REVIEW AND ASSESSMENT OF THE MICHIGAN EISENHOWER PROFESSIONAL DEVELOPMENT PROGRAM

October 1999-June 2001

Prepared for the Michigan Department of Education

REPORT OF FINDINGS

Michigan Teacher Perceptions of Their Classroom Practice and Preparation in Mathematics and Science

Observing Mathematics and Science Lessons in Michigan Classrooms: An Assessment of Classroom Practice

Michigan Eisenhower Higher Education Grantee Professional Development Programming: Review and Assessment

High Poverty and Unaccredited Schools Being Served by Eisenhower Higher Education Grantees: October 1999-June 2001

Michigan Teacher Perceptions of Barriers to Implementing High Quality Mathematics and Science Curricula

June 2001

Prepared by
Science and Mathematics
Program Improvement
(SAMPI)
Institute for Science Education
Western Michigan University

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through funds provided by the Michigan State Board of Education

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Institute for Science Education--Western Michigan University

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About this Document

This document contains a set of five reports based on particular data collection strategies used to conduct the Review and Assessment of the Michigan Eisenhower Professional Development Program. These reports are compilations of results from those efforts. An overall report of findings will also be available through the Michigan Department of Education.

About Science and Mathematics Program Improvement (SAMPI)

SAMPI is a part of the Institute for Science Education in the College of Arts and Sciences at Western Michigan University. The SAMPI team conducts client-centered technical assistance, evaluations, program development projects, educational research, professional development, and dissemination efforts to a variety of educational agencies across the United States. SAMPI focuses its efforts on mathematics and science education, technology education, environmental education, and general school reform. A collaborative, consensus-building approach is used to facilitate active involvement of clients. Staff provide information and services to improve programs as well as to determine impact of programs. An important goal is to help clients conduct valid and reliable information gathering and analysis and make subsequent use of the information as an integral part of their planning and implementation.

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INTRODUCTION

❑ **Background.** A review and assessment of the Michigan Eisenhower Professional Development Program began in Fall 1999. The purpose of the evaluation was to determine effects of the Michigan Eisenhower program, as well as take a "snapshot" of the status of mathematics and science teaching and learning in Michigan. In addition to requiring participation of the 1999-2000 higher education grantees, local grantees and mathematics and science centers were also invited to participate.

The Michigan Department of Education identified a set of performance objectives and associated indicators for which evaluative information would be gathered to assess progress in mathematics and science teaching and learning in Michigan. An evaluation plan incorporating those performance objectives was developed and implemented by Science and Mathematics Program Improvement (SAMPI) at Western Michigan University. The work was conducted between November 1999 and June 2001. The performance objectives:

1. Classroom instruction will be improved through high quality professional development.
2. High quality professional development and State policy will be aligned with content and student performance standards.
3. High quality professional development will be sustained, intensive, and high quality with lasting impact on classroom instruction.
4. High quality professional development will be provided to teachers/schools with disadvantaged student populations.

A variety of data collection procedures were identified, including a statewide survey of teachers who had participated in Michigan Eisenhower-funded programs provided by higher education and local grantees (including Michigan Mathematics and Science Centers), observations of mathematics and science lessons in a sample of Michigan classrooms, observation of professional development sessions conducted by higher education grantees, interviews with program directors and staff, gathering of data on the nature and extent of professional development programming provided, and information on who is served by higher education grants.

❑ **Organization of this Report.** This document is a set of five reports based on various data collection strategies used in the Michigan Eisenhower Review and Assessment. Each is designed to be a "stand-alone" report. Each contains a summary of data collected on the particular subject of the report. An overall report of findings, conclusions, and challenges for the future will be prepared based on the data in this set of reports. It will be available through the Michigan Department of Education.

The five reports in this document include:

- **Michigan Teacher Perceptions of Their Classroom Practice and Preparation in Mathematics and Science**--Findings from a survey of Michigan K-12 teachers receiving professional development services fully or partially funded by the Michigan Eisenhower Professional Development Program

- **Observing Mathematics and Science Lessons in Michigan Classrooms: An Assessment of Classroom Practice**--Findings from observations of mathematics and science lessons in a sample of Michigan classrooms--2000-01 school year

- **Michigan Eisenhower Higher Education Grantee Professional Development Programming: Review and Assessment**--Findings from a study of the professional development programming provided by 1999-2000 higher education grantees

- **High Poverty and Unaccredited Schools Being Served by Eisenhower Higher Education Grantees: October 1999-June 2001**--An analysis of participation data

- **Michigan Teacher Perceptions of Barriers to Implementing High Quality Mathematics and Science Curricula**--Findings from a survey of Michigan K-12 teachers receiving professional development services fully or partially funded by the Michigan Eisenhower Professional Development Program

Michigan Teacher Perceptions of their Classroom Practice and Preparedness to Teach Science and Mathematics:

A Report of Findings from a Survey of Michigan K-12 Teachers Receiving Professional Development Services Fully or Partially Funded by the Michigan Eisenhower Professional Development Program

March 2001

SUMMARY OF MAJOR FINDINGS

Background. In fall 2000, a survey was conducted among teachers who were identified as having participated in professional development programs sponsored by Michigan Eisenhower higher education grantees and local grantees (including mathematics and science centers). This survey is part of a review and evaluation of the Michigan Eisenhower program being conducted by Science and Mathematics Program Improvement (SAMPI) at Western Michigan University. What follows is a summary of major findings from the survey. A full report of survey results follows this summary. This report is based on responses from 1284 teachers across Michigan.

❑ Summary profile of respondents:

- Grade Levels Taught: PreK-2 = 18%, 3-5 = 19%, 6-8 = 21%, 9-12 = 14%, Elementary Mixed = 7%, Secondary Mixed = 4%, Mixed K-12 = 6%
- Percent who had participated in Eisenhower-funded activity in last three years: Yes = 70%, No = 10%, Don't Know = 20%
- Hours of PD in mathematics and science in the last three years (number in box is % of teachers indicating that number of hours)

	Math	Science		Math	Science
None	16%	11%	11-15 hours	9%	9%
1-5 hours	18%	18%	16-20 hours	9%	9%
6-10 hours	19%	19%	> 20 hours	19%	33%

❑ 47% of all respondents said they were very familiar with the Michigan mathematics curriculum content standards for their grade level; 5% said they were not familiar with them; the rest indicated some familiarity. There was no difference in responses between higher education project respondents and local grant respondents.

❑ 57% of all respondents said they were very familiar with the Michigan science curriculum content standards for their grade level; 4% said they were not familiar with them; the rest indicated some familiarity. There was no difference in responses between higher education project respondents and local grant respondents.

❑ 60% of all respondents said their school mathematics curriculum was well aligned with Michigan curriculum standards and benchmarks; 3% said there was no alignment; the rest said there was some alignment.

❑ 64% of all respondents said their school science curriculum was well aligned with Michigan curriculum standards and benchmarks; 2% said there was no alignment; the rest said there was some alignment.

❑ Teachers were asked to rate their preparedness to implement teaching/learning strategies or tasks during mathematics and science lessons. Summary results for all respondents are shown in the chart below.

Teaching/Learning Strategies/Tasks	% Well Prepared in Mathematics	% Well Prepared in Science
Design a lesson incorporating inquiry-based activities	36%	45%
Lead a class of students using investigative approaches to learning	44%	52%
Manage a class of students engaged in hands-on work	71%	75%
Encourage students' interest in mathematics	66%	70%
Use questioning strategies that enhance development of student conceptual understanding and problem-solving	48%	49%
Implement your current school/district curriculum	65%	51%
Use student assessment data to change curriculum and instruction	36%	37%

A statistical analysis of differences between responses from teachers who have participated in programs sponsored by higher education grantees and those sponsored by local grantees (including mathematics and science centers) shows no differences in the area of preparedness in teaching/learning strategies/tasks.

❑ Teachers were asked to rate their preparedness to conduct lessons in particular MATHEMATICS content areas related to curriculum standards. Summary results for all respondents are shown below.

Mathematics Content Area	% Well Prepared
Patterns, relationships, and functions	55%
Geometry and measurement	55%
Data analysis and statistics	32%
Numerical and algebraic operations and analytical thinking	43%
Probability and discrete mathematics	23%

A statistical analysis of differences between responses from teachers who have participated in programs sponsored by higher education grantees and those sponsored by local grantees (including mathematics and science centers) shows few differences in the area of preparedness in mathematics content areas. Two statistical differences were identified:

1. More respondents who participated in higher education grantee sponsored activities feel better prepared to in the area of data analysis and statistics than among those who participated in local grantee programs.

2. More respondents who participated in local grantee sponsored activities feel better prepared in the area of numerical and algebraic operations and analytical thinking than among those who participated in higher education grantee programs.

❑ Teachers were asked to rate their preparedness to conduct lessons in particular SCIENCE content areas related to curriculum standards. Summary results for all respondents are shown below.

Science Content Area	% Well Prepared	Science Content Area	% Well Prepared
Cells	32%	Motion of Objects	32%
Organization of Living Things	46%	Waves and Vibrations	26%
Heredity	25%	Geosphere	26%
Evolution	19%	Hydrosphere	29%
Ecosystems	50%	Atmosphere and Weather	43%
Matter and Energy	45%	Solar System, Galaxy, and Universe	40%

A statistical analysis of differences between responses from teachers who have participated in programs sponsored by higher education grantees and those sponsored by local grantees (including mathematics and science centers) shows few differences in the area of preparedness in science content areas. There was only one item for which a statistical difference was identified:

1. More respondents who participated in local grantee-sponsored activities feel better prepared in the area of heredity than among those who participated in higher education grantee programs.

❑ Teachers were asked how often their students take part in particular learning strategies during mathematics and science lessons. Summary results for all participants are shown below.

Student Learning Strategies During a Lesson	% Often and Always Combined in Mathematics	% Often and Always Combined in Science
Participate in discussion with the teacher to further understanding	86%	90%
Make formal presentations to the class	22%	31%
Read from a textbook in class	36%	34%
Answer textbook/worksheet questions	62%	39%
Share ideas or solve problems with each other in small groups	82%	85%
Engage in hands-on activities	78%	90%
Follow specific instructions in an activity or investigation	76%	80%
Design or implement their own investigations	22%	30%
Record, represent, and/or analyze data	63%	74%
Supply evidence to support their ideas	57%	64%
Use the computer to support learning	32%	32%
Use calculators to support learning	54%	

A statistical analysis of differences between responses from teachers who have participated in programs sponsored by higher education grantees and those sponsored by local grantees (including mathematics and science centers) shows few differences in the area of frequency of student participation in learning strategies during mathematics and science lessons. The following items show a statistical difference in responses:

1. More respondents who were enrolled in higher education grantee-sponsored activities indicate they have students participate in the following kinds of activities more often than those teachers who were part of local grantee-sponsored programs:

   • Students make formal presentations to the class in mathematics classrooms
   • Students make formal presentations to the class in science classrooms
   • Students share ideas or solve problems with each other in small groups in mathematics classrooms
   • Students design and implement their own investigations in mathematics classrooms
   • Students design and implement their own investigations in science classrooms
   • Students supply evidence to support their ideas in mathematics classrooms

2. More respondents who were enrolled in local grantee-sponsored activities indicate they have students participate in the following kinds of activities more often than those teachers who were part of higher education grantee programs:

   • Students participate in discussions with the teacher to further understanding in mathematics classes
   • Students supply evidence to support their ideas in science classes

❑ The data were analyzed to determine if there were differences in responses based on grade levels (PreK-2, 3-5, 6-8, 9-12). Major findings follow:

- PreK-2 grade teachers indicated their district/school curriculum was more strongly aligned with the Michigan curriculum standards than from teachers in all other grade levels in both mathematics and science.
- More PreK-2 and 3-5 grade teachers said they were well prepared to manage a class of students engaged in hands-on work in mathematics than those in grades 6-8 and 9-12; however, in science more 6-8 and 9-12 teachers said they were well prepared to engage students in hands-on work than those in PreK-2 and 3-5.
- More PreK-2 and 3-5 grade teachers said they were well prepared to encourage students' interests in mathematics than those in grades 6-8 and 9-12.
- More 9-12 teachers indicated they were well prepared to use questioning strategies that enhance development of student conceptual understanding and problem-solving in both mathematics and science than those in all other grade levels.
- More 9-12 teachers said they were well prepared to use student assessment data to change curriculum and instruction in both mathematics and science than teachers from all other grade levels.
- More 9-12 teachers said they were well prepared to conduct lessons in the following mathematics subject areas than teachers from all other grade levels: Patterns, relationships, and functions; geometry and measurement; data analysis and statistics; numerical and algebraic operations and analytical thinking; and probability and discrete mathematics.
- More 9-12 teachers said they were well prepared to conduct lessons in the following science subject areas than teachers from all other grade levels: Cells, organization of living things, heredity, evolution, matter and energy, and motion of objects. More 6-8 teachers said they were well prepared to conduct lessons in the following science areas than teachers from other

grade levels: Geosphere and hydrosphere. More PreK-2 and 6-8 teachers said they were well prepared to conduct science lessons on the topic of atmosphere and weather than 3-5 and 9-12 teachers. More 6-8 teachers said they were well prepared to conduct science lesson on the topic of solar system, galaxy, and universe than teachers from all other grade levels.

- More 9-12 teachers said they had students answering textbook/worksheet questions in both mathematics and science than teachers from all other grade levels.
- More PreK-2 teachers said they had students engaged in hands-on activities in both mathematics and science than teachers from all other grade levels.

Michigan Teacher Perceptions of their Classroom Practice and Preparedness to Teach Science and Mathematics:

A Report of Findings from a Survey of Michigan K-12 Teachers Receiving Professional Development Services Fully or Partially Funded by the Michigan Eisenhower Professional Development Program

March 2001
Updated June 2001

❑ **Background.** In Fall 1999, SAMPI at Western Michigan University began implementation of a review and evaluation of the Michigan Eisenhower program, working with staff at the Michigan Department of Education. A set of performance objectives was developed to address core issues to be addressed by the Eisenhower program. An evaluation plan was developed by SAMPI framed by the objectives. In addition to requiring participation of 1999-2000 higher education grantees, local grantees and mathematics and science centers (many of whom administer Eisenhower funds in their service areas) were also invited to participate. The purpose of the evaluation is to determine effects of the Eisenhower program, as well as to take a "snapshot" of the status of mathematics and science teaching and learning in Michigan.

A variety of data collection procedures were identified for use in the review and evaluation, including observation of mathematics and science lessons, interviews of program directors and staff, survey of teachers, observation of professional development sessions, and gathering of project reports and other documents.

This report is a compilation of responses to a survey of teachers and a summary of findings based on the responses. Teachers were identified as having participated in higher education and local grantee programs (including mathematics and science centers). The survey was conducted in Fall 2000. Findings from this report will be incorporated in a final report about the Michigan Eisenhower Program based on performance objectives.

❑ **Organization of the Report.** This report is in two parts. Part I is a summary of findings interpreting the data from the survey (see above). Part II is a compilation of responses from teachers participating in higher education grantee programs and local grantee programs (including mathematics and science centers).

❑ **Survey Method and Sample.** Higher education grantees for 1999-2000 were required to submit names of teachers who were participating in their programs. Local grantees and mathematics and science centers were invited (on a volunteer basis) to submit names of participating teachers. All names submitted by higher education grantees and local grantees were included in the survey population, along with a sample of names submitted by mathematics and science centers. The total sample for the survey was 4,730 teachers from geographically diverse areas across Michigan. One thousand two hundred eighty-four (27%) were returned at the time this report was prepared.

The survey was mailed from SAMPI at Western Michigan University in September 2000 and included a cover letter and a 51-item survey. There were three sections: 1) information about the teacher, 2) perceptions about their preparedness to teach mathematics and/or science, and 3) degree to which their students engage in particular learning strategies. A follow-up post card was mailed in November 2000. Data were compiled as they were received. Analysis for this report is based on frequencies of responses

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❑ About the Respondents. There were 1,284 teachers who responded to the survey.

❑ Number of Years Teaching in Michigan and Grade Levels Taught

No. Years Teaching	%
Less than 1 to 5	17%
6 to 10	18%
11 to 15	15%
16 to 20	11%
More than 20	38%
Other or no response	1%

Grade(s) Taught	%
PreK-2	18%
3-5	29%
6-8	21%
9-12	14%
Elementary Mixed	7%
Secondary Mixed	4%
Mixed K-12	6%
No response	1%

❑ Amount of class time devoted to science and mathematics (elementary) and subjects taught (middle and high school)

Elementary Teachers (n = 730)

Times/Week Teach *Science*

No. Times/Week	%
Once	1%
Twice	9%
3 Times	18%
Four Times	22%
Five Times	39%
More than 5 Times*	11%

Lengths of a *Science* Lesson

Length of Lesson in Minutes	%
1 to 29 minutes	10%
30-39 minutes	17%
40-49 minutes	36%
50-59 minutes	15%
60-89 minutes	18%
More than 90 min.	4%

* This likely includes teachers who teach science to more than one class each week.

Elementary Teachers (n = 730)

Times/Week Teach *Mathematics*

No. Times/Week	%
Once	0%
Twice	1%
3 Times	2%
Four Times	5%
Five Times	79%
More than 5 Times*	13%

Lengths of a *Mathematics* Lesson

Length of Lesson in Minutes	%
1 to 29 minutes	6%
30-39 minutes	7%
40-49 minutes	30%
50-59 minutes	16%
60-89 minutes	38%
More than 90 min.	3%

* This likely includes teachers who teach mathematics to more than one class each week.

Middle and High School Teachers

Primary Subject(s) Taught

Subject(s)	%
Mathematics	38%
Science	40%
Mathematics and Science	6%
Other	16%

❑ Teachers were asked if they had participated in an Eisenhower-funded activity (workshop, conference, etc.) in the last three years.

Yes = 70% No = 10% Don't Know = 20%

Among respondents who were enrolled in Eisenhower higher education grant-funded programs, results were as follows:

Yes = 80% No = 8% Don't Know = 12%

Teachers who said they had participated in Eisenhower-funded activities were asked to indicate the number of sessions in which they had participated in the last three years. Of the 846 who said "yes," participation was as follows:

1-2 sessions = 26%
3-5 sessions = 33%
6-10 sessions = 19%
11-20 sessions = 6%
more than 20 sessions = 16%

Teachers who said they had participated in Eisenhower-funded activities were asked to indicate the subjects covered in the sessions. Of the 846 who said "yes," responses were as follows:

Mathematics = 26%
Mathematics and Science = 27%
Mathematics, Science, and Other Subjects = 3%
Mathematics and Other Subjects = 1%
Science = 31%
Science and Other Subjects = 3%
Other Subjects = 5%
No Response = 4%

❑ Teachers were asked how many hours of professional development (PD) they had received in the past three years in mathematics, science, and other subjects. Results follow:

Of the 840 respondents who indicated PD in mathematics:

None = 16%
1-5 hours = 18%%
6-10 hours = 19%
11-15 hours = 9%
16-20 hours = 9%
more than 20 hours = 29%

Of the 899 who indicated PD in science:

None = 11%
1-5 hours = 18%%
6-10 hours = 19%
11-15 hours = 9%%
16-20 hours = 10%
more than 20 hours = 33%

Of the 732 who indicated PD in other subjects:

None = 10%
1-5 hours = 18%
6-10 hours = 21%
11-15 hours = 10%%
16-20 hours = 13%
more than 20 hours = 28%

❑ Teachers were asked about their participation in Michigan Council of Teachers of Mathematics (MCTM). Results:

Are you a member?
Yes = 14% No = 81% Don't Know = 5%
Attended an annual conference in last 5 years?
Yes = 17% No = 75% Don't Know = 8%
Received Eisenhower funds to support participation?
Yes = 11% No = 42% Don't Know = 47%

❑ Teachers were asked about their participation in Michigan Science Teachers Association (MSTA). Results:

Are you a member?
Yes = 15% No = 81% Don't Know = 4%
Attended an annual conference in last 5 years?
Yes = 22% No = 69% Don't Know = 9%
Received Eisenhower funds to support participation?
Yes = 13% No = 43% Don't Know = 42%

❑ Teacher Perceptions about their Curriculum

❑ Familiarity with the Michigan curriculum content standards at their grade level:
Results are presented 1) by type of respondent (Table 1) and 2) by the grade level taught by respondents (Table 2).

TABLE 1:
Mathematics Standards

Rating	All Respondents	Higher Education Grant Respondents	Local Grant Respondents
Not Familiar	5%	5%	4%
Somewhat Familiar	48%	47%	48%
Very Familiar	47%	48%	47%

Rating	Grades PreK-2	Grades 3-5	Grades 6-8	Grades 9-12
Not Familiar	3%	3%	4%	10%
Somewhat Familiar	41%	52%	49%	40%
Very Familiar	56%	45%	47%	50%

Science Standards

Rating	All Respondents	Higher Education Grant Respondents	Local Grant Respondents
Not Familiar	4%	5%	4%
Somewhat Familiar	39%	37%	40%
Very Familiar	57%	58%	56%

Rating	Grades PreK-2	Grades 3-5	Grades 6-8	Grades 9-12
Not Familiar	3%	2%	4%	4%
Somewhat Familiar	44%	45%	31%	27%
Very Familiar	53%	53%	65%	69%

❑ Degree to which district/school curriculum aligned with Michigan curriculum standards and benchmarks:
Results are presented 1) by type of respondent and 2) by the grade level taught by respondents.

TABLE 2
In Mathematics

Rating	All Respondents	Higher Education Grant Respondents	Local Grant Respondents
Not Aligned	3%	2%	3%
Somewhat Aligned	37%	33%	37%
Well Aligned	60%	65%	60%

Rating	Grades PreK-2	Grades 3-5	Grades 6-8	Grades 9-12
Not Aligned	1%	3%	2%	5%
Somewhat Aligned	31%	37%	37%	39%
Well Aligned	68%	60%	61%	56%

In Science

Rating	All Respondents	Higher Education Grant Respondents	Local Grant Respondents
Not Aligned	2%	4%	3%
Somewhat Aligned	34%	35%	33%
Well Aligned	64%	61%	65%

Rating	Grades PreK-2	Grades 3-5	Grades 6-8	Grades 9-12
Not Aligned	1%	2%	4%	2%
Somewhat Aligned	26%	36%	34%	33%
Well Aligned	73%	62%	62%	65%

- Degree to which classroom-level assessment is aligned with district/school curriculum

  Results are presented 1) by type of respondent and 2) by the grade level taught by respondents.

TABLE 3
In Mathematics

Rating	All Respondents	Higher Education Grant Respondents	Local Grant Respondents
Not Aligned	3%	2%	2%
Somewhat Aligned	37%	35%	38%
Well Aligned	60%	63%	60%

In Mathematics continued . . .

Rating	Grades PreK-2	Grades 3-5	Grades 6-8	Grades 9-12
Not Aligned	1%	2%	2%	6%
Somewhat Aligned	32%	36%	40%	39%

Well Aligned	67%	62%	58%	55%

In Science:

Rating	All Respondents	Higher Education Grant Respondents	Local Grant Respondents
Not Aligned	2%	3%	2%
Somewhat Aligned	37%	40%	36%
Well Aligned	61%	57%	62%

Rating	Grades PreK-2	Grades 3-5	Grades 6-8	Grades 9-12
Not Aligned	2%	2%	2%	2%
Somewhat Aligned	35%	36%	37%	31%
Well Aligned	63%	62%	61%	67%

❑ Teacher Perceptions about their Preparedness to Teach Science and/or Mathematics.

❑ Teachers were asked to rate their preparedness to implement teaching/learning strategies during their mathematics and/or science lessons. Responses from those who teach mathematics and those who teach science are shown in the tables below. Table 4, Part I shows results in each category by type of respondent; Table 4, Part II shows results in each category by grade level taught by respondents. Number in box is % of respondents in that category.

TABLE 4, PART I
In Mathematics

Item	Rating	All Respondents	Higher Education Grant Respondents	Local Grant Respondents
Design a lesson incorporating inquiry-based activities	Not Prepared	3	1	4
	Somewhat	18	18	18
	Fairly Well	43	37	44
	Well Prepared	36	44	35
Lead a class of students using investigative approaches to learning	Not Prepared	3	1	2
	Somewhat	14	16	14
	Fairly Well	39	35	40
	Well Prepared	44	48	44
Manage a class of students engaged in hands-on work	Not Prepared	0	0	0
	Somewhat	5	4	5
	Fairly Well	24	25	24
	Well Prepared	71	71	71

In Mathematics Continued . . .

Encourage students' interest in mathematics	Not Prepared	0	0	0
	Somewhat	5	7	4
	Fairly Well	29	34	27
	Well Prepared	66	59	69
Use questioning strategies that enhance development of student conceptual understanding and	Not Prepared	1	1	1
	Somewhat	10	15	9
	Fairly Well	41	40	42

problem-solving	Well Prepared	48	44	48
Implement your current school/ district curriculum	Not Prepared	1	0	1
	Somewhat	6	9	6
	Fairly Well	31	31	31
	Well Prepared	62	60	62
Use student assessment data to change curriculum and instruction	Not Prepared	4	6	3
	Somewhat	17	17	16
	Fairly Well	43	42	44
	Well Prepared	36	35	37

In Science

Item	Rating	All Respondents	Higher Education Grant Respondents	Local Grant Respondents
Design a lesson incorporating inquiry-based activities	Not Prepared	3	1	3
	Somewhat	13	12	13
	Fairly Well	41	34	43
	Well Prepared	43	53	41
Lead a class of students using investigative approaches to learning	Not Prepared	2	1	2
	Somewhat	11	12	11
	Fairly Well	35	30	36
	Well Prepared	52	57	51
Manage a class of students engaged in hands-on work	Not Prepared	1	0	1
	Somewhat	4	5	4
	Fairly Well	20	21	19
	Well Prepared	75	74	76
Encourage students' interest in science	Not Prepared	1	0	1
	Somewhat	5	6	4
	Fairly Well	24	24	24
	Well Prepared	70	70	71
Use questioning strategies that enhance development of student conceptual understanding and problem-solving	Not Prepared	1	1	1
	Somewhat	9	12	9
	Fairly Well	41	41	41
	Well Prepared	49	46	49
Implement your current school/ district curriculum	Not Prepared	1	2	1
	Somewhat	5	7	6
	Fairly Well	22	32	28
	Well Prepared	51	59	65
Use student assessment data to change curriculum and instruction	Not Prepared	4	6	4
	Somewhat	17	17	17
	Fairly Well	42	41	43
	Well Prepared	37	36	36

TABLE 4, PART II
In Mathematics

Item	Rating	Grades PreK-2	Grades 3-5	Grades 6-8	Grades 9-12
Design a lesson incorporating inquiry-based activities	Not Prepared	3	3	4	4
	Somewhat	16	17	15	21
	Fairly Well	41	48	45	35
	Well Prepared	40	32	36	40
Lead a class of students using	Not Prepared	2	1	2	3

investigative approaches to learning	Somewhat	12	15	14	19
	Fairly Well	39	40	39	33
	Well Prepared	47	44	45	45
Manage a class of students engaged in hands-on work	Not Prepared	0	0	1	1
	Somewhat	1	4	4	8
	Fairly Well	21	25	24	29
	Well Prepared	79	66	60	53
Encourage students' interest in mathematics	Not Prepared	0	0	3	1
	Somewhat	0	5	7	7
	Fairly Well	21	29	32	39
	Well Prepared	79	66	60	53
Use questioning strategies that enhance development of student conceptual understanding and problem-solving	Not Prepared	0	0	3	1
	Somewhat	11	8	12	11
	Fairly Well	40	45	38	27
	Well Prepared	49	47	47	61
Implement your current school/ district curriculum	Not Prepared	0	1	2	1
	Somewhat	5	6	5	6
	Fairly Well	31	30	30	23
	Well Prepared	64	63	63	70
Use student assessment data to change curriculum and instruction	Not Prepared	3	2	4	2
	Somewhat	18	17	14	18
	Fairly Well	44	44	47	32
	Well Prepared	35	37	35	47

In Science

Item	Rating	Grades PreK-2	Grades 3-5	Grades 6-8	Grades 9-12
Design a lesson incorporating inquiry-based activities	Not Prepared	3	1	3	2
	Somewhat	16	15	9	7
	Fairly Well	43	42	42	38
	Well Prepared	38	42	46	53
Lead a class of students using investigative approaches to learning	Not Prepared	2	1	1	2
	Somewhat	13	13	7	9
	Fairly Well	41	33	32	33
	Well Prepared	44	53	60	56
Manage a class of students engaged in hands-on work	Not Prepared	0	0	1	2
	Somewhat	4	5	1	1
	Fairly Well	20	24	16	13
	Well Prepared	75	71	82	84

In Science Continued . . .

Encourage students' interest in science	Not Prepared	0	1	0	2
	Somewhat	2	5	5	3
	Fairly Well	22	24	23	24
	Well Prepared	76	70	72	71
Use questioning strategies that enhance development of student conceptual understanding and problem-solving	Not Prepared	0	1	1	2
	Somewhat	12	9	9	8
	Fairly Well	43	45	36	30
	Well Prepared	45	45	54	59
Implement your current school/	Not Prepared	1	1	2	2

district curriculum	Somewhat	5	7	5	3
	Fairly Well	34	28	23	22
	Well Prepared	60	64	70	72
Use student assessment data to change curriculum and instruction	Not Prepared	4	4	2	3
	Somewhat	19	18	17	14
	Fairly Well	44	44	43	35
	Well Prepared	32	34	38	47

❑ Teachers were asked to rate their preparedness to conduct lessons in particular **MATHEMATICS** content areas related to curriculum standards. Responses follow. TABLE 5, PART I shows results by types of respondents; TABLE 5, PART II shows results by grade level of respondents. Number in box is % of respondents in that category.

TABLE 5, PART I

Item	Rating	All Respondents	Higher Education Grant Respondents	Local Grant Respondents
Patterns, relationships, and functions	Not Prepared	1	0	0
	Somewhat	7	8	8
	Fairly Well	37	42	36
	Well Prepared	55	50	56
Geometry and measurement	Not Prepared	1	0	0
	Somewhat	9	14	8
	Fairly Well	35	33	36
	Well Prepared	55	53	55
Data analysis and statistics	Not Prepared	5	5	5
	Somewhat	23	15	25
	Fairly Well	40	40	28
	Well Prepared	32	40	30
Numerical and algebraic operations and analytical thinking	Not Prepared	4	2	4
	Somewhat	15	17	15
	Fairly Well	38	38	38
	Well Prepared	43	43	43
Probability and discrete mathematics	Not Prepared	7	7	7
	Somewhat	30	24	31
	Fairly Well	40	43	40
	Well Prepared	23	27	22

TABLE 5, PART II

Item	Rating	Grades PreK-2	Grades 3-5	Grades 6-8	Grade 9-12
Patterns, relationships, and functions	Not Prepared	0	1	0	2
	Somewhat	5	8	5	5
	Fairly Well	33	42	38	22
	Well Prepared	62	49	57	70
Geometry and measurement	Not Prepared	1	0	1	2
	Somewhat	11	7	6	8
	Fairly Well	40	40	28	22
	Well Prepared	48	53	65	67

Data analysis and statistics	Not Prepared	9	5	1	5
	Somewhat	30	25	15	13
	Fairly Well	36	46	37	33
	Well Prepared	25	24	47	49
Numerical and algebraic operations and analytical thinking	Not Prepared	7	4	2	2
	Somewhat	20	17	10	3
	Fairly Well	43	43	27	16
	Well Prepared	30	36	61	79
Probability and discrete mathematics	Not Prepared	12	7	4	6
	Somewhat	37	29	22	24
	Fairly Well	35	45	42	33
	Well Prepared	16	19	32	37

❑ Teachers were asked to rate their preparedness to conduct lessons in particular **SCIENCE** content areas related to curriculum standards. Responses follow. TABLE 6, PART I shows results by types of respondents; TABLE 6, PART II shows results by grade level of respondents. Number in box is % of respondents in that category.

TABLE 6, PART I

Item	Rating	All Respondents	Higher Education Grant Respondents	Local Grant Respondents
Cells	Not Prepared	10	10	10
	Somewhat	28	27	28
	Fairly Well	30	30	30
	Well Prepared	32	33	32
Organization of living things	Not Prepared	3	4	2
	Somewhat	15	20	14
	Fairly Well	36	38	36
	Well Prepared	46	38	48
Heredity	Not Prepared	14	13	14
	Somewhat	32	33	31
	Fairly Well	29	33	29
	Well Prepared	25	21	26
Evolution	Not Prepared	19	17	20
	Somewhat	33	36	32
	Fairly Well	29	28	30
	Well Prepared	19	19	19

TABLE 6, PART I Continued . . .

Ecosystems	Not Prepared	3	4	2
	Somewhat	14	17	13
	Fairly Well	33	33	34
	Well Prepared	50	46	51
Matter and energy	Not Prepared	3	3	3
	Somewhat	16	18	16
	Fairly Well	36	34	36
	Well Prepared	45	45	45
Motion of objects	Not Prepared	5	7	4
	Somewhat	24	19	25
	Fairly Well	39	39	40

	Well Prepared	32	35	31
Waves and vibrations	Not Prepared	8	9	8
	Somewhat	27	23	28
	Fairly Well	39	41	38
	Well Prepared	26	27	26
Geosphere	Not Prepared	9	9	9
	Somewhat	27	24	27
	Fairly Well	38	41	38
	Well Prepared	26	26	26
Hydrosphere	Not Prepared	9	8	9
	Somewhat	24	19	24
	Fairly Well	38	43	38
	Well Prepared	29	30	29
Atmosphere and weather	Not Prepared	4	5	3
	Somewhat	14	14	14
	Fairly Well	39	36	39
	Well Prepared	43	45	44
Solar system, galaxy, and universe	Not Prepared	4	6	4
	Somewhat	17	20	16
	Fairly Well	39	38	39
	Well Prepared	40	36	41

TABLE 6, PART II

Item	Rating	Grades PreK-2	Grades 3-5	Grades 6-8	Grades 9-12
Cells	Not Prepared	25	11	3	7
	Somewhat	42	28	20	13
	Fairly Well	24	37	29	19
	Well Prepared	9	24	48	61
Organization of living things	Not Prepared	3	2	1	5
	Somewhat	17	14	18	12
	Fairly Well	24	37	29	19
	Well Prepared	39	45	50	58

TABLE 6, PART II Continued . . .

Heredity	Not Prepared	21	18	9	6
	Somewhat	34	38	22	16
	Fairly Well	30	33	27	20
	Well Prepared	15	11	42	58
Evolution	Not Prepared	29	25	12	8
	Somewhat	38	37	27	20
	Fairly Well	22	28	35	28
	Well Prepared	11	10	26	44
Ecosystems	Not Prepared	4	1	3	2
	Somewhat	15	12	14	18
	Fairly Well	46	35	25	28
	Well Prepared	35	52	58	52

Matter and energy	Not Prepared	7	1	1	2
	Somewhat	26	14	11	6
	Fairly Well	41	37	36	28
	Well Prepared	26	47	52	64
Motion of objects	Not Prepared	10	4	2	4
	Somewhat	31	23	20	16
	Fairly Well	40	42	46	35
	Well Prepared	19	31	32	45
Waves and vibrations	Not Prepared	15	6	8	4
	Somewhat	35	29	16	20
	Fairly Well	35	41	45	33
	Well Prepared	15	24	35	28
Geosphere	Not Prepared	17	8	5	5
	Somewhat	36	26	20	28
	Fairly Well	34	42	40	38
	Well Prepared	13	24	35	28
Hydrosphere	Not Prepared	18	8	5	5
	Somewhat	33	24	16	25
	Fairly Well	32	43	38	34
	Well Prepared	17	25	40	36
Atmosphere and weather	Not Prepared	2	3	5	8
	Somewhat	8	10	19	23
	Fairly Well	41	49	30	33
	Well Prepared	49	38	46	36
Solar system, galaxy, and universe	Not Prepared	5	3	3	12
	Somewhat	15	15	16	24
	Fairly Well	46	44	30	36
	Well Prepared	34	38	51	28

❑ Student Participation in Mathematics and/or Science Activities in the Classroom.

❑ Teachers were asked to rate their perceptions about improvement in student accomplishments. Responses from those who teach mathematics and those who teach science are shown in the tables below. Table 8, Part I shows results in each category by type of respondent; Table 8, Part II shows results in each catetory by grade level taught by respondents. Number in box is % of respondents in each category.

TABLE 8, PART I:
In Mathematics

Item	Rating	All Respondents	Higher Education Grant Respondents	Local Grant Respondents
I have seen an increase in	No improvement	5	6	5

student eagerness to learn in the past three years.	A little improvement	24	17	25
	Some improvement	54	56	54
	A lot of improvement	17	21	16
Student achievement scores were improved in the past three years.	No improvement	2	1	2
	A little improvement	15	20	15
	Some improvement	57	52	57
	A lot of improvement	26	27	26
Students who do not usually do well in school have improved academically in the past three years.	No improvement	5	5	5
	A little improvement	28	24	28
	Some improvement	57	55	57
	A lot of improvement	10	16	10

In Science

Item	Rating	All Respondents	Higher Education Grant Respondents	Local Grant Respondents
I have seen an increase in student eagerness to learn in the past three years.	No improvement	3	5	3
	A little improvement	20	18	21
	Some improvement	52	50	51
	A lot of improvement	25	28	25
Student achievement scores were improved in the past three years.	No improvement	3	4	3
	A little improvement	18	19	18
	Some improvement	57	49	58
	A lot of improvement	22	28	21
Students who do not usually do well in school have improved academically in the past three years.	No improvement	4	5	4
	A little improvement	28	24	29
	Some improvement	58	55	58
	A lot of improvement	10	16	9

TABLE 8, PART II:
In Mathematics

Item	Rating	Grades PreK-2	Grades 3-5	Grades 6-8	Grades 9-12
I have seen an increase in student eagerness to learn in the past three years.	No improvement	2	6	5	11
	A little improvement	13	24	36	32
	Some improvement	61	54	48	51
	A lot of improvement	24	16	10	6
Student achievement scores were improved in the past three years.	No improvement	0	2	1	5
	A little improvement	12	13	17	17
	Some improvement	61	56	62	56
	A lot of improvement	27	29	20	22
Students who do not	No improvement	1	8	4	9

usually do well in school	A little improvement	21	27	34	26
have improved academically	Some improvement	66	54	52	59
in the past three years.	A lot of improvement	12	11	10	6

In Science

Item	Rating	Grades PreK-2	Grades 3-5	Grades 6-8	Grades 9-12
I have seen an increase in	No improvement	2	4	5	8
student eagerness to learn	A little improvement	11	16	24	37
in the past three years.	Some improvement	54	52	51	50
	A lot of improvement	33	28	20	5
Student achievement scores	No improvement	1	4	4	5
were improved in the past	A little improvement	17	17	23	15
three years.	Some improvement	62	54	54	62
	A lot of improvement	20	25	19	17
Students who do not	No improvement	2	7	55	4
usually do well in school	A little improvement	21	27	33	38
have improved academically	Some improvement	65	56	51	54
in the past three years.	A lot of improvement	12	10	11	4

❑ Teachers were asked how often their students take part in particular learning strategies during science and mathematics lessons. Responses from those who teach mathematics and those who teach science are shown in the tables below. Table 9, Part I shows results in each category by type of respondent; Table 9, Part II shows results in each catetory by grade level taught by respondents. Number in box is % of respondents in that category.

TABLE 9, PART I:
In Mathematics

Item	Rating	All Respondents	Higher Education Grant Respondents	Local Grant Respondents
Participate in discussions with	Never	0	1	1
the teacher to further under-	Sometimes	14	20	13
standing	Often	51	41	52
	Always	35	38	34

TABLE 9, PART I Mathematics Continued . .

Make formal presentations to	Never	23	20	23
the class	Sometimes	55	45	57
	Often	17	24	16
	Always	5	11	4
Read from a textbook in class	Never	26	32	25
	Sometimes	38	34	39
	Often	26	27	26
	Always	10	7	10
Answer textbook/worksheet	Never	8	10	7
questions	Sometimes	30	34	30
	Often	42	38	43
	Always	20	18	20
Share ideas or solve problems	Never	1	2	2

with each other in small groups	Sometimes	17	17	17
	Often	54	43	55
	Always	28	38	26
Engage in hands-on activities	Never	1	1	1
	Sometimes	21	22	21
	Often	49	43	50
	Always	29	34	28
Follow specific instructions in an activity or investigation	Never	1	1	1
	Sometimes	23	23	22
	Often	56	54	57
	Always	20	22	20
Design or implement their own investigations	Never	21	17	22
	Sometimes	57	49	58
	Often	19	27	18
	Always	3	7	2
Record, represent, and/or analyze data	Never	3	2	3
	Sometimes	34	25	35
	Often	49	56	48
	Always	14	17	14
Supply evidence to support their ideas	Never	5	2	6
	Sometimes	38	36	38
	Often	43	39	44
	Always	14	23	12
Use the computer to support learning	Never	20	28	19
	Sometimes	48	50	48
	Often	26	17	27
	Always	6	5	6
Use calculators to support learning	Never	7	11	6
	Sometimes	39	37	39
	Often	38	37	38
	Always	16	15	17

TABLE 9, PART I: In Science

Item	Rating	All Respondents	Higher Education Grant Respondents	Local Grant Respondents
Participate in discussions with the teacher to further under-standing	Never	0	0	1
	Sometimes	10	10	10
	Often	52	44	52
	Always	38	46	37
Make formal presentations to the class	Never	15	7	16
	Sometimes	54	47	54
	Often	25	33	25
	Always	6	13	5
Read from a textbook in class	Never	23	26	22
	Sometimes	43	48	42
	Often	25	21	26
	Always	9	5	10

Answer textbook/worksheet questions	Never	12	13	12
	Sometimes	49	54	48
	Often	29	25	30
	Always	10	8	10
Share ideas or solve problems with each other in small groups	Never	1	1	1
	Sometimes	14	14	14
	Often	56	50	57
	Always	29	35	26
Engage in hands-on activities	Never	1	0	0
	Sometimes	9	6	9
	Often	51	49	52
	Always	39	45	39
Follow specific instructions in an activity or investigation	Never	1	1	1
	Sometimes	19	18	19
	Often	56	51	57
	Always	24	30	23
Design or implement their own investigations	Never	12	9	13
	Sometimes	58	50	58
	Often	24	28	24
	Always	6	13	5
Record, represent, and/or analyze data	Never	2	1	2
	Sometimes	24	13	27
	Often	55	61	55
	Always	19	25	18
Supply evidence to support their ideas	Never	3	1	3
	Sometimes	33	22	35
	Often	47	55	46
	Always	17	22	16
Use the computer to support learning	Never	17	19	17
	Sometimes	50	49	51
	Often	26	26	26
	Always	6	6	6
Use calculators to support learning	Never	28	30	27
	Sometimes	45	40	46
	Often	20	21	20
	Always	7	9	7

TABLE 9, PART II: In Mathematics

Item	Rating	Grades PreK-2	Grades 3-5	Grades 6-8	Grades 9-12
Participate in discussions with the teacher to further under-standing	Never	1	0	0	1
	Sometimes	10	11	12	16
	Often	50	53	60	51
	Always	39	36	28	32
Make formal presentations to the class	Never	40	17	16	23
	Sometimes	44	62	63	61
	Often	14	16	18	12
	Always	2	5	3	4
Read from a textbook in class	Never	56	15	10	29
	Sometimes	24	42	47	38
	Often	15	32	32	21
	Always	5	11	12	11
Answer textbook/worksheet	Never	21	4	3	1

questions	Sometimes	35	35	20	15
	Often	36	42	54	40
	Always	8	19	23	44
Share ideas or solve problems with each other in small groups	Never	2	1	1	2
	Sometimes	15	18	15	23
	Often	59	54	56	51
	Always	24	27	29	23
Engage in hands-on activities	Never	0	0	1	3
	Sometimes	2	22	35	44
	Often	45	57	52	38
	Always	53	21	12	15
Follow specific instructions in an activity or investigation	Never	1	0	1	4
	Sometimes	20	21	20	31
	Often	53	61	61	42
	Always	26	18	18	23
Design or implement their own investigations	Never	20	20	19	30
	Sometimes	55	62	59	54
	Often	21	16	20	14
	Always	4	2	2	1
Record, represent, and/or analyze data	Never	4	2	0	4
	Sometimes	33	35	33	43
	Often	46	53	53	36
	Always	17	10	14	17
Supply evidence to support their ideas	Never	6	4	3	7
	Sometimes	46	38	34	34
	Often	37	47	46	43
	Always	11	11	17	16
Use the computer to support learning	Never	14	17	30	31
	Sometimes	50	48	48	53
	Often	30	28	17	15
	Always	6	7	5	1
Use calculators to support learning	Never	15	5	1	3
	Sometimes	58	41	26	13
	Often	23	45	48	30
	Always	4	9	25	54

TABLE 9, PART II: In Science

Item	Rating	Grades PreK-2	Grades 3-5	Grades 6-8	Grades 9-12
Participate in discussions with the teacher to further under-standing	Never	1	0	0	1
	Sometimes	9	7	12	13
	Often	47	51	55	60
	Always	43	42	33	26
Make formal presentations to the class	Never	35	7	4	11
	Sometimes	49	56	59	57
	Often	14	29	33	28
	Always	2	8	4	4
Read from a textbook in class	Never	49	11	7	32
	Sometimes	31	45	54	42
	Often	17	31	30	18
	Always	3	13	9	8
Answer textbook/worksheet questions	Never	25	7	7	5
	Sometimes	50	59	48	38

	Often	20	25	35	43
	Always	5	9	10	14
Share ideas or solve problems with each other in small groups	Never	1	0	1	1
	Sometimes	18	12	14	19
	Often	58	59	55	54
	Always	23	29	30	26
Engage in hands-on activities	Never	0	0	0	1
	Sometimes	5	9	12	10
	Often	44	59	55	55
	Always	51	32	33	34
Follow specific instructions in an activity or investigation	Never	1	0	0	3
	Sometimes	21	20	18	18
	Often	51	56	60	56
	Always	27	23	22	23
Design or implement their own investigations	Never	21	13	7	8
	Sometimes	60	57	58	55
	Often	15	26	27	32
	Always	4	4	8	5
Record, represent, and/or analyze data	Never	4	1	1	1
	Sometimes	33	23	20	17
	Often	49	58	56	62
	Always	14	18	23	21
Supply evidence to support their ideas	Never	6	2	0	1
	Sometimes	49	31	27	23
	Often	35	51	51	56
	Always	10	16	22	20
Use the computer to support learning	Never	25	17	16	8
	Sometimes	49	53	52	48
	Often	23	27	26	34
	Always	3	3	6	10
Use calculators to support learning	Never	55	30	12	13
	Sometimes	36	48	60	32
	Often	7	17	23	39
	Always	2	5	5	18

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Observing Mathematics and Science Lessons in Michigan Classrooms: An Assessment of Classroom Practice

A Report of Findings from Observations of Mathematics and Science Lessons in a Sample of Michigan Classrooms--2000-01 School Year as Part of a Review and Assessment of the Michigan Eisenhower Professional Development Program

June 2001

❑ **Background.** A review and assessment of the Michigan Eisenhower Professional Development Program began in Fall 1999. The purpose of the evaluation was to determine effects of the Michigan Eisenhower program, as well as take a "snapshot" of the status of mathematics and science teaching and learning in Michigan. In addition to requiring participation of 1999-2000 higher education grantees, local grantees and mathematics and science centers were also invited to participate.

The Michigan Department of Education identified a set of performance objectives for which evaluative information would be gathered to assess progress in mathematics and science teaching and learning in Michigan. An evaluation plan incorporating those performance objectives was developed and implemented by Science and Mathematics Program Improvement (SAMPI) at Western Michigan University. The work was conducted between November 1999 and June 2001. A variety of data collection procedures were identified, including a statewide survey of teachers who had participated in Michigan Eisenhower-funded programs provided by higher education and local grantees (including Michigan Mathematics and Science Centers), observations of mathematics and science lessons in a sample of Michigan classrooms, observation of professional development sessions conducted by higher education grantees, interviews with program directors and staff, gathering of data on the nature and extent of professional development programming provided, and information on who is served by higher education grants.

To gather information about lessons and classroom practice, it was decided to conduct observations of lessons in a statewide selection of K-12 classrooms. To accomplish this major task, representatives from higher education grantees, local and intermediate school districts, and mathematics and science centers, and other educational leaders in Michigan received two days of training on the use of a lesson observation protocol developed by SAMPI (see description below). Higher education grantees submitted lists of teachers being served by their projects. A random sample was selected and grantees were asked to conduct lessons in the classrooms of those teachers. For local grantee and mathematics and science centers, SAMPI helped design studies and determine observation samples. SAMPI also conducted lesson observations in classrooms in local school districts.

Observers completed debriefing protocols and submitted them to SAMPI for compilation and analysis. Reports based on the observations conducted by individual higher education grantees, local grantees, and mathematics and science centers were developed and returned to the projects. This report is a compilation of all observations conducted across Michigan.

❑ **Organization of the Report.** This report provides background and context for the study, study methods, and what the sample of observations represents. A profile of the lessons observed is presented, followed by findings about the various lesson components. This report includes results from all observations conducted across mathematics, science, and social studies. Separate reports for mathematics and science will be available, along with other analyses.

❑ **Study Methods.** A cadre of project directors, administrators, university faculty, curriculum specialists, mathematics and science center directors and staff, and teachers participated in two-day training sessions the goals of which were to: 1) learn to identify characteristics of and describe investigative science and mathematics teaching and learning, 2) develop effective skills for observing science and mathematics lessons, and 3) learn to use the SAMPI Lesson Observation Protocol for assessing science and mathematics lessons.

The SAMPI lesson observation system is a two-step process. The first involves having trained observers watch a complete lesson, take notes, and conduct brief pre- and post-observation interviews. The second step is for observers, using their notes, to complete a debriefing protocol. This five-part instrument provides observers with a systematic way to assess the key elements of a lesson by scoring a set of criteria on a 7-point scale. The first section of the instrument includes basic information about the lesson--date, length, purpose, description, materials used, etc. The remainder of the instrument is divided into four sections, one each for the four major components of a lesson: planning and organization, implementation, content, and classroom culture in which the lesson was conducted. Each of these sections include 5-9 criteria based on state and national teaching and learning standards.

Tests of internal consistency and observer agreement have been conducted on the debriefing instrument. Coefficient Alpha scores were computed to determine internal consistency and represent one type of reliability of the instrument. Alpha scores ranged from .75 to .93, with 1.0 perfect consistency. The actual criteria are based on established state and national teaching and learning standards in science and mathematics. The purpose of the two-day training programs was to establish reliability/consistency among observers. The consistency tests were based on data gathered during training sessions. A detailed description of the development and testing of the instrument is available from SAMPI, as well as information about the instrument and training on its use. Only those receiving the two-day training are authorized to use the instrument.

When debriefing instruments were complete, observers returned them to SAMPI for compilation and analysis. This report is based on the analysis of all observations conducted during the 2000-2001 school year.

❑ **Sample.** A total of 323 lessons were observed between January 2000 and May 2001. All 1999-2000 Eisenhower higher education grantees working with inservice teachers were expected to conduct observations based on a random sample prepared by SAMPI from a list of all teachers being served by their project. In addition, local grantees and mathematics and science centers were invited on a voluntary basis to participate in the training sessions and then conduct observations in their schools/districts. Not all local grantees who were trained chose to conduct observations. In addition, SAMPI staff conducted observations in classrooms in a variety of local school districts across the state. The degree to which the final sample represents the whole population is hard to determine. The proportion of middle school lessons observed is higher than other grade levels. There were also more mathematics lessons observed than science. It is also important to remember that a large proportion of the lessons were conducted by teachers who have received professional development in mathematics and/or science through Eisenhower-funded programs and mathematics and science centers. Readers should see this report as a "snapshot" of lessons from a large sample of classrooms from across Michigan.

❑ Profile of Lessons Observed.

➢ A total of 323 lessons were observed. Mathematics, science, and social studies lessons were observed: 221 mathematics, 90 science, and 12 social studies.

➢ Lessons were observed in classrooms from Kindergarten through 12th grade. The percentage of lessons by grade level is shown in the chart below.

Grade Level	% of Lessons
Kind	2.5%
1st	3.5%
2nd	6%
3rd	4%

Grade Level	% of Lessons
4th	5%
5th	9%
6th	14.5%
7th	21.5%
8th	17%

Grade Level	% of Lessons
9th	9%
10th	3%
11th	3.5%
12th	.5%

➢ 54% of the lessons came from pre-packaged mathematics or science programs, such as Everyday Math, Connected Math, Addison-Wesley, Core Plus, FOSS, DASH, GEMS, etc.

➢ 92% of lessons had appropriate and adequate supplies and equipment to conduct the lesson.

➢ Primary intended purpose(s) of the lesson were categorized. Purposes are shown in the chart below (numbers add to more than 100% because there can be more than one primary purpose for single lesson).

Purposes	% of Lessons
Identify prior student knowledge	25%
Introduce new concepts	35%
Develop conceptual understanding	52%
Review concepts	34%
Demonstrate how a concept applies in a real world context	23%

Purposes	% of Lessons
Develop awareness of contributions of mathe-maticians/scientists from diverse backgrounds	2%
Learn mathematics/science processes/skills	28%
Learn vocabulary/specific facts	18%
Develop appreciation for core mathematics/science ideas	9%
Assess student understanding of concepts	20%

➢ Major ways in which student activities were conducted were categorized. Activity configurations are show in the chart below (numbers add to more than 100% because there can be more than one configuration).

Configuration	% of Lessons
Whole group activity	71%
Small group activity	35%

Configuration	% of Lessons
Pairs of students	35%
Individual activity	32%

➢ For 49% of lessons, the classroom was arranged to maximize student-student interactions.

❑ **Assessment of Lesson Components.** After observing a lesson, observers rated a series of indicators (or criteria) in four categories: 1) planning and organization of the lesson, 2) implementation of the lesson, 3) content of the lesson, and 4) classroom culture in which the lesson was conducted. There are 5 to 8 indicators in each category. These indicators represent the major valued attributes and characteristics for each based on state and national teaching standards. Indicators can be used to describe evidence that can be used to determine if progress is being made toward goals and objectives, in this case, lessons with strong investigative elements and based on standards. Observers rated each indicator on a scale of 1 to 7, with 1 = low rating and 7 = high rating for that item. In the findings below for each category, the percentages presented represent the lessons that received a 6 or 7 rating.

❑ **Planning and Organization of the Lesson.** This component of the lesson is concerned with the planning for, organization of, and structure of a lesson. It is not about the effectiveness of implementation, the quality of content, or the effectiveness of the classroom climate, but whether the lesson was organized in a way to maximize learning.

➢ 68% of lessons were organized so that there could be substantive student-student interaction, such as small group work, think-pair-share, and/or whole group work that engaged all students in substantive discussion.

➢ 81% of lessons were organized so there could be substantive teacher-student interaction during whole group discussions facilitated by the teacher and/or during small group work or think-pair-share groupings with the teacher interacting with students.

➢ In 72% of lessons, investigative tasks were essential elements of the lesson plan, involving manipulation of information to help make sense of the lesson content, problem-solving, applications of content to the real world.

➢ 73% of lessons were organized so they could address students developmental levels, preparedness, and/or learning styles. A lesson design should incorporate a variety of specific learning strategies that accommodate student learning styles. The lesson should build on previous student experiences.

➢ 55% of lessons were organized so they addressed issues of access, equity, and diversity, including engaging all students, providing activities appropriate for the diversity of the class, and giving all students an equal change to be engaged in the learning.

➢ 58% of lessons were organized to provide adequate time for students and/or the teacher to reflect on the lesson and its content.

➢ 46% of lessons were organized to provide adequate time for wrap-up and closure of the content of the lesson. This refers to designing the lesson so there is time to bring an appropriate level of closure to the lesson or there is clarity about how next lessons will bring closure to the ideas of this lesson if closure is not appropriate for this lesson.

❑ **Implementation of the Lesson.** Implementation is about how the lesson is actually carried out based on the lesson design, and teacher and student roles in it.

➢ In 71% of the lessons teachers appeared confident in their ability to teach the lesson. In these lessons teachers seemed to know the topical materials and were comfortable with the instructional strategies being used.

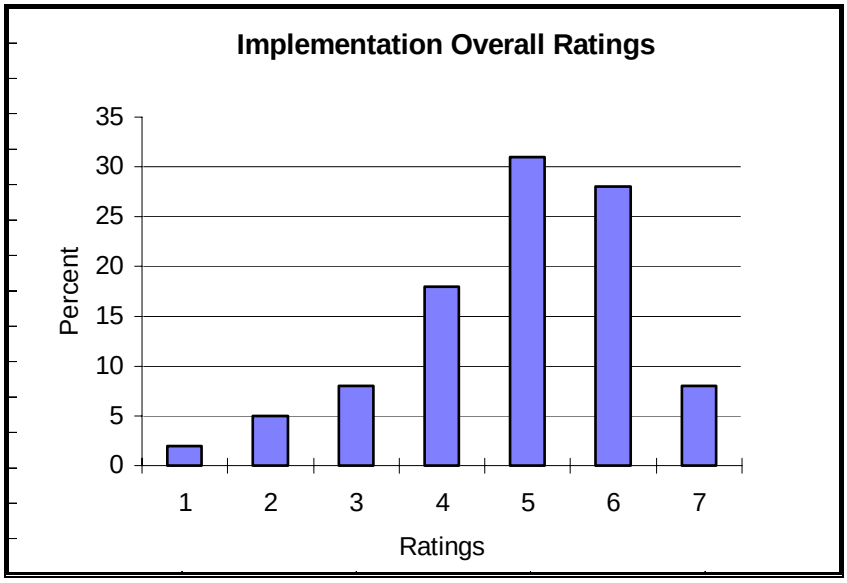
➢ During 34% of the lessons observed, teacher-student interaction was highly substantive and probing in nature. Questioning and dialog emphasized higher-order thinking and deep understanding and exposed students' prior knowledge.

➢ In 50% of the lessons, activities and other components were managed in ways that effectively engaged students in their own learning.

➢ The pace of the lesson was most appropriate in 49% of the lesson observed.

➢ During 32% of the lessons observed, student-student interaction was highly productive and enhanced individual understanding of the lesson's content in small group, pairing, and/or whole group discussion.

➢ Observers rated the overall effectiveness of the implementation of the lesson on a 7-point scale, with a 7 meaning the implementation of the lesson was very consistent with best practice in investigative mathematics/science investigative teaching and learning. The chart below shows the percent of lessons receiving each rating.



❑ **Content of the Lesson.** Content is concerned with the basic ideas and concepts associated with a lesson, as well as the necessary skills to accomplish the lesson tasks.

➢ Among 72% of the lessons observed, the content was considered very important and worthwhile. Concepts were significant and directly relevant to curriculum and what students were expected to know and do.

➢ During 39% of lessons observed, there was high intellectual engagement of students with the important ideas of the lesson. Students sought answers to important questions or problems, gathered appropriate information to address them, and discussed what they found with other students and the teacher.

➢ In 32% of the lessons science/mathematics was strongly portrayed as a dynamic body of knowledge enriched by conjecture, investigation, analysis, and justification. Tasks and activities did not lead to "canned" answers. Alternative solutions were appropriate. Students were expected to be able to defend their ideas.

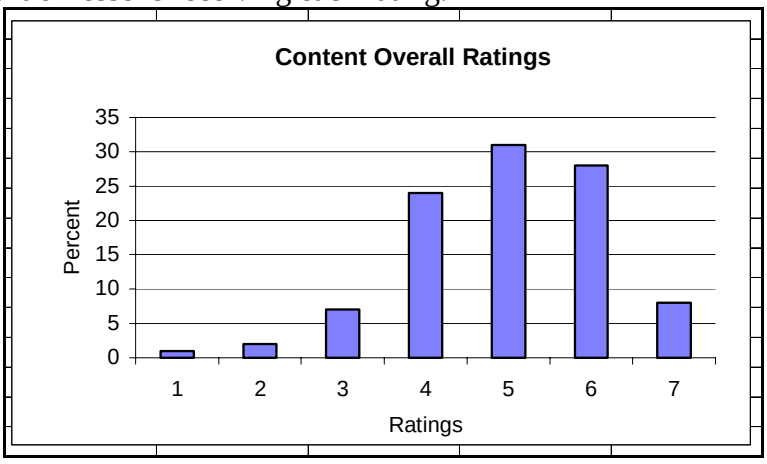
➢ In 69% of the lessons, teachers showed a good understanding of the concepts and content of the lesson and the topical area being addressed in the lesson.

➢ In 40% of the lessons observed, good connections were made between concepts and content of the lesson to previous and/or future lessons in the overall curriculum unit. In 24% of the lessons, connections were made between the lesson and other areas of science/mathematics or other subjects.

➢ In 34% of lessons, appropriate applications of the concepts/content were made to real-world situations.

➢ Science/mathematical theories, algorithms, and/or scientific models were incorporated in the lesson as appropriate in 27% of the lessons. Lesson concepts were put in larger contexts; solutions to problems and answers to questions required students or the teacher to use an existing model or create one to represent their ideas.

➢ Observers rated overall appropriateness and quality of the content of the lesson on a 7-point scale, with a 1 meaning the content addressed in the lesson was trivial or lacking in significance (little relationship to curriculum standards and benchmarks) and a 7 meaning significant content consistent with curriculum standards and benchmarks. The chart below shows the percent of lessons receiving each rating.



- **Culture in Which the Lesson Was Conducted.** This component of the lesson is related to the classroom climate, the level of engagement of students in activities and tasks, and the nature of the working relationships among students and between students and the teacher.

  ➢ During 57% of the lessons observed, active participation of all was encouraged and valued. All students were actively engaged in activities and tasks, with the teacher making specific efforts to engage all students.

  ➢ During 57% of lessons, teachers were very respectful of and valued students' ideas, questions, and contributions to the lesson. Ideas are accepted without making judgments; no ideas are dismissed out of hand, but students are expected to "make a case" for their ideas.

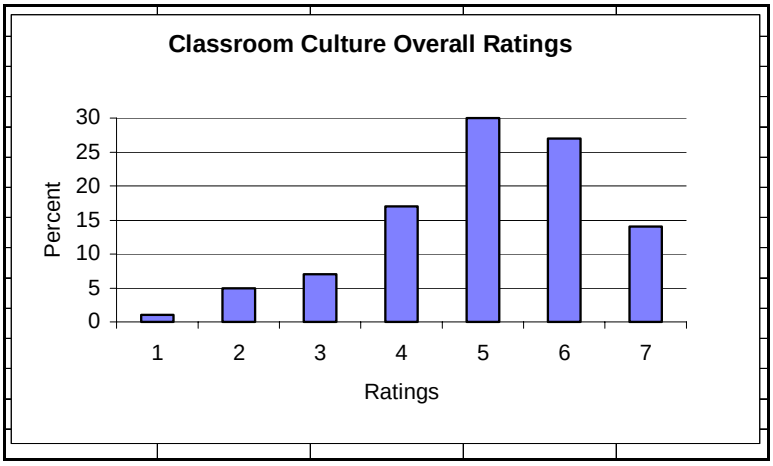
  ➢ During 38% of lessons observed, students were very respectful of and valued each others' ideas, questions, and contributions to the lesson. Ideas were not "put down." The sharing of ideas was valued.

  ➢ In 44% of the lessons observed, the classroom climate encouraged all students to generate ideas, questions, conjectures, and propositions. There was a very trusting and risk-taking atmosphere in the classroom.

  ➢ In 38% of lessons observed, student-student interactions reflected strong collaborative working relationships. Students readily worked in pairs and small groups or as teams to complete assignments and tasks.

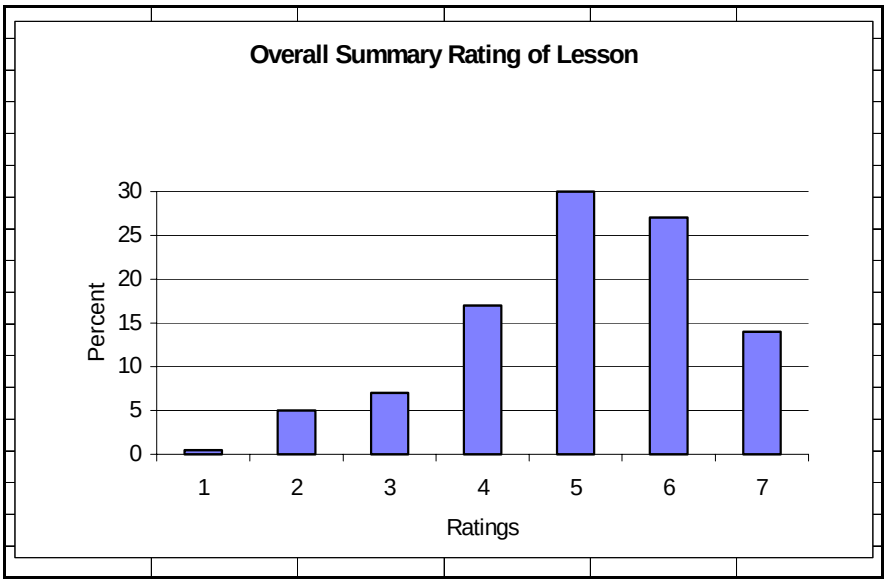
  ➢ In 48% of lessons observed, teacher-student interactions reflected strong collaborative working relationships. The teacher and students work together to solve problems and seek answers to questions.

  ➢ Observers rated the nature and effectiveness of classroom culture in which the lesson was conducted on a 7-point scale, with a 7 meaning the culture/climate of the classroom was very supportive for student learning. The graph below shows the percent of lessons receiving each rating.



❑ Overall Summary Assessment of Lessons

➢ Observers gave each lesson an overall summary rating on a 7-point scale, with 7 meaning that the lesson, overall, was an excellent example of a high quality investigative lesson. The graph below shows the percent of lessons receiving each rating.



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Michigan Eisenhower Higher Education Grantee Professional Development Programming: Review and Assessment

A Report of Findings from a Review of Professional Development Programming Provided by Recipients of Michigan Higher Education Competitive Grants Between January 2000 and April 2001

June 2001

❑ **Background.** A review and assessment of the Michigan Eisenhower Professional Development Program began in Fall 1999. The purpose of the evaluation was to determine effects of the Michigan Eisenhower program, as well as take a "snapshot" of the status of mathematics and science teaching and learning in Michigan. In addition to requiring participation of 1999-2000 higher education grantees, local grantees and mathematics and science centers were also invited to participate.

The Michigan Department of Education identified a set of performance objectives for which evaluative information would be gathered to assess progress in mathematics and science teaching and learning in Michigan. Some objectives related to the nature and extent of professional development being provided through programs conducted by higher education grantees. An evaluation plan incorporating those performance objectives was developed and implemented by Science and Mathematics Program Improvement (SAMPI) at Western Michigan University. The work was conducted between November 1999 and June 2001. A variety of data collection procedures were used.

To gather information about the nature and extent of professional development, several strategies were used. Evaluators observed professional development sessions facilitated by grantees, conducted interviews of project directors and other staff, gathered participation data, and reviewed project reports and other documents. This document reports on what was learned about professional development programming among the 1999-2000 higher education grantees. A separate report describes how high poverty and unaccredited schools were served by higher education grantees. Reports on other aspects of the review and assessment are also available.

❑ **Organization of the Report.** Findings in this report are organized around a set of questions about professional development programming: teachers served, amount of programming provided, quality of professional development provided, how programming addresses the Michigan Curriculum Framework, how programming reflects state professional development standards, staff perceptions of effectiveness of programming, and strengths and limitations of the professional development.

❑ **Study Methods.** Three primary strategies were used to gather information about the professional development (PD) programming being offered: 1) observation of one or more PD sessions at each of the grantee sites using a debriefing protocol based on state and national standards (see description below), 2) interviews of project directors and PD facilitators, and 3) gathering participation data from projects.

❑ **Sample.** The focus of this report is on the professional development programming of the 26 projects that received grants through the Michigan Eisenhower Higher Education Competitive Grants Program for 1999-2000. Grants were awarded in Fall 1999 for a one year period, with the option of a 6-month extension to continue through Spring 2001.

Grants were awarded in four categories (number in parentheses is number of grants awarded in that category):

Mathematics (4)
Science (6)
Both Mathematics and Science (9)
Other Core Subjects (7)

Fifteen Michigan institutions of higher education received grants (number in parentheses is number of grants received):

Central Michigan University (3)
Eastern Michigan University (3)
Ferris State University (2)
Grand Rapids Community College (1)
Lawrence Technological University (1)
Michigan State University (3)
Michigan Technological University (1)
Northern Michigan University (1)
Northwestern Michigan College (1)
Oakland University (1)
Saginaw Valley State University (2)
University of Michigan--Ann Arbor (3)
University of Michigan--Dearborn (2)
Wayne State University (1)
Western Michigan University (1)

Grants ranged from $26,000 to $145,000; 9 between $25-60,000; 6 between $61-85,000; 8 between $86-100,000; and 3 more than $100,000.

❑ **Findings.** Findings are organized around a set of questions related to professional development programming among the higher education grantees.

- ❑ **How many teachers were served by grantees?** Based on data provided by grantees (23 of the 25 reported), there were 1,125 teachers served from 374 different schools. In addition, 57 preservice teachers were served by grantees. (See separate report on high poverty and unaccredited schools served by grantees.)

- ❑ **How much professional development was provided by grantees?** The findings that follow are based on information provided by 18 of the 25 higher education grantees.

  - 9 projects conducted programs in both summer and during the school year; 6 projects conducted programs during the school year only; 3 projects conducted programs during the summer only.
  - All projects conducted multiple sessions. During the summer, projects provided from 3-18 full days of programming; during the school year from 3 to 22 half or full-day sessions (there were also 28 sessions of 1.5 hours in length).

- A total of 79 full day sessions of professional development was provided by the 18 reporting projects during summer; 141 half to full day sessions during the school year (plus 72 sessions 1.5 hours in length).
- A total of 689 hours of professional development was provided by the 18 reporting projects during summer; 665 were provided during the school year.
- The total number of 721 hours of professional development programming were provided across the 18 reporting projects.

❑ **What was the quality of instructional and management practices in the professional development and training sessions?** Evaluators observed 27 professional development sessions among 24 of the 25 higher education grantees (more than one session was observed in some projects). The length of the observation was from 3 to 6 hours, depending on the schedule for the sessions.

An observation debriefing instrument was used to analyze what was learned. The six-part instrument provides observers with a systematic way to assess the key elements of a session by scoring a set of criteria in each section on a 7-point scale. The criteria are based on state and national standards for professional development. The six components of the instrument include: Planning/Organization, Implementation, Content, Pedagogy/ Instructional Materials, Leadership, and Session Culture/Climate. The debriefing instrument is a modification of one developed by the National Science Foundation Local Systemic Change program.

Observers rated each indicator on a scale of 1 to 7, with 1 = low rating and 7 = high rating for that item. In the findings below for each category, the percentages presented represent the lessons that received a 6 or 7 rating. Only three sessions observed had major components designed to increase leadership capacities of participants. Ratings for leadership indicators are not included in this report.

➢ **Planning and Organization of the Session**

- 74% of sessions were organized to effectively encourage a collaborative approach to learning.
- In 67% of sessions, enough time and adequate structure were provided for "sense-making," including reflection about concepts, strategies, and issues.
- In 67% of sessions, enough time and adequate structure were provided for participants to share experiences and insights.

➢ **Implementation of the Session**

- In 74% of sessions, formal presentations were carried out very effectively.
- In 81% of the sessions, the facilitator's contributions to the session strongly enhanced the quality of the session.
- In 65% of sessions, facilitators were very effective in modeling questioning strategies likely to enhance participant conceptual understanding. There was an emphasis on higher-order questions, appropriate use of "wait time," etc.
- In 56% of the sessions, the facilitator's management style strongly enhanced the quality of the session.

- **Content of the Session**

  - In 78% of sessions, content was very sound and appropriately presented and/or explored.
  - During 78% of sessions, there was high intellectual engagement of participants with the important ideas of the session.
  - In 92% of the sessions, facilitators show a good understanding of the core concepts that were the focus of the session.
  - In 67% of the sessions, there was good attention to the topical content and it was appropriate for the purposes of the session and participant needs.

- **Pedagogy and Instructional Materials**

  - In 70% of sessions, there was good depth and breadth of attention to participant thinking and was appropriate for the purpose(s) of the session.
  - In 74% of sessions, there was good depth and breadth of attention to classroom strategies and were appropriate for the purpose(s) of the session.
  - In 74% of sessions, there was good depth and breadth of attention to instructional materials intended for classroom use and were appropriate for the purpose(s) of the session.
  - In 70% of sessions, facilitators show a strong understanding of pertinent pedagogical concepts.
  - During 74% of lessons, participants were very engaged with the important ideas of the session relevant to classroom practice

- **Session Climate and Culture**

  - During 67% of the lessons observed, active participation of all was encouraged and valued. All participants were actively engaged in the activities and tasks, with the facilitator making specific efforts to engage all students.
  - During 67% of lessons, facilitators were very respectful of and valued participant ideas, questions, and contributions to the session.
  - In 67% of sessions observed, interactions among participants reflected strong collaborative working relationships. Students readily worked in pairs and small groups or as teams.
  - In 67% of sessions observed, interactions between participants and facilitator reflected a strong collaborative working relationship. The facilitator and participants work together to solve problems, seek answers to questions, and address issues.
  - During 52% of sessions, participants were strongly encouraged to generate ideas, questions, and conjectures.
  - In 63% of sessions, participants showed a strong willingness to share ideas and take intellectual risks.
  - In 44% of sessions, intellectual rigors, constructive criticism, and the challenging of ideas were clearly evident.

- **Were Michigan Curriculum Framework standards and benchmarks addressed in professional development programming provided by grantees?** From interviews of project staff, all projects have incorporated the use of the Michigan Curriculum Framework in some way in their professional development, from raising teacher awareness of the document and its content to actually using the Framework to develop lessons. Examples of how the Framework was incorporated:

  - Participants identify benchmarks to address in lesson plans they develop
  - Critiquing video lesson segments to determine what benchmarks are being addressed
  - Speakers discuss how they use Framework to guide their curriculum and lessons
  - Lessons and units used in the sessions show relationship to benchmarks
  - Participants created lessons based on particular benchmarks and presented lessons to colleagues
  - Examples of how to address particular benchmarks provided
  - Technology content standards addressed; web materials identified for use correlated with benchmarks
  - Use of Framework toolkits
  - Relationship of MEAP test questions to benchmarks
  - Adapt/modify current lessons so they better address benchmarks
  - How to address fine arts benchmarks and science benchmarks concurrently

- **How were Michigan Professional Development standards addressed in the programming?** Project director and staff interview data indicate that about half of the projects have made specific efforts to organize and implement their programming based on PD standards. Based on observation of PD sessions, most projects are conducting their programs in a way that is consistent with the Michigan PD standards, even though it may not be a conscious effort. The nature and quality of most sessions is high (see discussion above about quality of sessions observed).

  Although all projects are based on either global or specific needs assessments of teachers and other constituents, those projects working closely with one or a few schools or districts are better able to customize programming. All projects make efforts to accommodate individual needs of teachers.

- **According to grantee staff, how are programs likely to affect changes in instruction or other classroom practice among participating teachers?** Based on interviews with project directors and staff, the following kinds of effects were identified.

  Inservice Teachers

  - Participants more comfortable with investigative approaches to teaching and learning
  - Teachers using non-traditional approaches to teaching core content
  - Lessons and other materials provided through the program being used by teachers
  - The way participants now see their roles as facilitators of classroom instruction
  - With an increased understanding of science concepts, teachers are better able to help their students learn the concepts
  - Teachers better able to access information and instructional materials about science topics
  - Raise teacher awareness of how to use technology as a tool for learning
  - Teachers will have another tool for providing inquiry-based science
  - Teachers use an integrated approach in using social studies topics to provide real-world context for mathematics and science investigations

- Teachers will use more cooperative learning to engage girls and minorities in learning of science and mathematics
- Change classroom practice to meet the needs of all learners
- Teachers will have strategies to help improve student learning and test scores
- Improved understanding of the Michigan Curriculum Framework standards and benchmarks and how to address them in classrooms
- Teachers will have ideas for engaging middle school students in learning
- Teachers more receptive to alternative ways of teaching science and mathematics

Pre-Schoolers and Parents

- Participants have tools to help them better understand how preschool children learn mathematics
- Teachers can better educate parents to think of mathematics as a regular part of their child's daily life
- Teachers will have ideas about how to engage parents and families in science activities

Leadership

- Teams have developed action plans for improving their science or mathematics program

Preservice Teachers

- Preservice teachers using techniques learned in the program in their own classrooms
- Cooperating inservice teachers affected by the enthusiasm of preservice teachers using investigative approaches with their students

❑ **According to grantee staff, what are the strengths and limitations of their programming?**

Project directors and staff were asked to identify strengths and limitations of their projects. A summary of comments follows.

Strengths:

- Sustained professional development over the course of the grant
- One-on-one follow-up with teachers in their classrooms
- A large cadre of skilled inservice teachers to work with preservice teachers
- Multiple locations for PD sessions so participants exposed to different sites
- Focus on an interdisciplinary approach to science
- Teachers actually conduct lessons during training and then again in their own classrooms during the school year
- Opportunities for teachers to share with each other
- Programming to strengthen physics teaching
- Strong science content
- Enthusiasm of presenters and participants
- Providing a relaxed atmosphere in which to work
- Teams of teachers and administrators working together
- Interactions of experienced and novice teachers on the use of computers
- Connecting mathematics to real-world situations
- Non-threatening and engaging activities and sessions
- Experienced staff, proven activities
- Materials distributed to participants
- Sessions focused on topics as requested by teachers
- Connecting the Framework with MEAP
- Connecting science and the arts

Limitations:

- Need more administrators involved in program; more administrative support for teachers as they participate in the program
- Administrator lack of understanding about role of preschool in the learning process, particularly for at-risk children
- Not enough time to have preservice teachers conduct more than one or two lessons in the classroom
- Difficulty recruiting teachers to participate, given the time frame of the project and the timing of awards
- Teachers not willing to make major summer commitment to multi-week session
- Difficulty of participants to be able to overcome inertia of their school settings
- Need to engage more schools and teachers in the programs
- More difficult to engage teachers in school year sessions because of busy schedules
- Difficulty getting release time for teachers during the school year
- Maintaining networking of teachers after summer sessions
- Turnover of teachers in particular districts hampers implementation of intended programs

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Michigan Eisenhower Professional Development Program

High Poverty and Unaccredited Schools Being Served by Eisenhower Higher Education Grantees October 1999-June 2001

A Summary Report

June 2001

❑ **Background.** A review and assessment of the Michigan Eisenhower Professional Development Program began in Fall 1999. The purpose of the evaluation was to determine effects of the Michigan Eisenhower program, as well as take a "snapshot" of the status of mathematics and science teaching and learning in Michigan. The Michigan Department of Education identified a set of performance objectives for which evaluative information would be gathered to guide the assessment. An evaluation plan incorporating those performance objectives was developed and implemented by Science and Mathematics Program Improvement (SAMPI) at Western Michigan University. The work was conducted between November 1999 and June 2001. A variety of data collection procedures were identified, including a statewide survey of teachers who had participated in Michigan Eisenhower-funded programs provided by higher education and local grantees (including Michigan Mathematics and Science Centers), observations of mathematics and science lessons in a sample of Michigan classrooms, interviews of programs directors and staff, gathering of data on the nature and extent of professional development programming provided, and information on who is served by higher education grants.

One of the performance objectives relates to the number of at-risk schools being served by higher education projects. This document reports on at-risk schools being served. Reports based on other aspects of the review and assessment are also available, along with an overall report, from the Michigan Department of Education.

❑ **Methods.** All higher education grantees were asked to submit a list of teachers served by their project, along with the school where each person teaches. State level lists of high poverty schools (high proportion of students receiving free and reduced lunch) and schools designated unaccredited (having a high proportion of students with low MEAP scores) were provided by the Michigan Department of Education. Using the lists, a tabulation of these categories of schools receiving services from higher education grantees was created.

There were 25 higher education grantees for the 1999-2000 grant period (funding actually extends for 18 months through June 2001). Twenty three submitted lists of participants and their school assignments.

❑ **Findings.** There were 1125 teachers in 374 different schools served in some way by one of the higher education grant-funded professional development programs. In addition, 57 preservice teachers from one university were served by the program.

High poverty schools. There were 624 teachers in 186 different schools served in some way by one of the higher education grant-funded professional development programs. This represents 50% of the schools and 55% of teachers served by grantees.

The chart below shows each project (numbered) and the proportion of schools and teachers from high poverty schools served by that project.

Project Number	Number schools served by project	% schools served by the project identified high poverty	Number teachers served by project	% teachers served by the project from high poverty schools
1	9	89%	73	92%
2	15	67%	35	77%
3	6	100%	10	100%
4	2	50%	19	5%
5	11	18%	18*	11%
6	26	31%	51	31%
7	14	43%	31	48%
8	16	19%	16	19%
9	21	0%	57	0%
10	15	60%	18	33%
11	35	63%	34	54%
12	No data		No data	
13	39	51%	77	52%
14	18	78%	25	68%
15	4	25%	8	25%
16	20	55%	52	58%
17	No data		No data	
18	7	57%	25	64%
19	1	0%	13	0%
20	1	100%	16	100%
21	82	50%	161	47%
22	2	100%	17	100%
23/24	14	93%	231	96%
25	7	57%	100	59%
26	9	11%	9	11%

* Project also served 57 preservice teachers

Unaccredited Schools. Schools with a high percentage of students receiving low scores on state standardized tests (MEAP) are considered unaccredited by the Michigan Department of Education. A school can be unaccredited in reading, mathematics, science, or any combination of subjects. In the 1999-2000 school year, unaccredited schools across the state in which one or more teachers were served by higher education grantees included:

Subject	# Schools served*
4th Grade Math	3
4th Grade Reading	9
5th Grade Science	57
7th Grade Math	8
8th Grade Science	80

* 23 schools were unaccredited in more than one subject

103 schools were unaccredited in one grade/subject; 11 in 2 grades/subjects; 11 in 3 grades/ subjects; and 1 in 5 grades/subjects. One hundred twenty-eight schools that are unaccredited in one or more grades/subjects are being served by the higher education grantees. This represents 34% of all schools being served by higher education grantees.

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Michigan Teacher Perceptions of Barriers to Implementing High Quality Mathematics and Science Curricula

A Report of Findings from a Survey of Michigan K-12 Teachers Receiving Professional Development Services Fully or Partially Funded by the Michigan Eisenhower Professional Development Program

June 2001

❑ **Background.** A review and assessment of the Michigan Eisenhower Professional Development Program began in Fall 1999. The purpose of the evaluation was to determine effects of the Eisenhower program, as well as to take a "snapshot" of the status of mathematics and science teaching and learning in Michigan. The Michigan Department of Education identified a set of performance objectives for which evaluative information would be gathered to guide the assessment. The work was conducted between November 1999 and June 2001. A variety of data collection procedures were identified, including a statewide survey of teachers who had participated in Michigan Eisenhower-funded programs provided by higher education and local grantees (Michigan Mathematics and Science Centers). One item on the survey asked: "What do you see as the primary barriers to implementing high quality mathematics and/or science curriculum in your school?" The survey was conducted in Fall 2000. A report based on the other 50 items on the survey is available from the Michigan Department of Education. This report is a summary of responses to the "barriers" question.

❑ **Summary of Findings.** The barriers described by respondents have been analyzed and grouped into seven related categories. The categories and specific barriers are described below. Several of the categories are best understood by examining subcategories, also described below.

- **Respondents.** Approximately 1300 teachers completed the entire survey. Of those, 1,086 provided responses to the "barriers" question. Of those, 1,067 (98%) identified one or more specific barriers to implementing high quality mathematics and/or science curricula in their schools. The other 19 respondents (2%) replied that there were no barriers. Respondents who identified barriers described from one to five different barriers each, with an average of two per respondent. Twelve respondents (1%) stated there were no barriers in mathematics, but identified barriers in science; six (0.5%) stated there were not barriers in science but identified barriers in mathematics.

- **Overview of Responses.** Inadequacies in **Resources** and **Time** were by far the most frequently mentioned barriers to implementing high quality mathematics and/or science curricula. About one-half of all respondents (48%) said inadequacy of physical resources (e.g., equipment, funding, facilities) presents a barrier in their schools. One-third of all respondents (33%) said insufficient time (so much to do, not enough time) stands in the way of implementing quality programs in their schools.

  The next two categories of barriers, inadequacies in **Curriculum/Methodology** and insufficient **Teacher Training**, were both identified by just under one in five respondents, at 19% and 18% respectively. About one in six (16%) identified barriers associated with the **Students** (student

preparedness, student attitude). Slightly more than one in ten (11%) identified similar barriers associated with the **Teachers** (unwilling attitude, lack of preparation). Just under one in ten (9%) identified barriers associated with **Classroom Management** (class size, managing activities).

It is worth noting that two other major stakeholder groups were mentioned: parents and/or students' home environment (5%) and administration/leadership (4%). These figures show that while some respondents did identify barriers associated with these groups, relatively few name them as major barriers to implementing high quality mathematics and/or science curricula in their schools.

Categories of Barriers	% of Respondents Who Identified the Barrier
Physical Resources	48%
Time	33%
Curriculum/Methodology	19%
Teacher Training	18%
Students	16%
Teachers	11%
Classroom Management	9%

- **Barrier #1: Physical Resources.** Almost half of all respondents said a lack or inadequacy of physical resources and/or funding to acquire them presents a barrier. This problem stands out by far as the most frequently named barrier.

  Within this category, lack of adequate equipment is the primary subcategory, named by more than one-third of all respondents (37%). These respondents said their schools lack adequate supplies of textbooks, printed materials, perishables, equipment, computers and other technology (and associated software), especially related to updating methodologies. They spoke of having to search for or try to create their own materials. They also reported barriers associated with outdated or inferior textbooks, equipment, or technology. They also identified problems with management, storage, and upkeep of sufficient quantities of equipment and supplies.

  Examples of comments: *"I have only 8 textbooks in biology for a class of 25 and 10 textbooks in math . . . We are in desperate need of science equipment (microscopes, prepared slides, balances, etc.)."*

  " We lack materials. I lack basic knowledge of how to create hands-on activities ... Our textbooks do not align with Michigan's math and science standards, benchmarks, and curriculum. We always have to invent and gather materials out of the air."

  Other barriers in this category were primarily associated with funding and facilities, named by 8% and 6% of respondents respectively. Respondents reported "lack of money" generally, or lack of funds for specific purposes such as field trips (funding for equipment was included above). Those who identified barriers related to facilities stated their schools lack such necessities as science and

computer labs, facilities in the classroom, or space in the classroom to conduct experiments or meet in small groups.

A sample comment: *"Classroom space and accommodations for investigations (running water, electric outlets, storage space)."*

- **Barrier #2: Time.** Fully one-third of all respondents (33%) reported that lack of time is a major barrier. Teachers described demands to cover more and more materials and competing needs to spend time covering the basics: reading, writing, and basic math.

  Sample comment: *"Time! There are only so many hours in the school day. It takes more time to do hands-on than old-fashioned lectures. It is tough to cover all subject matter."*

  Teachers report they have little or no time to collaborate with each other, to plan or prepare lessons, labs, or enriching activities, or to collect or create materials for hands-on learning. They described small group work, inquiry projects, and hands-on activities as time-intensive methodologies. They reported they do not have adequate time in the class period or the school day to fit these activities in and give them the time they need.

  Examples of comments: *"We keep adding curriculum and programs . . . my planning has tripled with no increase in planning time."*

  " I have five different preps a day. It is very difficult to prepare the lessons, organize the lab activities, prepare for the MEAP, assess student learning, and align curriculum to state standards all at the same time."

- **Barrier #3: Curriculum/Methodology.** About one-fifth of all respondents (19%) named inadequacies or problems with curriculum or methodologies as barriers. Respondents described having too many demands in the curriculum and barriers created by continuously growing and frequently changing mandates for teaching.

  Examples of comments: *"Too much curriculum. District loves to add curriculum, but never takes any away."*

  "The state changing what we need to teach so often. It's hard to develop many engaging lessons in many subjects when the requirements are changing."

  Teachers described lack of curriculum, curriculum that is created but ignored, and curriculum that is outdated, poorly designed, not aligned with state standards, problematic for the students, or not consistent from one grade to the next. They described required curricula as covering subjects "an inch deep and a mile wide." About 3% of all respondents specifically named the pressure to "teach to the MEAP" or other standardized assessments as a barrier. Barriers related to inappropriate methodologies and assessment techniques were also identified.

  Examples of comments: *"Developing a K-12 curriculum that has continuity and that is consistent from teacher to teacher."*

  "Too many students who . . . although they may be learning at a slower rate than others, they are tested at the same time as others. The whole class is assessed not allowing for the levels of learning (MEAP). The old ways were more adaptable for some."

- **Barrier #4: Teacher Training.** Just under one-fifth of the teachers (18%) reported that inadequate teacher training presents a primary barrier. They identified a need for more training generally, training for all the staff, and specifically training in hands-on or inquiry-based methodologies and classroom management when using these methodologies. They described inadequacies in the timing, content, and delivery of available training, and expressed a particular need for training with follow-up reinforcement and support.

  Examples of comments: *"We may get training, but there's seldom follow-up or support. In addition, much of our recent training has been irrelevant or poor quality."*

  "Being able to find release time for in-depth training in both areas [math and science]. When you find that time, marking the training valuable and worthwhile. Don't waste valuable time with unorganized training or with someone trying to 'sell' a program. . . "

- **Barrier #5: Students.** About one in six respondents (16%) named issues associated with students as barriers. These fell into two primary subcategories: Student Preparedness (identified by 7% of respondents) and Student Attitude (also identified by 7% of respondents). Student preparedness concerns include lack of grade-appropriate preparation, skills, competence, and life or world experience, as well as barriers associated with extremes of academic preparedness and/or ability within the same classroom.

  Examples of comments: *"Students need to read at grade level or even a half-year ahead to be able to read instructions, word problems, experiments, etc. Science texts are at grade level or beyond, which makes everything else difficult for at least 60% of students."*

  "Trying to move to a deeper understanding without losing the huge number of low-level students present in some of the classes. The strong students are ready to move on while others are not . . . "

  Barriers related to student attitude include unmotivated students, students who expect high grades with little effort, and disciplinary or behavior issues.

  Examples of comments: *"Too many kids do not have basic math skills. They do not practice at home, they try to learn in 40-minute lessons, but need extensions outside of school."*

  "Biggest problem is that many . . . students want all A's but expect to do little to get it."

  Other barriers related to students centered around developmental issues, such as students who are not developmentally ready for the demands placed on them by the curricula, students who are not ready to handle cooperative learning, and young children losing their ability to focus by the end of a long day.

- **Barrier #6: Teachers.** Slightly over one-tenth of the respondents (11%) identified barriers associated with the teachers, which again fell into the two primary subgroups of Attitude and Preparation. These barriers were identified by relatively small numbers of respondents. Teacher Attitude was named by 6% of all respondents and Teacher Preparation by 3% (note, however, that 18% of respondents named a need for teacher training, see above). Barriers associated with teacher attitudes were described as unwillingness to change and different philosophies or methodologies. Teacher preparation barriers were described as lack of preparation or lack of confidence.

  Examples of comments: *"Teachers that are unwilling to change--they believe that a textbook is a curriculum and have little or no understanding of the Michigan Curriculum Framework."*

  "Too many teachers who are not prepared to teach science or do not know how to teach it."

- **Barrier #7: Classroom Management.** Approximately 9% of all respondents identified issues grouped into this category, including barriers created by class size, lack of staffing assistance for teachers in the room, or classroom management.

  One comment: *"It is hard to do more hands-on projects and investigations with a large class size. I teach 3rd grade and I have 26 students. It is hard to spread myself around to facilitate/ support investigations."*

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