven Wallace (Michigan State), of 14 published mathematics textbooks for elementary school teachers. Textbooks have also been written by Sybilla Beckmann-Kazeez (University of Georgia) and Gary Jensen (Washington University). Annie has an annotated bibliography and will send it to Tami to post on the web site. CUPM has resources for lots of resources; they are just getting going on this. The statement that these resources is a listing and not an endorsement is good –recommend putting this statement on each new window that opens up. Reduce the number of Madden resources until others are added; so many Madden resources present a prejudice for his work. Leave out judgments of resources, for example McCallum’s article under Additional Resources is called “thoughtful” –leave this out. Types of resources should be defined, not just as “ additional” resources. Richard A.: The MAA has a MET committee which ought to have resources available. Zalman: Stick to only National Reports and Textbooks. Alan: Resources section does need more focus; do it right or not at all; be bold enough to be selective; Bernie / Ed / Alan need to bump heads on resources.

Regional and Network Activities

Hand-outs were distributed at the meeting on some of the regional activities taking place; Alan and Dale talked about other regional activities. Workshop participants and mini-grant recipients should be kept posted on happenings within the regions.

Zalman: There are some other networks out there – the AP network, T3 (a Texas Instruments network) which is mostly secondary teachers, Project Next, AMATYC-ACCESS (Sadie Bragg, Borough of Manhattan).

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Dale reported on the California network. The “California Network of Mathematics Educators” met before the AMTE meeting in San Diego, and will meet again in Palm Springs in November 2004. This network is just getting organized and would provide a place for workshop participants to meet in the future. Dale encouraged PMET to participate in this for ongoing dialog.

Alan reported on the New York regional network. The SUNY system is trying to get more focused on content knowledge for teachers, and to become a network and resource for other teachers.

Richelle: How about a conference or reunion of mini-grant recipients, to create networking opportunities for them? Alan: There will be a PMET reunion at the Atlanta meetings.

Richard A.: There is an annual spring meeting of a network of elementary teachers at the University of Wisconsin at Waukesha.

Richelle: Is there a listserv by workshop, to keep workshop participants connected? Ed: This is being done by the workshop directors. Alan: It might be unwieldy to combine them all into one listserv.

Action on NAC suggestions from previous meeting in 2003

Alan reviewed the list of suggestions from the Chicago meeting of the National Advisory Committee (in meeting notebook) and PMET action on those suggestions. Among them were:

Project Structure:

- (1) Break PMET activities down, to get more people involved in the pieces.
This is being done in the regional and state networks.
- (2) When listing workshops in article/web site, list the institutions where workshops are held.
We are doing this now.
- (3) Include research mathematicians on the Workshops Advisory Committee.
Ed and Alan are on the advisory committee, they are also research mathematicians.

Project Evaluation

- (1) External evaluator should attend the NAC meeting(s).
Peter is here [attending the 2004 NAC meeting].
- (2) Design various kinds of workshops and compare the results.
Peter will work this into the evaluations.

PMET Workshops

- (1) Require that workshop leaders provide materials to make them available to a wider audience.
Some workshop leaders provide these on the web sites they create for the workshop.
- (2) Target community colleges, smaller institutions responding to state/regional changes.
Doing this, getting good response.
- (3) Hold a workshop at an elite research university for national exposure.
Workshop in 2005 will be held at MSRI in Berkley, CA.
- (4) Get list-serve from Bill McCallum at University of Arizona.
Tami will look in to this.

Regional Networks and Mini-grants:

PMET Second Annual Progress Report

- 1) State expectation for workshop leaders and mini-grant awardees to attend mini-conference.

Done, this is required.

- 2) Plan a certain number of mini-grants and encourage other funding.

PMET leadership will refine PMET mini-grant budgeting.

Alan again thanked the committee for their attendance, suggestions and continued support. The next meeting will be in 2005; location and date to be communicated in follow-up emails. The meeting adjourned at 1:45 pm.