Mid-Michigan Mathematics Partnership (M^3P)

Evaluation Report 2 of 2

Summative Evidence & Findings

Mathematics and Science
Partnership Program
Title II, Part B
Elementary & Secondary Act (EASA)
U. S. Department o f Education

Central Michigan University
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RESEARCH & EVALUATION OVERVIEW

This research study was designed to produce evidence which assesses the extent to which the *Mathematics and Science Partnership* (MSP) program grant initiative known as the *Mid-Michigan Mathematics Project (M^3P)* met or exceeded its stated program goals. The major goals of the project were to:

1) Provide mathematics professional development for K-8 teachers in 12 schools in *CASM's* service area, resulting in increased student achievement in mathematics,
2) Focus on the *Grade Level Content Expectations (GLCE)* in Mathematics: ensuring teachers' understanding of the *GLCE* and improving mathematics content knowledge,
3) Integrate technology into mathematics instruction/assessment through *Classroom Performance Systems (CPS*), and
4) Establish online learning communities and support through *Blackboard*.

The study utilized an accepted quasi-experimentation design known as a *non-equivalent control group* (Cook & Campbell, 1979) along with multiple covariates analyzed through a one-way Analysis of Variance (ANOVA) statistical procedure to control for any pretreatment group differences. This mixed methods approach to evaluation has proven useful in utilizing both quantitative and qualitative performance indicators in a single research design (Frechtling, J., & Sharp, NSF, 1997).

Furthermore, the research study also included both formative and summative measures to gauge the merit and worth of the grant initiative reflective of *The Program Evaluation Standards, 2nd Edition* as stated by the American Evaluation Association (Joint Committee on Standards for Educational Evaluation, 1994): 1) Utility (provides practical information), 2) Feasibility (realistic, doable, cost-effective), 3) Propriety (legality & ethical standards), and 4) Accuracy (findings gauge the merit, worth & value of the program). This utilization of both research design and program evaluation principles assured for a rigorous review of all program components and stated goals through the planning, implementation and evaluation phases of the grant project. A statement confirming that the evaluator adhered to and utilized the program evaluation standards during this research study is found in *Appendix B* on page 35.

Performance Indicators

Measures related to the content and procedural knowledge of mathematics teachers in grades K-8 included quantitative measures of mathematics content in a pretest versus posttest design (i.e. *NAEP & Teacher Content Knowledge (CRT*); both quantitative and qualitative measures of instructional pedagogy (i.e. *Teacher Artifacts/Sample Lessons & SAMPI Teacher Observations*); and group feedback (i.e. *Technology Use & Professional Development*). Student measures included the following quantitative measures: student performance on formal criterion-referenced assessments (i.e. *Michigan Educational Assessment Program* state achievement tests).

Research Null Hypotheses

The study posited that no significant differences will be found across treatment conditions for:

1) measures of content and procedural knowledge of mathematics teachers in grades K-8,
2) measures of mathematical achievement for:
    a. elementary students in grades 3-5,
    b. middle school students in grades 6-8, and
3) measures of teachers instructional practices to foster mathematics achievement.

Control Group

The *Mid-Michigan Mathematics Project (M^3P)* was a collaborative effort between *Central Michigan University, Capital Area Science and Math Center (CASM), and five service area school districts: 1) Clinton County Regional Education Service Area, 2) Eaton Intermediate School District, 3) Ionia County Intermediate School District, 4) Lansing Public Schools,* and 5) *Shiawassee Regional Educational Service District.* Teachers from within the residing five service area school districts were formally asked to participate in the study. All teachers who voiced interest in the project were accepted into the treatment group. Schools not represented in the treatment group but also residing with the five service area regions were then asked to serve as the comparison group for purposes of this study.

In this manner, teachers in schools from 9 different school districts currently comprised the treatment group, while teachers from school within 5 school districts made up the comparison group. Current numbers for the study included 52 teachers in the treatment group, with 29 teachers in the control group. Teachers ranged in grade level assignments from kindergarten through eighth grade (i.e. K-8). The K-5 teachers teach mathematics along with other subject areas and were trained as elementary education majors, while the teachers in grades 6-8 are mathematics content teachers with mathematics training and certification.

Assignment to Treatment Conditions

Kerlinger (1973) notes that a major difficulty confounding educational research is the inability to establish experimental groups when working within existing school settings. All prospective teacher participants were pretested in fall, 2004. Teachers were assigned to treatment and comparison group conditions based on their self-select into the stated various professional development activities.

A one-way analyses of variance (ANOVA) procedure was used to verify if any significant group differences are found on the pretest measures of teachers measures of content and procedural knowledge of mathematics teachers in grades 4-8. No significant pretest group differences were found, thus self-selection effects have not violated any experimental procedures for the treatment conditions.

NAEP Total Score Pretest Group Comparisons	**Mean Difference**	**q**	**P value**	
K-2 NAEP Treatment Pretest vs. K-2 NAEP Comparison Pretest	0.250	0.148	ns	p > 0.05
3-5 NAEP Treatment Pretest vs. 3-5 NAEP Comparison Pretest	-2.521	2.115	ns	p > 0.05
6-8 NAEP Treatment Pretest vs. 6-8 NAEP Comparison Pretest	2.090	2.420	ns	p > 0.05

PERFORMANCE DATA 2004-2006

NAEP Data

Bruce Mitchell of *Michigan State University* compiled released items from the National Assessment of Educational Progress (NAEP) in mathematics to construct various criterion-referenced tests (CRT's) to be used in the study. Forms of the assessment were designed for teachers of mathematics students in grades K-2, 3-5 and 6-8 based upon appropriate content considerations. NAEP CRT items were presented in a multiple-choice format with about 40 items comprising each of these designed assessments. The number of items for the content areas subscales of the NAEP assessment varied across

grade levels to better align with the grade level content expectations and knowledge base associated with student content of the lower elementary, upper elementary and middle school mathematics curricular demands. The chart below further illustrates the components of the four NAEP pretests/posttests for teachers of grades K-2, grades 3-5 and grades 6-8.

NAEP Pretest & Posttest, 2004-2006

		Grades K-2	Grades 3-5	Grades 6-8
TOTAL Score	# of items	40	39	38
Algebra & Functions Subtest	# of items	4	8	12
Geometry & Measurement Subtest	# of items	18	17	17
Number & Operations Subtest	# of items	18	14	9

The items were aligned with mathematical topics included in the *Michigan Curriculum Framework* (*MCF*) which outlines the horizontal and vertical curricula for mathematics for students in grades K-12. The assessment used in 2004 – 2006 (Years 1 & 2) of the grant focused on the *MCF* areas of *algebra & functions, geometry & measurement*, and *numbers & operations*. Assessments planned for 2006-2008 (Years 3-4) of the grant were planned to cover the previous *MCF* topics along with an additional strand of *data & probability*.

Administration

The CRT was designed to be administered in a pretest/posttest manner. In the fall of 2004 at the start of the project, a *NAEP Pretest CRT* was administered to the treatment and comparison group teachers. Subsequent assessments took place with a posttest for treatment and comparison group participants administered in May – June of 2006. Please see ***Appendix A***: *Data Collection Timeline* found on page 31 of this report, for more complete information on the administration of this particular performance indicator.

Statistical Analyses & Results 2004-2006

To determine whether the means of the treatment and comparison group pretests and treatment group posttests differed significantly a one-way analysis of variance (ANOVA) was selected as the statistic of choice utilizing a *Tukey-Kramer Multiple Comparisons Test*. The one-way analysis of variance (ANOVA) was utilized for the total score of the NAEP assessment measure, along with the three subscales scores of *Algebra*, *Geometry & Measurement*, and *Numbers & Operations*.

On the following two pages, data is provided from the ANOVA analyses of the NAEP teacher data. The chart on page 6 portrays mean and standards deviation scores, sample size and test item numbers for the pretest and posttest data for the NAEP aggregate assessment, along with the three subscales of *Algebra, Geometry & Measurement, and Numbers & Operations.* The data is also broken down by the three treatment groups of K-2 teachers, 3-5 teachers, and 6-8 teachers, along with their corresponding comparison groups. The chart on page 7 provides ANOVA data related to mean differences and p-values of the pretest versus posttest data, along with the treatment versus comparison group data.

NAEP Pretest, 2004-2006

TOTAL Score

	Grades K-2				Grades 3-5				Grades 6-8			
	Treatment		Comparison		Treatment		Comparison		Treatment		Comparison	
	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest
MEAN	34.7	35.7	34.4	35.6	30.1	36.3	32.6	34.3	31.2	33.9	29.1	32.9
SD	5.556	4.480	2.074	3.286	4.817	2.057	3.867	2.733	3.501	3.667	4.456	3.859
n = sample size	20	14	5	5	20	13	7	6	24	16	17	11
items	40	40	40	40	39	39	39	39	38	38	38	38

NAEP Pretest, 2004-2006

Algebra Subtest Score

	Grades K-2				Grades 3-5				Grades 6-8			
	Treatment		Comparison		Treatment		Comparison		Treatment		Comparison	
	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest
MEAN	3.7	3.1	3.8	4.0	6.0	7.2	7.1	6.8	9.2	10.8	10.8	10.6
SD	0.745	0.949	1.483	0.000	2.154	0.725	0.690	0.408	2.375	1.797	1.185	1.120
n = sample size	20	14	5	5	20	13	7	6	24	16	17	11
items	4	4	4	4	8	8	8	8	12	12	12	12

NAEP Pretest, 2004-2006

Geometry & Measurement Subtest Score

	Grades K-2				Grades 3-5				Grades 6-8			
	Treatment		Comparison		Treatment		Comparison		Treatment		Comparison	
	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest
MEAN	14.5	16.1	13.8	14.4	12.3	15.6	13.7	14.8	14.2	15.1	11.2	14.0
SD	3.069	2.507	1.483	2.074	4.261	1.557	2.509	1.329	3.317	1.692	2.223	2.366
n = sample size	20	14	5	5	20	13	7	6	24	16	17	11
items	18	18	18	18	17	17	17	17	17	17	17	17

NAEP Pretest, 2004-2006

Number & Operations Subtest Score

	Grades K-2				Grades 3-5				Grades 6-8			
	Treatment		Comparison		Treatment		Comparison		Treatment		Comparison	
	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest
MEAN	16.5	17.1	16.8	17.2	11.8	13.5	11.7	12.7	7.8	8.0	7.1	8.3
SD	2.360	1.269	0.837	1.304	3.956	0.519	1.976	1.862	1.896	1.549	1.560	0.647
n = sample size	20	14	5	5	20	13	7	6	24	16	17	11
items	18	18	18	18	14	14	14	14	9	9	9	9

NAEP Total Score	Mean Difference	q	P value	
K-2 Treatment Pretest vs. K-2 Treatment Posttest	-1.064	0.906	ns	p > 0.05
K-2 Comparison Pretest vs. K-2 Comparison Posttest	-1.200	0.563	ns	p > 0.05
K-2 Treatment Posttest vs. K-2 Comparison Posttest	0.114	0.065	ns	p > 0.05
3-5 Treatment Pretest vs. 3-5 Treatment Posttest	-6.250	6.464	***	p < 0.001
3-5 Comparison Pretest vs. 3-5 Comparison Posttest	-1.720	1.145	ns	p > 0.05
3-5 Treatment Posttest vs. 3-5 Comparison Posttest	2.000	1.493	ns	p > 0.05
6-8 Treatment Pretest vs. 6-8 Treatment Posttest	-2.667	3.033	ns	p > 0.05
6-8 Comparison Pretest vs. 6-8 Comparison Posttest	-3.782	3.587	ns	p > 0.05
6-8 Treatment Posttest vs. 6-8 Comparison Posttest	0.975	0.914	ns	p > 0.05

Algebra Subscore	Mean Difference	q	P value	
K-2 Treatment Pretest vs. K-2 Treatment Posttest	0.507	2.335	ns	p > 0.05
K-2 Comparison Pretest vs. K-2 Comparison Posttest	-0.200	0.508	ns	p > 0.05
K-2 Treatment Posttest vs. K-2 Comparison Posttest	-0.088	2.640	ns	p > 0.05
3-5 Treatment Pretest vs. 3-5 Treatment Posttest	-1.230	3.194	ns	p > 0.05
3-5 Comparison Pretest vs. 3-5 Comparison Posttest	0.343	0.570	ns	p > 0.05
3-5 Treatment Posttest vs. 3-5 Comparison Posttest	0.430	0.806	ns	p > 0.05
6-8 Treatment Pretest vs. 6-8 Treatment Posttest	-1.605	3.853	*	p < 0.05
6-8 Comparison Pretest vs. 6-8 Comparison Posttest	0.224	0.449	ns	p > 0.05
6-8 Treatment Posttest vs. 6-8 Comparison Posttest	0.213	0.421	ns	p > 0.05

Geometry & Measurement Subscore	Mean Difference	q	P value	
K-2 Treatment Pretest vs. K-2 Treatment Posttest	-1.643	2.491	ns	p > 0.05
K-2 Comparison Pretest vs. K-2 Comparison Posttest	-0.600	0.501	ns	p > 0.05
K-2 Treatment Posttest vs. K-2 Comparison Posttest	1.743	1.767	ns	p > 0.05
3-5 Treatment Pretest vs. 3-5 Treatment Posttest	-3.300	4.139	*	p < 0.05
3-5 Comparison Pretest vs. 3-5 Comparison Posttest	-1.086	0.872	ns	p > 0.05
3-5 Treatment Posttest vs. 3-5 Comparison Posttest	0.800	0.724	ns	p > 0.05
6-8 Treatment Pretest vs. 6-8 Treatment Posttest	-0.896	1.513	ns	p > 0.05
6-8 Comparison Pretest vs. 6-8 Comparison Posttest	-2.765	3.894	*	p < 0.05
6-8 Treatment Posttest vs. 6-8 Comparison Posttest	1.603	1.479	ns	p > 0.05

Number & Operations Subscore	Mean Difference	q	P value	
K-2 Treatment Pretest vs. K-2 Treatment Posttest	-0.571	1.255	ns	p > 0.05
K-2 Comparison Pretest vs. K-2 Comparison Posttest	-0.400	0.484	ns	p > 0.05
K-2 Treatment Posttest vs. K-2 Comparison Posttest	-0.129	0.190	ns	p > 0.05
3-5 Treatment Pretest vs. 3-5 Treatment Posttest	-1.750	2.437	ns	p > 0.05
3-5 Comparison Pretest vs. 3-5 Comparison Posttest	-0.986	0.879	ns	p > 0.05
3-5 Treatment Posttest vs. 3-5 Comparison Posttest	0.800	0.804	ns	p > 0.05
6-8 Treatment Pretest vs. 6-8 Treatment Posttest	-0.167	0.460	ns	p > 0.05
6-8 Comparison Pretest vs. 6-8 Comparison Posttest	-1.241	2.853	ns	p > 0.05
6-8 Treatment Posttest vs. 6-8 Comparison Posttest	-0.300	0.681	ns	p > 0.05

Discussion of Results 2004-2006

The chart below summarizes the significance noted through the ANOVA analyses.

NAEP Significance Results Chart

	TOTAL Score	Algebra & Functions Subtest	Geometry & Measurement Subtest	Number & Operations Subtest
Grades K-2	no significance	no significance	no significance	no significance
Grades 3-5	**treatment group significance (pre/post)**	no significance	**treatment group significance (pre/post)**	no significance
Grades 6-8	no significance	**treatment group significance (pre/post)**	*comparison group significance (pre/post)*	no significance

Analyses of the summative NAEP data for the 2004-2006 time period provides the following results:

- increases were noted for mean score pretest/posttest measures for 3 of 3 or 100% of the teacher groups (grades K-2, grades 3-5 & grades 6-8) on the total NAEP items,
- increases were noted for mean score pretest/posttest measures for 2 of 3 or 66.7% of the teacher groups (grades 3-5 & grades 6-8) on the algebra subscale of the NAEP items,
- increases were noted for mean score pretest/posttest measures for 3 of 3 or 100% of the teacher groups (grades, K-2, grades 3-5 & grades 6-8) on the geometry and measurement subscale of the NAEP items,
- increases were noted for mean score pretest/posttest measures for 3 of 3 or 100% of the teacher groups (grades K-2, grades 3-5 & grades 6-8) or 100% on the number and operations subscale of the NAEP items,
- analysis of variance (ANOVA) procedures verify that 3 of 12 or 25% of the treatment grade group pretest/posttest mean sores differed significantly from the comparison group,
    - of these 2 of 3 or 67% statistically significant mean score differences were attributed to teachers of grades 3-5, while
    - 1 of 3 or 33% statistically significant mean score differences were attributed to teachers of grades 6-8.

Teacher Content Knowledge (CRT) Session Data

It was determined that additional measures of mathematics content knowledge of teachers might be helpful to the study. These measures were embedded into the planned professional development scheduled as half-day and full-day sessions occurring during the school year. Additional CRT items were constructed reflective of the mathematics content particular to the professional development sessions. Thus, this process yielded additional measures of mathematics performance by teacher participants of the treatment groups.

Administration

The Teacher Content Knowledge Session CRT was administered during the three professional development sessions that occurred in spring of 2005 (i.e. March through May) and through the five staff development sessions of the 2005-2006 school year (September through May). The CRT session data was administered in a pretest/posttest manner for all the professional development sessions.

Year Two Data 2005-2006

Results from the *Teacher Content Knowledge Session CRT* data for 2005 is listed in the following three charts. This data complements the NAEP CRT as an additional indicator of teacher content knowledge in mathematics at a particular time of the study.

		Grades K-2		Grades 3-5		Grades 6-8	
		Pre	Post	Pre	Post	Pre	Post
Math Content	MEAN	2.47	3.69	3.49	4.31	3.76	4.38
Session 2	Items	9	9	15	15	13	13
	n	20	20	15	15	18	17
Math Content	MEAN	3.03	4.37	3.76	4.38	3.71	4.18
Session 3	Items	8	8	16	16	15	15
	n	17	16	16	17	17	15
Math Content	MEAN		4.62	3.55	3.87	3.58	4.55
Session 4	Items		7	21	21	14	14
	n		12	17	17	15	15
Math Content	MEAN	3.44	3.89	2.99	4.26	3.74	3.99
Session 5	Items	17	17	21	21	21	21
	n	10	10	18	19	17	17
Math Content	MEAN	3.57	4.22	3.84	4.39	3.66	4.09
Session 6	Items	7	7	11	11	21	21
	n	15	16	16	16	16	13

Statistical Analysis of the Data

Assessment questions to gauge teacher content knowledge were created in a Likert design for easy use by teachers. Assessment items from the pretest and posttest measures were then tabulated to produce mean scores. The three teacher groups each provided five sets of session data, thus totaling 15 data points. A sample of a typical content knowledge item and the corresponding Likert scale is provided in the chart on page 10:

Sample Teacher Content Knowledge Item

Directions:

Assign a number to each concept below assign based on the description provided.

1. No Knowledge of this. Have not heard of this, drawing a blank, etc.
2. Very little knowledge. Have heard of this or did some brief work with it, but have forgotten a lot.
3. Know about this and can operate in some ways, but not at the understanding level.
4. Know, understand and solve problems related to concept (if applicable), but not sure I can develop a lesson for students.
5. Know, understand and feel confident I can develop a lesson for students.

Concepts:

1. The probabilities associated with outcomes on two dice.

Discussion of Results: *Year Two Data 2005-2006*

The data indicated a positive trend in the confidence level of teachers in developing and delivering lessons that reflect the Michigan *Grade Level Content Expectations* (*GLCE's*) appropriate for their classroom use.

- Content area teacher knowledge assessed as pretest/posttest measures at each professional development session yielded positive increase 100% of the time for all 15 of the 5 professional development sessions,
  - With a total sample size of 235 teacher respondents.

This confirms that teacher content knowledge as related to instructional proficiency in the teaching of mathematics has positively increased in the grant period of 2005-2006.

Year One Data 2004-2005

Results from the *Teacher Content Knowledge Session CRT* data for 2005 is listed in the following three charts. This data complemented the NAEP CRT as an additional indicator of teacher content knowledge in mathematics during the first year of the study. The charts on pages 11-12 of the report illustrate these data.

Discussion of Results form Year One, 2004-2005

The data indicated a positive trend in the confidence level of teachers in developing and delivering lessons that reflect the Michigan *Grade Level Content Expectations* (*GLCE's*) appropriate for their classroom use. It also showed a continued need for help in some specific content areas in which the teachers still do not feel confident to teach. These data were utilized in planning and implementing the professional development activities in the second year of the grant for the 2005-2006 school year.

Grades K-2	Session 4		Session 5		Session 6	
	Pre	Post	Pre	Post	Pre	Post
No knowledge of this. Have not heard of this, drawing a blank, etc.	40.2%	10.0%	21.9%	0.0%	18.2%	0.0%
Very little or no knowledge of this. Have heard of this or did some brief work with it, but have forgotten a lot.	17.8%	6.7%	17.6%	1.6%	11.2%	1.7%
Know about this and can operate in some ways, but not at the understanding level.	7.5%	8.9%	20.9%	5.3%	11.2%	6.8%
Know and understand, but not sure I can develop a lesson for students.	19.6%	22.2%	20.9%	32.1%	20.2%	25.6%
Know, understand, and feel confident I can develop a lesson for students.	15.0%	30.0%	18.7%	61.1%	39.3%	65.8%
Content items	6	6	10	10	11	11
Participants	24	24	19	19	22	22

Grades 3-5	Session 4		Session 5		Session 6	
	Pre	Post	Pre	Post	Pre	Post
No knowledge of this. Have not heard of this, drawing a blank, etc.	46.4%	31.4%	17.7%	1.6%	32.2%	0.0%
Very little or no knowledge of this. Have heard of this or did some brief work with it, but have forgotten a lot.	24.1%	14.7%	16.6%	2.0%	30.2%	4.0%
Know about this and can operate in some ways, but not at the understanding level.	9.8%	9.8%	16.2%	4.4%	15.7%	4.3%
Know and understand, but not sure I can develop a lesson for students.	12.5%	11.8%	22.3%	20.7%	11.0%	26.7%
Know, understand, and feel confident I can develop a lesson for students.	7.1%	16.7%	27.2%	51.8%	10.6%	28.2%
Content items	7	7	14	14	15	15
Participants	24	24	19	19	17	17

Grades 6-8	Session 4		Session 5		Session 6	
	Pre	Post	Pre	Post	Pre	Post
No knowledge of this. Have not heard of this, drawing a blank, etc.	M	M	18.2%	1.8%	0.5%	6.0%
Very little or no knowledge of this. Have heard of this or did some brief work with it, but have forgotten a lot.	M	M	16.8%	1.4%	20.0%	6.8%
Know about this and can operate in some ways, but not at the understanding level.	M	M	11.8%	11.4%	28.6%	10.8%
Know and understand, but not sure I can develop a lesson for students.	M	M	18.6%	34.1%	26.4%	29.5%
Know, understand, and feel confident I can develop a lesson for students.	M	M	34.5%	50.5%	23.6%	52.3%
Content items	M	M	11	11	11	11
Participants	20	20	20	20	20	20

Survey of Enacted Curriculum (SEC) Data

The *Survey of Enacted Curriculum (*SEC) is a widely-recognized assessment of teacher perceptions and use of curricula, standards and instructional issues in mathematics, science and language arts.. The surveys were developed by John Smithson of the University of Wisconsin Center for Educational Research (UWCER). The survey utilizes a multiple choice format and is available in both print and on-line formats. The survey is rather lengthy and consist of 150 questions in part one of the assessment related to learning, instruction ad professional development. The latter part of the survey (Part 2) deals with the specific curricula aspect. The survey results can be disaggregated and analyzed in various strands and/or topics of interest. The Michigan Department of Education is utilizing the SEC for various federal grant projects, such as the *Mathematics Science Partnerships* and *Reading First* grant initiatives.

Administration

The SEC pretest was administered to the treatment and comparison group of elementary and middle school mathematics teachers in the winter of 2005 through a paper and pencil format. Posttesting for the SEC for the treatment and comparison group teachers occurred in May-June of 2006.

SEC Mathematics Scales

The SEC items were reviewed for alignment with the stated goals and objectives of the grant. Clusters of items forming strands (a.k.a. scales) have been determined as reliable and valid indicators through prior reliability studies conducted by the UWCER staff. The following fourteen strands, documented on pages 13 through 17 of this report, were deemed as reflective of the grant intent and selected for further study and analyses:

Assessment Use

Questions		
65	Short answer questions such as performing a mathematical procedure.	Reliability Coefficient = 0.727
66	Extended response item for which student must explain or justify solution.	
67	Performance task or events (for example, hands-on activities).	
68	Individual or group demonstration, presentation.	
69	Mathematics projects.	
70	Portfolios.	
71	Systematic observation of students.	

Influence of Standards

Questions		
72	Your state's curriculum framework or content standards.	Reliability Coefficient = 0.674
73	Your district's curriculum framework or guidelines.	
77	National mathematics education standards.	
84	Provide mathematics instruction that meets content standards (district, state, or national).	
129	State mathematics content standards (for example, what they are and how they are used).	
130	Alignment of mathematics instruction to curriculum.	

Professional Collegiality

Questions		
94	I am supported by colleagues to try out new ideas in teaching mathematics.	Reliability Coefficient = 0.823
97	Mathematics teachers in this school trust each other.	
98	It's OK in this school to discuss feelings, worries, and frustrations with other mathematics teachers.	
99	Mathematics teachers respect other teachers who take the lead in school improvement efforts.	
100	It's OK in this school to discuss feelings, worries, and frustrations with the principal.	
101	The principal takes personal interest in the professional development of the teachers.	

Perform Procedures

Questions
- 37 Solve word problems from a textbook or worksheet.
- 45 Solve word problems from a textbook or worksheet.
- 53 Work with manipulatives (for example, counting blocks, geometric shapes, or algebraic tiles) to understand concepts.
- 54 Measure objects using tools such as rulers, scales, or protractors.
- 56 Collect data by counting, observing, or conducting surveys.
- 59 Practice procedures.
- 61 Retrieve or exchange data or information (for example, using the Internet or partnering with another class).

Reliability Coefficient = 0.758

Communicative Understanding

Questions
- 29 Present or demonstrate solutions to a math problem to the whole class.
- 32 Work in pairs or small groups on math exercises, problems, investigations, or tasks.
- 39 Explain their reasoning or thinking in solving a problem, using several sentences orally in writing.
- 47 Talk about their reasoning or thinking in solving a problem.
- 57 Present information to others using manipulatives (for example, chalkboard, whiteboard, poster board, projector).

Reliability Coefficient = 0.802

Analyze Information (Conjectures, Generalize, Prove Math)

Questions
- 41 Make estimates, predictions or hypotheses.
- 42 Analyze data to make inferences or draw conclusions.
- 44 Complete or conduct proofs or demonstrations of their mathematical reasoning.
- 49 Make estimates, predictions or hypotheses.
- 52 Complete or conduct proofs or demonstrations of their mathematical reasoning.

Reliability Coefficient = 0.868

Make Connections (Solve new notions)

Questions		
38	Solve non-routine mathematical problems (for example, problems that require novel or no-formulaic thinking).	Reliability Coefficient = 0.861
40	Apply mathematical concepts to "real-world" problems.	
46	Solve non-routine mathematical problems (for example, problems that require novel or no-formulaic thinking).	
48	Apply mathematical concepts to "real-world" problems.	
50	Analyze data to make inferences or draw conclusions.	
51	Work on a problem that takes at least 45 minutes to solve.	

Active Learning

Questions		
30	Use manipulatives (for example, counting blocks, geometric shapes, or algebraic tiles), measurement instruments (for example, rulers or protractors), and data collection devices (for example, surveys or probes).	Reliability Coefficient = 0.853
32	Work in pairs or small groups on math exercises, problems, investigations, or tasks.	
33	Do a mathematics activity with the class outside the classroom.	
53	Work with manipulatives (for example, counting blocks, geometric shapes, or algebraic tiles) to understand concepts.	
54	Measure objects using tools such as rulers, scales, or protractors.	
56	Collect data by counting, observing, or conducting surveys.	

Active Teacher Engagement Professional Development Scale

Questions		
112	Observed demonstration of teaching techniques.	Reliability Coefficient = 0.767
113	Led group discussions.	
114	Developed curricula or lesson plans, which other participants or the activity leader reviewed.	
115	Reviewed student work or scored assessments.	
116	Developed assessments or tasks as part of a formal professional development activity.	
117	Practiced what you learned and received feedback as part of a professional development activity.	
118	Received coaching or mentoring in the classroom.	
119	Given a lecture or presentation to colleagues.	

Coherent Professional Development Program Scale

Questions

120 Designed to support the school-wide improvement plan adopted by your school.

121 Consistent with your mathematics department or grade level plan to improve teaching.

122 Consistent with your own goals for your professional development.

123 Based explicitly on what you have learned in earlier professional development activities.

124 Followed up with related activities that built upon what you learned as part of the activity.

Reliability Coefficient = 0.752

Professional Development with Content Focus Scale

Questions

129 State math content standards (for example, what they are and how they are used).

130 Alignment of math instruction to curriculum.

132 In-depth study of math or specific concepts within math (for example, fractions).

133 Study of how children learn particular topics in math.

Reliability Coefficient = 0.746

Professional Development with Data Focus Scale

Questions

136 Classroom math assessment (for example, diagnostic approaches, textbook-developed tests, teacher-developed tests).

137 State or district math assessment (for example, preparing for assessments, understanding assessments, or interpreting assessments).

138 Interpretation of assessment data for use in math instruction.

Reliability Coefficient = 0.824

Professional Development with Standards & Instruction Focus Scale

Questions

129 State math content standards (for example, how they are used).

130 Alignment of math instruction to curriculum.

131 Instructional approaches (for example, use of manipulatives).

Reliability Coefficient = 0.830

Professional Development with Student Learning Focus Scale

Questions

133 Study of how children learn particular topics in math.

134 Individual differences in student learning

135 Meeting the learning needs of special populations of students (for example, second language learners; students with disabilities)

136 Classroom math assessment (for example, diagnostic approaches, textbook-developed tests, teacher-developed tests).

139 Technology to support learning in math.

Reliability Coefficient = 0.818

Statistical Analyses & Results 2004-2006

To determine whether the means of the treatment and comparison group pretests and treatment group posttests differed significantly a one-way analysis of variance (ANOVA) was selected as the statistic of choice utilizing a *Tukey-Kramer Multiple Comparisons Test*. The one-way analysis of variance (ANOVA) was utilized for the total score of the NAEP assessment measure, along with the three subscales scores of *Algebra*, *Geometry & Measurement*, and *Numbers & Operations*.

On the following two pages, data is provided from the ANOVA analyses of the SEC teacher data. The chart on page 18 portrays mean and standards deviation scores, and sample size for the pretest and posttest data for the SEC for all of the fourteen scales. The chart on page 19 provides ANOVA data related to mean differences and p-values for the fourteen SEC Scales based upon the pretest versus posttest data comparisons, along with the treatment versus comparison group data comparisons.

Assessment Use	Treatment		Comparison		ANOVA Results Scale 1	Mean Difference	q	P value	
	Pretest	Posttest	Pretest	Posttest					
MEAN	1.387	1.893	2.813	1.449	Treatment Pretest vs. Treatment Posttest	0.506	3.773	*	p < 0.05
SD	0.695	0.903	1.467	0.767	Comparison Pretest vs. Comparison Posttest	1.364	7.069	***	p < 0.001
n = sample size	59	44	29	21	Treatment Posttest vs. Comparison Posttest	0.440	2.486	ns	p > 0.05
Influence of Standards	**Treatment**		**Comparison**		**ANOVA Results Scale 2**	**Mean Difference**	**q**	**P value**	
	Pretest	**Posttest**	**Pretest**	**Posttest**					
MEAN	3.071	3.307	2.420	3.278	Treatment Pretest vs. Treatment Posttest	-0.236	1.545	ns	p > 0.05
SD	0.952	0.916	1.414	1.239	Comparison Pretest vs. Comparison Posttest	-0.858	3.904	*	p < 0.05
n = sample size	59	44	29	21	Treatment Posttest vs. Comparison Posttest	0.029	0.143	ns	p > 0.05
Professional Collegiality	**Treatment**		**Comparison**		**ANOVA Results Scale 3**	**Mean Difference**	**q**	**P value**	
	Pretest	**Posttest**	**Pretest**	**Posttest**					
MEAN	2.528	2.826	1.816	3.032	Treatment Pretest vs. Treatment Posttest	-0.298	5.029	**	p < 0.01
SD	0.229	0.326	0.813	0.111	Comparison Pretest vs. Comparison Posttest	-0.206	14.264	***	p < 0.001
n = sample size	59	44	29	21	Treatment Posttest vs. Comparison Posttest	-1.216	2.611	ns	p > 0.05
Perform Procedures	**Treatment**		**Comparison**		**ANOVA Results Scale 4**	**Mean Difference**	**q**	**P value**	
	Pretest	**Posttest**	**Pretest**	**Posttest**					
MEAN	1.702	2.169	1.355	1.959	Treatment Pretest vs. Treatment Posttest	-0.467	5.250	**	p < 0.01
SD	0.641	0.461	0.771	0.700	Comparison Pretest vs. Comparison Posttest	-0.604	4.720	**	p < 0.01
n = sample size	59	44	29	21	Treatment Posttest vs. Comparison Posttest	0.210	1.773	ns	p > 0.05
Communicative Understanding	**Treatment**		**Comparison**		**ANOVA Results Scale 5**	**Mean Difference**	**q**	**P value**	
	Pretest	**Posttest**	**Pretest**	**Posttest**					
MEAN	1.929	2.277	2.462	2.229	Treatment Pretest vs. Treatment Posttest	-0.348	5.735	***	p < 0.001
SD	0.336	0.389	0.635	0.407	Comparison Pretest vs. Comparison Posttest	0.233	2.669	ns	p > 0.05
n = sample size	59	44	29	21	Treatment Posttest vs. Comparison Posttest	0.048	0.594	ns	p > 0.05
Analyze Information	**Treatment**		**Comparison**		**ANOVA Results Scale 6**	**Mean Difference**	**q**	**P value**	
	Pretest	**Posttest**	**Pretest**	**Posttest**					
MEAN	1.315	1.664	2.048	1.733	Treatment Pretest vs. Treatment Posttest	-0.349	3.458	ns	p > 0.05
SD	0.599	0.559	1.114	0.612	Comparison Pretest vs. Comparison Posttest	0.315	2.170	ns	p > 0.05
n = sample size	59	44	29	21	Treatment Posttest vs. Comparison Posttest	0.069	0.514	ns	p > 0.05
Make Connections	**Treatment**		**Comparison**		**ANOVA Results Scale 7**	**Mean Difference**	**q**	**P value**	
	Pretest	**Posttest**	**Pretest**	**Posttest**					
MEAN	1.401	1.803	1.920	1.841	Treatment Pretest vs. Treatment Posttest	-0.402	4.664	**	p < 0.01
SD	0.604	0.702	0.347	0.710	Comparison Pretest vs. Comparison Posttest	0.079	0.637	ns	p > 0.05
n = sample size	59	44	29	21	Treatment Posttest vs. Comparison Posttest	-0.038	0.331	ns	p > 0.05

Active Learning	Treatment		Comparison		ANOVA Results Scale 8	Mean Difference	q	P value	
	Pretest	Posttest	Pretest	Posttest					
MEAN	1.952	2.246	1.592	2.143	Treatment Pretest vs. Treatment Posttest	-0.294	2.858	ns	p > 0.05
SD	0.748	0.676	0.733	0.785	Comparison Pretest vs. Comparison Posttest	-0.551	3.724	*	p < 0.05
n = sample size	59	44	29	21	Treatment Posttest vs. Comparison Posttest	0.103	0.752	ns	p > 0.05
Active Teacher Engagement	**Treatment**		**Comparison**		**ANOVA Results Scale 9**	**Mean Difference**	**q**	**P value**	
	Pretest	**Posttest**	**Pretest**	**Posttest**					
MEAN	0.784	1.682	1.832	1.137	Treatment Pretest vs. Treatment Posttest	-0.898	12.187	***	p < 0.001
SD	0.506	0.377	0.683	0.581	Comparison Pretest vs. Comparison Posttest	0.695	6.557	***	p < 0.001
n = sample size	59	44	29	21	Treatment Posttest vs. Comparison Posttest	0.545	5.555	***	p < 0.001
Coherent Prof Dev Program	**Treatment**		**Comparison**		**ANOVA Results Scale 10**	**Mean Difference**	**q**	**P value**	
	Pretest	**Posttest**	**Pretest**	**Posttest**					
MEAN	2.129	2.314	1.848	2.133	Treatment Pretest vs. Treatment Posttest	-0.185	4.328	*	p < 0.05
SD	0.354	0.262	0.242	0.306	Comparison Pretest vs. Comparison Posttest	-0.285	4.635	**	p < 0.01
n = sample size	59	44	29	21	Treatment Posttest vs. Comparison Posttest	0.181	3.180	ns	p > 0.05
Prof Dev Content Focus	**Treatment**		**Comparison**		**ANOVA Results Scale 11**	**Mean Difference**	**q**	**P value**	
	Pretest	**Posttest**	**Pretest**	**Posttest**					
MEAN	1.720	2.193	1.086	1.643	Treatment Pretest vs. Treatment Posttest	-0.473	4.562	**	p < 0.01
SD	0.776	0.458	1.022	0.615	Comparison Pretest vs. Comparison Posttest	-0.557	3.734	*	p < 0.05
n = sample size	59	44	29	21	Treatment Posttest vs. Comparison Posttest	0.550	3.983	*	p < 0.05
Prof Dev Data Focus	**Treatment**		**Comparison**		**ANOVA Results Scale 12**	**Mean Difference**	**q**	**P value**	
	Pretest	**Posttest**	**Pretest**	**Posttest**					
MEAN	1.277	1.939	1.000	1.587	Treatment Pretest vs. Treatment Posttest	-0.662	15.384	***	p < 0.001
SD	0.245	0.204	0.522	0.225	Comparison Pretest vs. Comparison Posttest	-0.587	9.483	***	p < 0.001
n = sample size	59	44	29	21	Treatment Posttest vs. Comparison Posttest	0.352	6.143	***	p < 0.001
Prof Dev Standards & Inst Focus	**Treatment**		**Comparison**		**ANOVA Results Scale 13**	**Mean Difference**	**q**	**P value**	
	Pretest	**Posttest**	**Pretest**	**Posttest**					
MEAN	2.153	2.439	1.770	2.016	Treatment Pretest vs. Treatment Posttest	-0.286	6.035	***	p < 0.001
SD	0.401	0.168	0.417	0.271	Comparison Pretest vs. Comparison Posttest	-0.246	3.609	ns	p > 0.05
n = sample size	59	44	29	21	Treatment Posttest vs. Comparison Posttest	0.423	6.703	***	p < 0.001
Prof Dev Student Lrng Focus	**Treatment**		**Comparison**		**ANOVA Results Scale 14**	**Mean Difference**	**q**	**P value**	
	Pretest	**Posttest**	**Pretest**	**Posttest**					
MEAN	0.973	1.645	1.710	1.181	Treatment Pretest vs. Treatment Posttest	-0.672	6.095	***	p < 0.001
SD	0.306	0.437	1.646	0.300	Comparison Pretest vs. Comparison Posttest	0.529	3.336	ns	p > 0.05
n = sample size	59	44	29	21	Treatment Posttest vs. Comparison Posttest	0.464	3.161	ns	p > 0.05

Discussion of Results

The chart below summarizes the significance noted through the ANOVA analyses of the SEC.

SEC Significance Results Chart

	SEC Scale	Treatment Pretest vs. Treatment Posttest	Comparison Pretest vs. Comparison Posttest	Treatment Posttest vs. Comparison Posttest
1.	**Assessment Use**	* p < 0.05	*** p < 0.001	no significance
2.	**Influence of Standards**	no significance	* p < 0.05	no significance
3.	**Professional Collegiality**	** p < 0.01	*** p < 0.001	no significance
4.	**Perform Procedures**	** p < 0.01	** p < 0.01	no significance
5.	**Communicative Understanding**	*** p < 0.001	no significance	no significance
6.	**Analyze Information**	no significance	no significance	no significance
7.	**Make Connections**	** p < 0.01	no significance	no significance
8.	**Active Learning**	no significance	* p < 0.05	no significance
9.	**Active Teacher Engagement**	*** p < 0.001	*** p < 0.001	*** p < 0.001
10.	**Coherent Professional Development Program**	* p < 0.05	** p < 0.01	no significance
11.	**Professional Development with Content Focus**	** p < 0.01	* p < 0.05	* p < 0.05
12.	**Professional Development with Data Focus**	*** p < 0.001	*** p < 0.001	*** p < 0.001
13.	**Professional Development with Standards & Instruction Focus**	*** p < 0.001	no significance	*** p < 0.001
14.	**Professional Development with Student Learning Focus**	*** p < 0.001	no significance	no significance

The *Survey of Enacted Curriculum* was used to assess teacher participant if curricula, pedagogy and professional development. 14 scales were utilized that have been deemed reliable and valid for such use. Final analyses of data provided the following results:

- Mean scores increases were also noted for all teacher treatment groups on 14 of the 14 SEC subscales,
- analysis of variance (ANOVA) procedures verify that 11 of 14 or 78.6% of the treatment grade group pretest/posttest mean sores differed significantly,
- of these, 3 of 11 or 27.2% of the treatment grade group pretest/posttest mean sores differed significantly from the comparison group,
    - *these three subscales were Active Teacher Engagement, Professional Development with Data Focus, & Professional Development with Student Learning Focus.*

Technology Use Data

A variety of quantitative and qualitative feedback mechanisms were used to assess the impact and use of technology by the grant participants. This feedback focused on the use of:

1) *Blackboard* technology to improve communication and foster dialogue among teachers regarding instructional matters of importance;
2) the training of teachers in the use of the *Classroom Performance System* (*CPS*) technology, and
3) the subsequent use of *CPS* technology to aid teachers in delivering lessons that reflect the Michigan *Grade Level Content Expectations* (*GLCE's*) appropriate for their classroom use.

Administration

At each professional development session, feedback was sought regarding the use and comfort of teacher participants in using the technologies related to the grant, along with a continuing assessment of the participants various technological training needs. This feedback is captured through the participants' use of *Blackboard* and *Classroom Performance System* (*CPS*).

Preliminary Statistical Analyses & Results 2005

Some examples of the feedback data related to *Blackboard* usage was counts data that summarizes the types of activities in which teacher participants are engaged on line. In the spring of 2005,

- 107 hits or 17% of the recorded activity on Blackboard were related to announcements,
- 161 hits or 25% of the activities were group discussions, while
- 173 hits or 27% of the activities recorded were related to mathematics content area items, such as the sharing, viewing, or downloading of sample lesson plans.

One example of how feedback data was collected using the *Classroom Performance System* (*CPS*) technology was a Likert-type survey. The data below reflects some of the feedback data from the Session 3 professional development:

- 79% of the 32 participants agreed that the afternoon technology session provided new and useful information, while
- 89% of the same 32 participants agreed that their need for technology integration with mathematics content was achieved.

During the 2005 summer week-long institutes, the following feedback data for technology was collected:

- 85 % of the 13 grade 6-8 participants strongly agreed that the technology facilitators were helpful in addressing participants' question related to technology. 88% of the 17 grade 3-5 participants also expressed strong agreement on this question; while 82% of the K-2 participants also strongly agreed.
- 100 % of the 13 grade 6-8 participants strongly agreed or agreed that they were better prepared to integrate technology into a mathematics lesson. 88% of the 17 grade 3-5 participants also expressed strong agreement on this question; while 84% of the K-2 participants concurred.
- 39 % of the 13 grade 6-8 participants strongly agreed that they were comfortable in creating assessments and adding basic classroom lists in the *Classroom Performance System* (*CPS*). 12% of the 17 grade 3-5 participants also expressed strong agreement on this question; while 36% of the K-2 participants also strongly agreed.

Discussion

The three examples of feedback data collected in 2005 regarding technology use showed strong positive reactions to the varying types and delivery of technology professional development utilized in the grant. The data also exemplified the need for additional training in the use and implementation of the *Classroom Performance System* (*CPS*). This need was currently being addressed by professional

development activities in the second year if the granting period. Additional feedback data on Technology Usage was planned for collection in the 2006-2007 school year.

Teacher Artifacts (Sample Lessons)

Teachers participating in the week-long summer institutes in June, 2005 and during year two of the grant during the 2005-200 school year, were required to complete a lesson plan reflective of best practices in instructional methodology along with addressing one of the content areas of the Michigan *Grade Level Content Expectations* (*GLCE's*). The lessons were reviewed by the professional development staff and edited by the authoring teachers as needed. The finished products of these sample lessons were posted on the Blackboard system for use by other teacher participants during the 2005-206 school year.

In the second year of the grant, each participating teacher was required to collaborate in the development of two additional lessons. These lessons will in turn be posted on Blackboard for teacher use, and subsequently produced for dissemination on a CD-ROM.

Statistical Analyses & Results

The sample lessons were treated as artifacts, and were recorded as qualitative data examples as a result of grant participation. The types and number of resulting lesson plans were counted and categorized for later analyses. No additional statistical analyses of these prototypical grant products was warranted or planned at this time.

Discussion

The types and number of sample lessons recorded on *Blackboard* and the final CD-ROM product were treated as qualitative data and treated as such. The compilation CD produced through the grant activities verified that the teachers participants found the lesson artifacts useful and valuable. Further dissemination of the compilation CD containing these teacher artifacts along with the videotaped model lessons confirms successful completion of major grant project goal.

Professional Development Feedback Data

Professional development feedback was formally collected throughout the granting period. This information proved useful in providing formative evaluative comments about the professional development activities and in assessing the need for future professional development. It was also used at the end of the two-year granting period to make summative comments about the overall impact and effectiveness of the professional development program. The feedback survey instrumentation consisted of quantitative sections utilizing Likert-type scale items; and qualitative sections for gathering open-ended responses and comments.

Professional Development Session Data *(Quantitative Feedback)*

Teacher participants were asked to provide feedback at the conclusion of all of the professional development activities held in years one-two of the grant. This feedback process yielded the following results for professional development sessions 4-6 held in 2006 are displayed in the chart below. It can be said that the professional development were positively received by the teacher participants, since 88-97% of the teachers consistently ranked the activities as meeting their needs and expectations across all grade groups (i.e. K-2, 3-5, & 6-8).

Grade Group	Summary Statement	Session 4	Session 5	Session 6
K-2	Agreed that the professional development met their needs & expectations	89%	98%	89%
	n	24	19	21
3-5	Agreed that the professional development met their needs & expectations	96%	92%	93%
	n	10	15	17
6-8	Agreed that the professional development met their needs & expectations	97%	88%	88%
	n	24	20	18

Professional Development Session Data *(Quantitative Feedback)*
During the summer institutes, teacher participants were asked to provide summative feedback through the use of open-ended questions and guided discussion. Responses from the open-ended questions and their additional comments were coded and categorized, yielding the following results:

- Regarding the category *Mathematics Content Knowledge*, 91% (20 of 22) comments made by K-2 grade group participants were deemed positive, while 95% (19 of 20) comments from teacher participants of the grade group 3-5 were categorized as positive, with 65% (22 of 34) of comments made by 6-8 teacher grade group participants were positive.
- For the category *Teaching, Learning, & Instructional Strategies*, 70% (35 of 50) comments made by K-2 grade group participants were deemed positive, while 91% (32 of 35) comments from teacher participants of the grade group 3-5 were categorized as positive, with 57% (16 of 28) of comments made by 6-8 teacher grade group participants were positive.
- Regarding the category *Professional Development*, 75% (239 of 52) comments made by K-2 grade group participants were deemed positive, with 72% (28 of 39) comments from teacher participants of the grade group 3-5 were categorized as positive, and 50% (28 of 56) of comments made by 6-8 teacher grade group participants were positive.

Additional participant feedback collected at the 2005-2006 professional development sessions can be found in *Appendix C* at the end of this report.

Discussion of Results: *Year Two Data 2005-2006*
The pre and post assessments given at each professional development sessions indicated:

- Teachers feel more comfortable with the GLCE, and
- Can incorporate GLCE into a mathematics lesson

Workshop session data for the 2005-2006 school year provides the following evidence:

- 96.2% of the teachers feel more comfortable with the GLCE,
- this data was collected over 15 professional development sessions and represents a sample size of 183 teacher respondents.

Teacher Observation (SAMPI) Data

SAMPI Data

Observers trained in by the Science and Mathematics Program Improvement (SAMPI) department at Western Michigan University conducted lesson observations of the grant participant teachers involved in the *M³P* mathematics and science partnership grant. The SAMPI Lesson Observation System is an observational protocol based on the national teaching and learning standards. A five-part debriefing system enables SAMPI observers to debrief with teachers and assess key elements of a lesson. The criteria of choice uses a three-part scale based upon a 7-point continuum along with a yes/no series of responses. Each of the three scales align with 5-9 national standards. The three SAMPI scales entitled, *Implementation, Content of the Lesson, & Classroom Culture*; along with the charted yes/no responses to *Planning & Organization*, can be seen in the charts below and on the ensuing page.

Administration

During the months of January – April, 2006 observations occurred utilizing the SAMPI protocol. Teacher participants self-selected for the lesson observations, yielding ten observations in all. These lessons were videotaped for use in the final CD-ROM product of best practice instruction.

Statistical Analyses & Results 2005-2006

Mean scores were tabulated and utilized to baseline teaching behaviors during the January – April, 2006 observation period. The mean score data for these observations can be found in the charts below beginning on this page and continuing through page 26:

SAMPI Implementation	**Pretest** **MSP 2006** (n= 10 lessons)	**Posttest** **MSP 2007**	**Noted Trend Difference**
1. Teacher appeared confident in facilitating this lesson.	6.4	**planned for 2007**	**planned for 2007**
2. Periods of student-teacher interactions were probing and substantive	6.2		
3. The teacher's classroom management style was effective in engaging students in the lesson.	6.1		
4. The pace of the lesson was appropriate for the developmental levels of the students.	6.2		
5. Periods of student-student interaction were focused on pertinent lesson content and enhance individual understanding of it.	5.6		
6. The lesson was organized so that there was adequate time for students and/or the teacher to reflect on the lesson.	5.8		
7. The lesson was organized so there was adequate time for wrap-up and closure of the lesson.	5.4		
Overall rating for Implementation	**5.8**		

SAMPI Lesson Content	Pretest MSP 2006 (n= 10 lessons)	Posttest MSP 2007	Noted Trend Difference
1. The content of the lesson was important and worthwhile.	6.9	planned for 2007	planned for 2007
2. Students were intellectually engaged with important ideas related to the focus of the lesson.	6.3		
3. The subject matter was portrayed as a dynamic body of knowledge enriched by conjecture, investigation, analysis, and/or proof justification.	5.8		
4. The teacher showed an understanding of the concepts and content that were the focus of the lesson, and the topical/conceptual area addressed.	6.9		
5. The lesson included connections between concepts & content in this lesson and previous and/or future lessons	6.9		
6. Te lesson included connections between the lesson and other subjects	6.4		
7. The lesson incorporated applications of the content or concepts to real-world situations.	5.6		
8. The lesson included abstractions, theories and models as appropriate.	6.4		
Overall rating for Lesson Content	**6.4**		

SAMPI Classroom Culture	Pretest MSP 2006 (n= 10 lessons)	Posttest MSP 2007	Noted Trend Difference
1. Active participation of all students was encouraged and valued.	6.3	planned for 2007	planned for 2007
2. The teacher showed respect for and valued students' ideas, questions, and contributions to the lessons.	6.6		
3. Students showed respect for and valued students' ideas, questions, and contributions to the lessons.	5.5		
4. The classroom climate for the lesson encouraged all students to generate ideas, questions, conjectures and propositions.	5.5		
5. Student-student interactions reflected collaborative working relationships.	5.3		
6. Teacher-student relationships reflected collaborative working relationships.	6.3		
Overall rating for Classroom Culture	**6.0**		

SAMPI Technology to Support the Lesson	Pretest MSP 2006 (n= 10 lessons)	Posttest MSP 2007	Noted Trend Difference
1. Technology resources were adequate to support the lesson.	7.0	planned for 2007	planned for 2007
2. Technology use was effectively integrated into this lesson.	6.1		
3. The use of technology enhanced student learning of the lesson's core concepts/content.	5.6		
4. The use of technology supported real-world application of the lesson concepts/content.	4.9		
5. Technology use enhance the ability of students to collaborate with each other.	4.7		
6. Classroom management was effective in engaging students in the use of technology.	6.3		
7. The teacher shows skills and ability in using technology to support student learning.	6.1		
Overall rating for Implementation	**5.5**		

SAMPI OVERALL Lesson Rating	Pretest MSP 2006 (n= 10 lessons)	Posttest MSP 2005	Noted Trend Difference
Overall rating SUMMARY	**5.8**	**planned for 2007**	

Discussion of Results 2005-2006

It can be said that for the ten observations noted above:

- *Lesson Content* was the strongest component viewed in the observations, scoring a 6.4 on the 7-point SAMPI scale,
- *Classroom Culture* was also deemed noticeably high with a score of 6.0 out of 7 possible points.
- Overall, the mean score ranges of 5.5 through 6.4 for the various lesson components exhibited strong positive results,
- Thus it can be said that, strong positive effective instructional practices in delivering and implementing were utilized and observed.

Student Achievement Data

The Michigan Educational Assessment Program (MEAP) results were used to assess student growth in mathematics. The test was annually given in grades 4 & 8 in the baseline year of 2004 and the subsequent year, 2005. Starting in the 2005-2006 school year, No Child Left Behind (NCLB) requirements produced tests results for mathematics in each of the grades 3-8. These data were incorporated into the grant reports as MEAP aggregate scores. Entire district student scores for the elementary grades (3-5) were combined to comprise the elementary aggregate group, and similarly

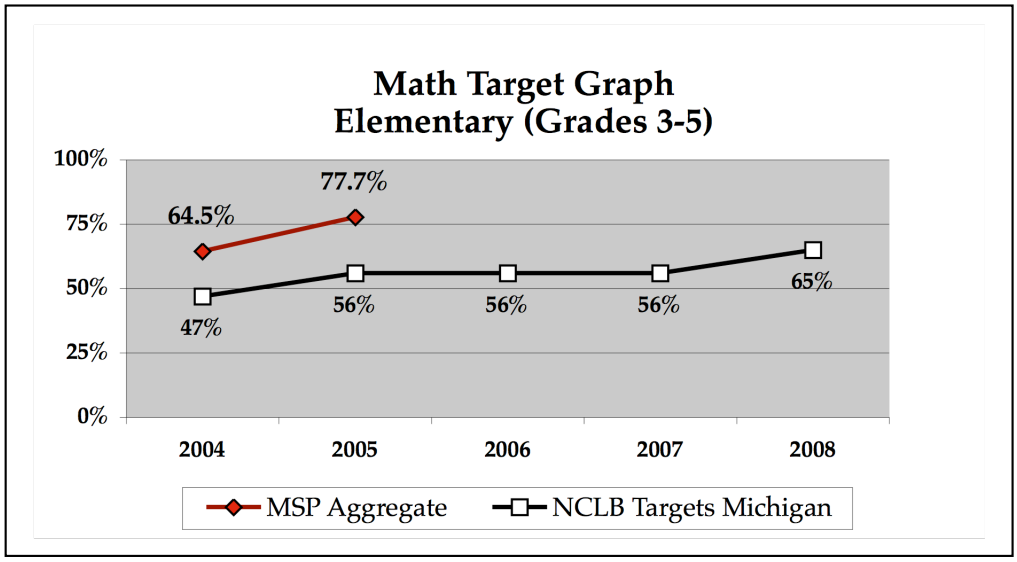
entire district student scores for the middle school grades (608) were combined to comprise the middle school aggregate group. Thus, the aggregate scores reflected the total population of all students assessed from school districts served by the grant within in each of the given years from the *Mid-Michigan Mathematics Project (M³P)*.

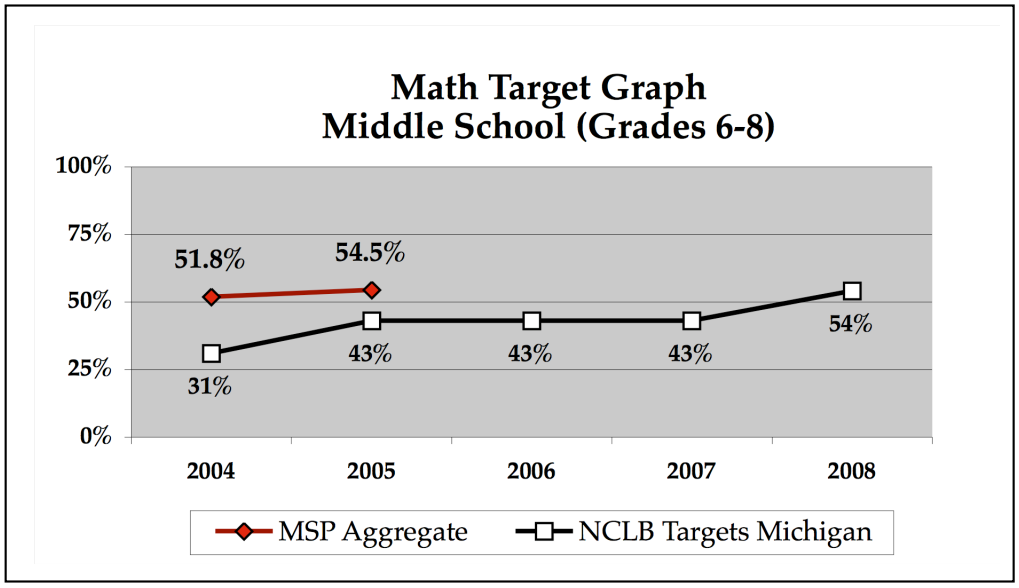
Administration

The February, 2004 MEAP data was considered baseline for the grant, since this was the first data point prior to the grant implementation. The next administration of the MEAP occurred in October, 2005 with subsequent administrations planned annually in October for the years of 2006, 2007 and 2008.

Statistical Analyses & Results

The data used was reported as the percentage of students annually meeting or exceeding state standards in mathematics as determined by the MEAP test measures. Trend data for the students of participating teachers was combined for all *Mid-Michigan Mathematics Project (M³P)* to produce aggregate scores.





MEAP Student Data 2004-2006

District	Elementary Grades 3-5			Middle School Grades 6-8		
	Pretest	Posttest	Gain	Pretest	Posttest	Gain
Bath	78.0%	87.9%	9.9%	71.0%	68.1%	-2.9%
Belding	63.1%	82.0%	18.9%	68.0%	65.0%	-3.0%
Durand	74.1%	86.8%	12.7%	63.8%	64.8%	1.0%
Lansing	58.8%	72.8%	14.0%	58.8%	43.3%	-15.5%
Morris	63.6%	79.4%	15.8%	57.1%	53.0%	-4.1%
Ovid-Elsie	93.8%	92.2%	-1.6%	60.8%	78.2%	17.4%
Owosso	70.6%	80.9%	10.3%	59.4%	70.8%	11.4%
Palo	31.3%	75.4%	44.1%	36.4%	33.3%	-3.1%
Potterville	66.0%	75.6%	9.6%	54.1%	59.7%	5.6%
AGGREGATE	64.5%	77.7%	13.2%	51.8%	54.5%	2.7%

Discussion of 2004-2006 Results

Student achievement was measured in the grant using the Michigan Education Assessment Program (MEAP) mandated state assessment. Student data from the February, 2004 administration of the MEAP was utilized as baseline data. This information predates the start of the grant activities. The most recent MEAP data was from the following administration in October, 2005. Results from the MEAP are presented in Michigan as the number and percentage of students meeting or exceeding state standards, or mastery (%M). The results for student achievement presented below reflect the related *Project Profile* of 10/26/06.

Change in % of students proficient on the state administered MEAP mathematics test from baseline of February, 2004 to October, 2005:

- Aggregate treatment group of elementary students (grades 3-5) increased 13.2% from 64.5% to 77.7%,
  - this increase in student achievement was deemed significant for elementary school students in the evaluation report, and
- Aggregate treatment group for middle students (grades 6-8) increased 2.7% from 51.8% to 54.5%,
  - this increase in student achievement was not deemed significant for middle school students in the evaluation report.

For the 9 school districts involved in the grant, student data findings for elementary students (grades 3-5) and middle school students (grades 6-8) are presented below:

- 88.9%, or 8 of 9 of the school districts, increased elementary student achievement,
- the range of student achievement increases varied from 9.6% to 44.1%,
- 44.4%, or 4 of 9 of the school districts, increased middle student achievement.
- the range of student achievement increases varied from 1.0% to 17.4%.

Additional assessment of students through a more specific criterion-referenced test (CRT) was planned for 2006-2008 in phase two of the grant. This data will not be available since the grant was not funded for the continuation period of 2006 -2008.

SUMMARY FINDINGS 2004-2006

Null Hypotheses Findings

The chart below details the decisions and final determinations related to the null hypotheses for this study.

Null Hypotheses	Evidence	Decision
1) No significant differences will be found across treatment conditions for measures of content and procedural knowledge of mathematics teachers in grades K-8.	1) Some significant differences evidenced in 2006 NAEP data; 2) positive trend differences noted in teacher content knowledge (CRT) session data in both 2005 & 2006; 3) SAMPI observational evidence was positive in 2006; and, 4) teacher feedback trend data on professional development was positive in both 2005 & 2006.	***Reject Null Hypothesis*** based upon confirming evidence through triangulation of 3 positive performance indicators.
2) No significant differences will be found across treatment conditions for measures of mathematical achievement for students in grades 3-8.	1) Significant differences evidenced in MEAP elementary school performance in 2006; 2) positive trend differences noted in MEAP middle school performance in 2006.	***Reject Null Hypothesis*** in 2006 for elementary aggregate treatment group of students; ***Accept Null Hypothesis*** in 2006 for middle school students based upon the need for more evidence to verify positive trend data.
3) No significant differences will be found across treatment conditions for measures of teacher instructional practices to foster mathematics achievement.	1) Statistically significant differences evidenced on 11 of 14 SEC subscales in 2006; 2) teacher feedback trend data on professional development was positive in both 2005 & 2006.	***Reject Null Hypothesis*** based upon confirming evidence through triangulation of 3 positive performance indicators.

<u>Discussion Related to Null Hypotheses</u>

For the data presented in this reported, significant differences were evidenced on 3 of 4 study hypotheses for the period 2004-2006. Overall rejection of the hypotheses for 2004-2006 was 3 of 4 or 75%, verifying that confirming evidence exists to support positive impact on teachers and students due to the grant activities. Additional data planned for collected in Round II of this MSP grant in years 2006-2007 might have further corroborated or disputed these summative evaluative findings.

CLAIM STATEMENTS

Claim statements regarding the implementation of the two-year *Mid-Michigan Partnership (M^3P)* grant are included below:

1) A quasi-treatment research design was used with established treatment and comparison groups.

2) Sample size for the treatment groups was originally 59, but changes in teacher assignments brought the current number of participants to 52 in year two of the grant. 29 teachers comprise the comparison group.

3) Two performance indicators were used to gauge teacher content knowledge in mathematics. One was a CRT composed of released-*NAEP* items administered in a pretest/posttest manner. A second indicator was a pretest-posttest CRT used at each of the professional development sessions.

   - Mean score increase were noted on the NAEP for all teacher treatment groups (grades K-2, grade 3-5 & grades 6-8) 100% of the time,
     - Mean scores increases were also noted for all teacher treatment groups (grades K-2, grade 3-5 & grades 6-8) on the geometry and measurement subscale 100% of the time,
     - Mean scores increases were also noted for all teacher treatment groups (grades K-2, grade 3-5 & grades 6-8) on the number and operations subscale 100% of the time,
     - Mean scores increases were also noted for 2 of 3 or 66.7% of the teacher treatment groups (grade 3-5 & grades 6-8) on the algebra subscale,
     - analysis of variance (ANOVA) procedures verify that 3 of 12 or 25% of the treatment grade group pretest/posttest mean sores differed significantly from the comparison group,
     - of these 3 of 3 or 100% statistically significant mean score differences were attributed to teachers of grades 3-5.
   - Content area teacher knowledge assessed as pretest/posttest measures at each professional development session yielded positive increase 100% of the time for all 15 of the 5 professional development sessions (total sample size of 235 teacher respondents).

4) The *Survey of Enacted Curriculum* was used to assess teacher participant if curricula, pedagogy and professional development. 14 scales were utilized that have been deemed reliable and valid for such use. Final analyses of data provided the following results:
   - Mean score increase were noted on the SEC for all teacher treatment groups 100% of the time,
     - Mean scores increases were also noted for all teacher treatment groups on 14 of the 14 SEC subscales,
     - analysis of variance (ANOVA) procedures verify that 11 of 14 or 78.6% of the treatment grade group pretest/posttest mean sores differed significantly,
     - of these, 3 of 11 or 27.2% of the treatment grade group pretest/posttest mean sores differed significantly from the comparison group.

5) Preliminary feedback of the use and implementation of technology by teacher participants (i.e. Blackboard online learning & CPS) verified a growing use and comfort with the technology though additional work is need in this area.

6) Regarding professional development, strong quantitative and qualitative evidence supported the claim that teachers positively viewed the professional development sessions as helpful and useful in increasing their content knowledge of mathematics, along with their instructional capabilities as a teacher.

7) Sample lessons have been created that exhibit and exemplify best practices in the use of instruction in addressing the state of Michigan's Grade Level Content Expectations for mathematics.

8) Teacher observation took place in 2006 utilized the SAMPI observational system along with a videotape recording (n=10). This data was used to confirm that best practices were incorporated into classroom teaching as model lessons. These lessons were videotaped and paired with the sample teacher lessons also produced through grant activities.
   - Overall, the mean score ranges of 5.5 through 6.4 for the various lesson components exhibited strong positive results,
   - Thus it can be said that, strong positive effective instructional practices in delivering and implementing were utilized and observed.

9) A CD-ROM was developed of the model lessons and videotape archives of instructional best practices for dissemination to teachers not directly served by the grant.

10) Student achievement was analyzed in a pretest/posttest manner utilizing state testing data in mathematics (*MEAP*). Some of the evaluative findings are presented below:
   - Aggregate treatment group of elementary student achievement in mathematics (grades 3-5) increased 13.2% from a baseline score of 64.5% to 77.7%,
     - this increase in student achievement was deemed significant for elementary school students in the evaluation report.
   - Aggregate treatment group for middle school student achievement in mathematics (grades 6-8) increased 2.7% from a baseline score of 51.8% to 54.5%,
     - this increase in student achievement was not deemed significant for middle school students in the evaluation report.
   - For the 9 school districts involved in the grant, student data findings for elementary students (grades 3-5) and middle school students (grades 6-8) are presented below:
     - 88.9%, or 8 of 9 of the school districts, increased elementary student achievement,
     - the range of district achievement increases for elementary mathematics students varied from 9.6% to 44.1%,
     - 44.4%, or 4 of 9 of the school districts, increased middle student achievement,
     - the range of district achievement increases for middle school students varied from 1.0% to 17.4%.

11) Statistical evidence exists to reject the null hypotheses for three of the four major program goals of this study. Thus, confirming exists to support the claim that the grant activities positively influenced both the teacher and student content knowledge related to improving mathematics teaching and learning.

Recommendations

The following evaluative comments are provided for consideration as guidelines to be considered for use in any future study of the *Mid-Michigan Partnership (M^3P)* grant in 2006 and beyond:

Recommendation 1
Study Fidelity
Continue use of quasi-experimental treatment versus comparison group design, with the addition of addressing possible threats to the internal validity of the study based upon selection of the comparison group of choice.

Recommendation 2
Performance Indicators
Additionally, the utilization of standardized criterion-referenced assessments to gauge both teacher and student knowledge in mathematics related to specific content is also encouraged. This would address any measurement error related to the use of non-standardized instruments within the study. An example of this would be to replace the current NAEP CRT teachers measure with the standardized Learning of Mathematics for Teachers (LMT) instrument to embolden the possibility of within and between group differences of teacher content knowledge. Similarly, a more specific CRT for students may uncover group differences in specific content related to mathematics teaching and learning.

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Appendix A: Data Collection Timeline

	Performance Indicator	Group(s)	Year 1 2004-2005 1st Quarter Sep - Nov	2nd Quarter Dec - Feb	3rd Quarter Mar - May	4th Quarter Jun - Aug	Year 2 2005-2006 1st Quarter Sep - Nov	2nd Quarter Dec - Feb	3rd Quarter Mar - May	4th Quarter Jun - Aug
1.	NAEP Content Knowledge *Mathematics Tests* (CRT)	Teacher Treatment & Comparison	Administer pretest measures for treatment groups	Score pretest measures for treatment groups	Administer pretest measures for comparison groups	Score pretest measures for comparison groups	Administer pretest measures for treatment groups		Administer & score posttest measures; Complete data analyses	
2.	*Survey of Enacted Curriculum* (SEC) selected items	Teacher Treatment & Comparison		Administer pretest measures for treatment & comparison groups		Score pretest measures	Complete preliminary analyses of data		Administer & score posttest measures; Complete data analyses	
3.	Content Knowledge professional development sessions ***Mathematics*** (CRT)	Teacher Treatment ONLY		Administer & score group measures		Collect data & complete data analyses	Administer & score group measures			Collect data & complete data analyses
4.	Content Knowledge professional development sessions ***Technology*** (CRT)	Teacher Treatment ONLY		Administer & score group measures		Collect data & complete data analyses	Administer & score group measures			Collect data & complete data analyses
5.	Content Knowledge professional development sessions ***GLCE's*** (review of teacher artifacts)	Teacher Treatment ONLY				Administer & score group measures	Complete preliminary analyses of data			Collect data & complete data analyses
6.	Professional Development Sessions Feedback Surveys (formative) print format	Teacher Treatment ONLY	Collect survey data after each PD session			Complete preliminary analyses of data	Collect survey data after each PD session			Collect data & complete data analyses
7.	Professional Development Session Feedback (summative) chart paper activities & print surveys	Teacher Treatment ONLY				Collect Year 1 PD data	Complete preliminary analyses of data		Collect Year 2 PD data	Collect data & complete data analyses
8.	Teacher Observations (SAMPI)	Teacher Treatment ONLY					Begin sampling	Complete sampling		Complete data analyses
9.	Student Content Knowledge *MEAP Data* (CRT)	Student Impact ONLY				Collect student data	Complete preliminary analyses of data	Collect student data	Complete data analyses	

Appendix B: AEA Program Evaluation Standards Assurances

Utility Standards

The utility standards are intended to ensure that an evaluation will serve the information needs of intended users.	**The evaluator subscribes to and honors this standard.**
U1 Stakeholder Identification--Persons involved in or affected by the evaluation should be identified, so that their needs can be addressed.	√
U2 Evaluator Credibility--The persons conducting the evaluation should be both trustworthy and competent to perform the evaluation, so that the evaluation findings achieve maximum credibility and acceptance.	√
U3 Information Scope and Selection--Information collected should be broadly selected to address pertinent questions about the program and be responsive to the needs and interests of clients and other specified stakeholders.	√
U4 Values Identification--The perspectives, procedures, and rationale used to interpret the findings should be carefully described, so that the bases for value judgments are clear.	√
U5 Report Clarity--Evaluation reports should clearly describe the program being evaluated, including its context, and the purposes, procedures, and findings of the evaluation, so that essential information is provided and easily understood.	√
U6 Report Timeliness and Dissemination--Significant interim findings and evaluation reports should be disseminated to intended users, so that they can be used in a timely fashion.	√
U7 Evaluation Impact--Evaluations should be planned, conducted, and reported in ways that encourage follow-through by stakeholders, so that the likelihood that the evaluation will be used is increased.	√

Feasibility Standards

The feasibility standards are intended to ensure that an evaluation will be realistic, prudent, diplomatic, and frugal.	**The evaluator subscribes to and honors this standard.**
F1 Practical Procedures--The evaluation procedures should be practical, to keep disruption to a minimum while needed information is obtained.	√
F2 Political Viability--The evaluation should be planned and conducted with anticipation of the different positions of various interest groups, so that their cooperation may be obtained, and so that possible attempts by any of these groups to curtail evaluation operations or to bias or misapply the results can be averted or counteracted.	√
F3 Cost Effectiveness--The evaluation should be efficient and produce information of sufficient value, so that the resources expended can be justified.	√

Propriety Standards

The propriety standards are intended to ensure that an evaluation will be conducted legally, ethically, and with due regard for the welfare of those involved in the evaluation, as well as those affected by its results.	**The evaluator subscribes to and honors this standard.**
P1 Service Orientation--Evaluations should be designed to assist organizations to address and effectively serve the needs of the full range of targeted participants.	√
P2 Formal Agreements--Obligations of the formal parties to an evaluation (what is to be done, how, by whom, when) should be agreed to in writing, so that these parties are obligated to adhere to all conditions of the agreement or formally to renegotiate it.	√
P3 Rights of Human Subjects--Evaluations should be designed and conducted to respect and protect the rights and welfare of human subjects.	√
P4 Human Interactions--Evaluators should respect human dignity and worth in their interactions with other persons associated with an evaluation, so that participants are not threatened or harmed.	√
P5 Complete and Fair Assessment--The evaluation should be complete and fair in its examination and recording of strengths and weaknesses of the program being evaluated, so that strengths can be built upon and problem areas addressed.	√
P6 Disclosure of Findings--The formal parties to an evaluation should ensure that the full set of evaluation findings along with pertinent limitations are made accessible to the persons affected by the evaluation, and any others with expressed legal rights to receive the results.	√
P7 Conflict of Interest--Conflict of interest should be dealt with openly and honestly, so that it does not compromise the evaluation processes and results.	√
P8 Fiscal Responsibility--The evaluator's allocation and expenditure of resources should reflect sound accountability procedures and otherwise be prudent and ethically responsible, so that expenditu res are accounted for and appropriate.	√

Accuracy Standards

The accuracy standards are intended to ensure that an evaluation will reveal and convey technically adequate information about the features that determine worth or merit of the program being evaluated.	**The evaluator subscribes to and honors this standard.**
A1 Program Documentation--The program being evaluated should be described and documented clearly and accurately, so that the program is clearly identified.	√
A2 Context Analysis--The context in which the program exists should be examined in enough detail, so that its likely influences on the program can be identified.	√
A3 Described Purposes and Procedures--The purposes and procedures of the evaluation should be monitored and described in enough detail, so that they can be identified and assessed.	√
A4 Defensible Information Sources--The sources of information used in a program evaluation should be described in enough detail, so that the adequacy of the information can be assessed.	√
A5 Valid Information--The information gathering procedures should be chosen or developed and then implemented so that they will assure that the interpretation arrived at is valid for the intended use.	√
A6 Reliable Information--The information gathering procedures should be chosen or developed and then implemented so that they will assure that the information obtained is sufficiently reliable for the intended use.	√
A7 Systematic Information--The information collected, processed, and reported in an evaluation should be systematically reviewed and any errors found should be corrected.	√
A8 Analysis of Quantitative Information--Quantitative information in an evaluation should be appropriately and systematically analyzed so that evaluation questions are effectively answered.	√
A9 Analysis of Qualitative Information--Qualitative information in an evaluation should be appropriately and systematically analyzed so that evaluation questions are effectively answered.	√
A10 Justified Conclusions--The conclusions reached in an evaluation should be explicitly justified, so that stakeholders can assess them.	√
A11 Impartial Reporting--Reporting procedures should guard against distortion caused by personal feelings and biases of any party to the evaluation, so that evaluation reports fairly reflect the evaluation findings.	√
A12 Metaevaluation--The evaluation itself should be formatively and summatively evaluated against these and other pertinent standards, so that its conduct is appropriately guided and, on completion, stakeholders can closely examine its strengths and weaknesses.	√

Appendix C: *Professional Development Session Feedback*

Workshop Evaluation Comments, Session 2, Grade Group K-2

- This was fun but I'm not sure I could use technology at the kdg level. OK, I just got the sample sheet for CPS. Possibility, now!
- Good job !@#$%!
- "+", along with "Agree" circled next to #4 which reads "The facilitator was helpful in addressing participants' questions."

Workshop Evaluation Comments, Session 2, Grade Group 3-5

- Yes! We're working on data now! (Next to #7 which reads "I can use the material presented today to create a new lesson.")
- Great job, !@#$%!
- I could use more ideas in #8 above (#8 reads "I can incorporate technology in a lesson based on this session's material.)
- Great, as usual!

Workshop Evaluation Comments, Session 2, Grade Group 6-8

- CPS written next to #8 (#8 reads "I can incorporate technology in a lesson based on this session's material.)
- Food was Great. The overhead fiasco cost us time.
- !@#$% is a wonderful instructor =).
- Perfect timing!
- Great job! Very engaging!
- Good Review!
- where is the technology integration? where is the methodology?
- Cold written next to #3 which reads "The physical environment of the workshop was conducive to learning today." Neither "Agree" or "Disagree" is circled.

Workshop Evaluation Comments, Session 3, Grade Group K-2

- Yes !@#$% (written next to #4. "The facilitator was helpful in addressing participant's questions", along with an "Agree circled".)
- Walking me through a website is not the best use of my time. I do realize others need it but should not be taking up 30 minutes of my time. Also, knowing that we will be working on lessons/cps activities during the day would be helpful in advance. That way I can bring appropriate materials.
- !@#$% was infinitely patient - Good stuff!
- I still do not have all materials that I need to be successful with this grant. I am hoping at our next sessions (Session 4) this will be taken care of.
- liquids!
- need more afternoon breaks!
- Please provide water or drinks beyond meal times.
- Need water please =).

Workshop Evaluation Comments, Session 3, Grade Group 3-5
- Our binder is getting very full. One binder for each year would be very helpful.
- Better understanding of CPS! Thanks!
- Good CPS training session! Thanks!
- Need to practice on #8 (#8 is "I can incorporate technology in a lesson based on this session's material.")
- Great job on the snacks/lunch Angie!
- Some of the material would be very hard for third grade, but I enjoyed hearing about the bar graph ideas. My students will enjoy them, too!
- !@#$% is an excellent instructor =)!

Workshop Evaluation Comments, Session 3, Grade Group 6-8
- Great Websites & data experiments!
- Still need Pascal's triangle.
- Good job & you were all very helpful.
- Finally did some 'new' activities that I can use in my class - age/content level correct!

Workshop Evaluation Comments, Session 4, Grade Group K-2
- No Comments

Workshop Evaluation Comments, Session 4, Grade Group 3-5
- =) next to #4 "The facilitator was helpful in addressing participants' questions."
- I really liked the CPS presentation today with the rules!

Workshop Evaluation Comments, Session 4, Grade Group 6-8
- great day
- There was none. (Next to #8 "I can incorporate technology in a lesson based on this session's material.")
- Cool! (Next to #2 on post assessment - Tic-tac-toe activity on coordinate plane)
- Real Cool! (Next to #3 on post assessment - Race car activity related to (x,y)
- Great food! Excellent Games!

Workshop Evaluation Comments, Session 5, Grade Group K-2
- No Comments

Workshop Evaluation Comments, Session 5, Grade Group 3-5
- Chilly (Next to #3 The physical environment of the workshop was conducive to learning today.)
- Because I came to the wrong session (Next to #2: I can relate material from this session to a GLCE appropriate for my students.)
- !@#$% Rocks!
- It's always enjoyable spending the evening with !@#$%.
- Happy Pi Day!

Workshop Evaluation Comments, Session 5, Grade Group 6-8
- Could slow down a bit today.
- Very Glad to be included

Workshop Evaluation Comments, Session 6, Grade Group K-2

- No Comments

Workshop Evaluation Comments, Session 6, Grade Group 3-5

- Please do some presentation on remedial activities.
- We have some technology problems and shortages in Potterville. Difficult to plan for a lesson and make it work
- Topnotch!
- Great lessons in this geometry section!

Workshop Evaluation Comments, Session 6, Grade Group 6-8

- No Comments