Department of Energy
Oak Ridge Institute for Science and Education
Pre-Freshman Enrichment Program
Final Technical Report
Grant DE-FG03-95TE00003

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Mathematics Intensive Summer Session (MISS)

Project Director
Dr. David L. Pagni
Department of Mathematics
California State University Fullerton
Fullerton, CA 92834
Phone: 714-278-2671
Fax: 714-278-3972
e-mail: dpagni@fullerton.edu

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MASTER

This final technical report appears in two parts: the report for the 1995 summer MISS program and the report for the 1996 summer MISS program. Copies of the U.S. Department of Energy Pre-Freshman Enrichment Program 1995 Entry Form and 1996 Entry Form completed by all participants were sent to the Oak Ridge Institute for Science and Education in the fall of 1995 and 1996 respectively. Those forms are on file should they be needed. Attached also is a copy of the Summary of ideas for panel discussions, problem-solving sessions, or small group discussions presented at the Department of Energy Oak Ridge Institute for Science and Education Pre-Freshman Enrichment Program Project Directors Meeting held in San Antonio, TX, November 12-14, 1995.

DISCLAIMER

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DISCLAIMER

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III. PERSONAL INFORMATION

7. Date of Birth: ____/____/19____
Month Day Year

8. Sex: ☐ Male ☐ Female

9. Racial/ethnic background: (Check one)

- ☐ 1. American Indian or Alaskan Native
- ☐ 2. Asian or Pacific Islander
- ☐ 3. Black, not Hispanic
- ☐ 4. White, not Hispanic
- ☐ 5. Hispanic

10. What grade were you in during the 1994-1995 school year? (Circle one)

6 7 8 9 10 Other: _____

11. Which of the following describes the grades you got in school during the past year?

Math:

- ☐ 1. Mostly A's
- ☐ 2. A's and B's
- ☐ 3. Mostly B's
- ☐ 4. B's and C's
- ☐ 5. C or below

Science:

- ☐ 1. Mostly A's
- ☐ 2. A's and B's
- ☐ 3. Mostly B's
- ☐ 4. B's and C's
- ☐ 5. C or below

Other Subjects:

- ☐ 1. Mostly A's
- ☐ 2. A's and B's
- ☐ 3. Mostly B's
- ☐ 4. B's and C's
- ☐ 5. C or below

12. What is the HIGHEST level of formal education obtained by your parents?
(GIVE TWO ANSWERS FOR THIS QUESTION: One for each parent)

Mother

Father

☐	☐ 1. Eighth grade or less
☐	☐ 2. Some high school
☐	☐ 3. High school graduate
☐	☐ 4. Postsecondary school, for example, a technical or trade school
☐	☐ 5. Some college
☐	☐ 6. College degree or higher

Yes

No

13. ☐ ☐ Have you ever participated in other math/science enrichment programs?
(outside of school) before?

Yes

No

14. ☐ ☐ Have you participated in the PREP program before?

Department of Energy
Oak Ridge Institute for Science and Education
Pre-Freshman Enrichment Program
Project Directors Meeting
San Antonio, TX
November 12-14, 1995

Summary of ideas for panel discussions, problem-solving sessions, or small group discussions -- submitted by David Pagni, CSU Fullerton

- How do we recruit students in order to get a good pool of applicants?
- How do we involve parents in the recruiting process, during the program, and in post-program activities?
- How do we follow-up students in years after the program -- how do we solve the problem of students moving and becoming "lost" to the database?
- What makes an exciting program for students, yet one that truly accomplishes what it sets out to do in terms of student achievement?
- How do we keep costs down? What is the best way of using business, parent, other volunteers? What are other ways to control costs?
- How can we seek funds to keep the program going? What are the best sources of funds, both small and large?
- What materials seem to be the most successful? What program strategies seem to be the most successful?
- What follow-up activities have been used during the school year (assuming the PREP program has been a summer experience)?
- For each director, what one problem stood out as a threat to the program at one time and how was it solved?
- For each director, with whom do you collaborate with on your campus in order to make the program work successfully?
- Is discipline ever a problem in the program? If so, what measures are in place to deal with them?
- Are reward systems in place? If so, what type of awards are given?
- How do we deal with "credit" that is requested by students and/or their schools?

Mathematics Intensive Summer Session (MISS) Report for 1995
Submitted by Dr. David L. Pagni
DOE Grant: DE-FG03-95TE00003

Currently, the number of young people who are opting for careers in science and mathematics is shrinking even though the need for people in technical fields requiring mathematics and science backgrounds is expanding. These career choices are likely to have negative local, national, and international effects. This potentially negative situation is intensified by the multiple discrimination in the school years that affects more than fifty percent of the potential work force: women and underrepresented ethnic groups (American Indians, African American, and Latinos). The elimination of young women from careers requiring strong mathematics backgrounds generally begins after seventh grade.

To address this situation, during the Summer of 1995 California State University, Fullerton (CSUF) offered the Mathematics Intensive Summer Session (MISS) for the sixth consecutive year. MISS is a unique program which seeks to narrow the gender and ethnic gap by providing an intensive mathematics course for young women. This intensive mathematics program, serving primarily underrepresented young women, was offered so that the young women could gain academic prowess, self esteem and personal power in their mathematical preparation.

The Mathematics Intensive Summer Session (MISS) is a month-long program designed to help high school girls succeed in college prep mathematics at the Geometry level and above. The long range goal is to encourage more female students to take and succeed in calculus, thus opening the way for university majors such as Chemistry, Engineering, Geology, Biology, Physics, and Mathematics. The program began on July 6th and ended on August 2, 1995.

The target students were high school freshman or sophomore level females motivated to attend college. For the most part their grades in subjects other than math support their college aspirations. In mathematics however, they have usually struggled. This means that their grades in Prealgebra and Algebra I are usually C's or lower. MISS students plan to enroll in Geometry during the fall 1995.

Because of local, state, and national needs to have more minority females entering scientifically based fields (and thus, mathematically based fields),

the MISS recruiting also focused on young women from underrepresented groups who fulfilled the criteria. However, the recruitment and selection process ensured that no ethnic or socioeconomic group was turned away.

Table 1 Ethnic Distribution of MISS Students -- 1995				
Afro-American	Hispanic	Caucasian	Asian	Filipino
25%	53%	9%	9%	3%

The recruitment of target students began with the contact of high school principals and counselors in the service area of CSU Fullerton. Using the criteria listed, girls were identified and asked to apply for the program. A brochure, which began with "Dear Potential MISS Participant," was distributed to the identified girls. The brochure discussed MISS program details, including expectations for math study, commitment to after school and evening activities, and eligibility. Specifically, the brochure stated:

To be eligible to participate in the MISS program you must:

1. *Be female.*
2. *Be enrolled in college preparation classes in high school.*
3. *Have completed algebra.*
4. *Plan to attend a community college or university when you complete high school.*
4. *Preference will be given to underrepresented ethnic minority students.*

The brochure also told parents and students about informational meetings designed to answer questions about the MISS program. These meetings were held on June 6th and 14th from 6:00 – 7:30 p.m. Parents' concerns centered on the mathematics class and evening activities. They wanted to know how the content to be studied would help their daughters do better in the high school mathematics.

Applications for the MISS Program were screened according to the criteria mentioned above as well as a written essay in which the prospective participants stated why they wanted to attend MISS. Students who were from underrepresented ethnic groups, first generation college aspiring, or who proclaimed an interest in pursuing a math-based major were given priority. Thirty-two applicants were accepted into the program. An evening

orientation meeting was held with the MISS participants and their parents on July 5, 1995.

During the summer, the daily program for MISS students included six hours of mathematics instruction/problem solving/quizzes. Students were tested on the first day using a math anxiety questionnaire, a math self-concept questionnaire, an Algebra Readiness Exam, and a Geometry Readiness Exam. At the end of the program students complete post-tests for the same questionnaires and exams.

Otherwise a typical day would look like this:

8:00 - 8:15	Math Starter (Short Problem)
8:15 - 10:00	Lesson 1
10:00 - 10:15	Break
10:15 - 12:00	Lesson 2
12:00 - 1:00	Lunch
1:00 - 2:00	Lesson 3
2:00 - 2:55	Lesson 4
2:55 - 3:00	Evaluation

Responsibility for the math class was shared by Dr. Pagni and one female prospective high school math teacher, Ms. Michele Chey, who possesses a BA in mathematics. Students worked in teams of four throughout the month. The teams were formed on the first day of class by placing girls into groups according to their pre-test results. Scores on the Algebra Readiness pre-test were divided into four sets, high, medium-high, medium-low and low. A team consisted of a student from each of the sets. A team building activity had the girls creating a team name and Logo and listing the members on a 3' x 2.5' sheet of paper which was posted on the wall above their table. The teams also invented a team "cheer" that was performed before the class.

The summer math course focused on a curriculum that would prepare the students to succeed in a Geometry course. The University of Chicago School Mathematics Project (UCSMP) text Geometry (Scott, Foresman and Company, 1993) was used for the main curriculum. Topics covered included: Points and Lines, Definitions and If-then Statements, Angles and Lines, Polygons, Triangle Congruence, Measurement Formulas and some Coordinate Geometry. The course work also integrated technology in the form of the Texas Instruments (TI-82) graphing calculator. Each student was given a calculator on the first day of the project. The girls were taught to use various functions of the calculator on an "as-needed" basis. Students learned to use the graphing feature, the various functions in the math menu, and how to do some simple programming on the calculator.

Using the graphing calculator turned out to be one of the highlights of the program. We hoped to empower the students with new knowledge and the skill of applying the calculator to mathematical problem solving, but the enthusiasm and power felt by the students surprised even us. The young women loved using the calculator! Upon completion of the program the calculator officially became each student's to keep.

The results of the project are very promising. First, students showed strong growth on the mathematics diagnostic tests (Algebra Readiness, Geometry Readiness). Second, the students showed gains in attitude towards mathematics as well as self-concept in mathematics (see table 2).

MISS Pre-Post Test Results for 1995

Test	Average			
	Pretest Score	Posttest Score	Gain	Percent Gain
Algebra Readiness	30.69	32.13	1.41	7%
Geometry Readiness	15.06	22.78	8.00	85%
Math Attitude	22.53	24.75	2.22	13%
Math Self-Concept	20.19	22.97	2.78	21%
English Self-Concept	23.34	24.19	0.84	4%

The students' evaluation of the program was extremely positive. In the Survey of Participant Opinions, all of the students indicated that the program increased their self confidence in doing geometry proofs and 90% agreed that it increased their self confidence in solving word problems. The students also created a "graduation" booklet containing photos of students and instructors and quotes by students. A culmination luncheon capped the summer session with an awards ceremony honoring students for a)perfect attendance; b)best achievement; c)positive attitude; d)most improvement; e)most helpful; f)most focused; and g)best overall team. In addition, each student received a flower bouquet and a certificate of completion.

Although the summer program has ended, the learning continues. Many of the young women are meeting on a regular basis for academic year follow up on their own high school campus. The project directors maintain communication with high school personnel, with the students themselves, and with their parents. A letter was sent to parents with individual comments on their child provided by the instructors and resident assistants. Scores on the tests given in class and the pre-post test results were also provided. Finally, a letter was sent to the counselor of each participant, describing the content covered and the time commitment so that high school elective credit could be given for MISS.

The MISS program has generated interest nationwide. Inquiries have been made by the Mathematical Association of America (MAA), the Center for Women Policy Studies, and individuals interested in replicating the project. In November, 1992 MISS was featured as a founding member of the

SUMMA Consortium (SUMMAC), a project of the Mathematical Association of America's Strengthening Underrepresented Minority Mathematics Achievement Program. MISS continues to be part of SUMMA, and is listed in its Directory of Intervention Projects.

In conclusion, the experience so far has indicated that MISS is a viable program for high school females. The need to assist underrepresented young women become successful in mathematics exists. There is strong interest among students to participate in such a program, and students can make strong gains that prepare them for successful geometry experience, thus breaking the chain of unsuccessful performance in mathematics.

Mathematics Intensive Summer Session (MISS) Report for 1996
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Currently, the number of young people who are opting for careers in science and mathematics is shrinking even though the need for people in technical fields requiring mathematics and science backgrounds is expanding. These career choices are likely to have negative local, national, and international effects. This potentially negative situation is intensified by the multiple discrimination in the school years that affects more than fifty percent of the potential work force: women and underrepresented ethnic groups (American Indians, African American, and Latinos). The elimination of young women from careers requiring strong mathematics backgrounds generally begins after seventh grade.

To address this situation, during the Summer of 1996 California State University, Fullerton (CSUF) offered the Mathematics Intensive Summer Session (MISS) for the seventh consecutive year. MISS is a unique program which seeks to narrow the gender and ethnic gap by providing an intensive mathematics course for young women. This intensive mathematics program, serving primarily underrepresented young women, was offered so that the young women could gain academic prowess, self esteem and personal power in their mathematical preparation.

The Mathematics Intensive Summer Session (MISS) is a month-long program designed to help high school girls succeed in college prep mathematics at the Geometry level and above. The long range goal is to encourage more female students to take and succeed in calculus, thus opening the way for university majors such as Chemistry, Engineering, Geology, Biology, Physics, and Mathematics. The program began on July 8th and ended on August 2, 1996.

The target students were high school freshman or sophomore level females motivated to attend college. For the most part their grades in subjects other than math support their college aspirations. In mathematics however, they have usually struggled. This means that their grades in Prealgebra and Algebra I are usually C's or lower. MISS students plan to enroll in Geometry during the fall 1996.

Because of local, state, and national needs to have more minority females entering scientifically based fields (and thus, mathematically based fields), the MISS recruiting also focused on young women from underrepresented groups who fulfilled the criteria. However, the recruitment and selection process ensured that no ethnic or socioeconomic group was turned away.

Table 1 Ethnic Distribution of MISS Students -- 1996					
Afro-American	Hispanic	Caucasian	Asian	Filipino	Native American
21%	45%	7%	21%	3%	3%

The recruitment of target students began with the contact of high school principals and counselors in the service area of CSU Fullerton. Using the criteria listed, girls were identified and asked to apply for the program. A brochure, which began with "Dear Potential MISS Participant," was distributed to the identified girls. The brochure discussed MISS program details, including expectations for math study, commitment to after school and evening activities, and eligibility. Specifically, the brochure stated:

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The brochure also told parents and students about an informational meeting designed to answer questions about the MISS program. This meeting was held on June 18th from 6:00 – 7:30 p.m. Parents' concerns centered on the mathematics class and evening activities. They wanted to know how the content to be studied would help their daughters do better in the high school mathematics.

Applications for the MISS Program were screened according to the criteria mentioned above as well as a written essay in which the prospective participants stated why they wanted to attend MISS. Students who were from underrepresented ethnic groups, first generation college aspiring, or who proclaimed an interest in pursuing a math-based major were given priority. Twenty-nine applicants were accepted into the program. An evening orientation meeting was held with the MISS participants and their parents on July 8, 1996.

During the summer, the daily program for MISS students included six hours of mathematics instruction/problem solving/quizzes. Students were tested on the first day using a math anxiety questionnaire, a math self-concept questionnaire, an

Algebra Readiness Exam, and a Geometry Readiness Exam. At the end of the program students complete post-tests for the same questionnaires and exams.

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Test	Average			
	Pretest Score	Posttest Score	Gain	Percent Gain
Algebra Readiness	29.0	32.4	3.4	14%
Geometry Readiness	13.1	18.7	5.6	58%
Math Attitude	23.15	25.11	1.96	10%
Math Self-Concept	20.63	22.93	2.30	20%
English Self-Concept	23.52	23.96	0.44	2%

The students' evaluation of the program was extremely positive. In the Survey of Participant Opinions, all of the students indicated that the program increased their self confidence in doing geometry proofs and 90% agreed that it increased their self confidence in solving word problems. The students also created a "graduation" booklet containing photos of students and instructors and quotes by students. A culmination luncheon capped the summer session with an awards ceremony honoring students for a)achievement; b)positive attitude; c)most improvement;

d)most persistent; e)best mathematical thinker; and f)best peer helper. In addition, each student received a flower bouquet and a certificate of completion.

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