



COLUMBUS STATE

UNIVERSITY

**Connecting Content and Process Standards
to Build Conceptual Understanding in Mathematics
Columbus State University Math Collaborative Grant Evaluation
Final Report**

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Executive Summary

The *Connecting Content and Process Standards to Build Conceptual Understanding of Mathematics* Grant Program provided participants with a range of educational opportunities for improving instruction of elementary mathematics. The program consisted of a summer seminar in which faculty received instruction regarding mathematics content and linking classroom efforts to new Georgia framework standards. These instructional seminars were followed up with a significant series of engagement activities that were conducted throughout the school year. These activities involved production of lessons, monthly study groups, and demonstration lessons. These lessons were designed to promote teacher development and improve standards during the course of the academic year.

Results from the summer seminar were promising with the majority of participants showing improvement on content knowledge. In addition, participating teachers showed improvement on 95% of all items presented in the workshop. This indicates that the knowledge based portions of the grant were producing appropriate results to meet Objective 4 of the grant.

Activities conducted throughout the school year did not receive the same level of participation. Efforts to conduct follow up workshops, demonstration lessons, and study groups all met with limited success due to a lack of participation. The grant was also severely hindered by a lack of the cohort to return post-test surveys focusing on the implementation of the methodologies in the classroom. These factors caused the grant to fail to meet five of the six objectives available for evaluation. It should be noted that regular efforts to conduct follow up activities were documented by the Columbus Regional Mathematics Collaborative Staff and that over half of the participating individuals did participate in these activities.

Results for the grant indicate that only one of the six objectives was met based on the evaluation criteria. Evidence does indicate that the staff of the Columbus Regional Mathematics Collaborative did make extensive efforts to reach out to the panel of participating teachers for follow-up activities. Significant panel attrition resulted in an inability to effectively complete all of the grant objectives. Future work should examine the construction of the evaluation metrics and the methods used for delivery of follow up services in order to match the high level of service delivered during the summer seminar.

Project Description

The Columbus Regional Mathematics Collaborative hosted a Connecting Content and Process Standards to Build Conceptual Understanding in Mathematics in hopes of providing professional learning to elementary teachers to develop both their content knowledge and their ability to incorporate the process skills into their teaching. From this workshop, elementary school teachers should be able to successfully implement standards that will help increase students' mathematical understanding.

Evaluation Methodology

The evaluation methodology in *Connecting Content and Process Standards to Build Conceptual Understanding in Mathematics* consisted of a pre-test and post-test design. The pre-test was given to see what elementary teachers knew before they completed the workshop and the post-test was given to see what they learned from the workshop. There were two parts that made up the pre and post-test which included the content knowledge section and the self-rating portion.

The evaluation rubric for this grant consisted of three process objectives and four outcome objectives that the Columbus Regional Mathematics Collaborative hoped to accomplish. The results of each objective are described in the "Results of Objectives" portion of the report. The following are each individual objectives:

Table 1.A	
Grant Objectives	
Process Objectives	
Objective 1	CRMC will conduct a 5 PLU course during a one week summer workshop and two school-year follow-up days for 30 elementary teachers
Objective 2	CRMC will conduct monthly study groups in the targeted high need schools.
Objective 3	CRMC will conduct at least 40 demonstration lessons in project participants' classrooms during the year.
Outcome Objectives	
Objective 4	At least 80% of project participants will demonstrate increases in mathematics content knowledge as measured by outcomes on a pre and post-test given during the workshop.
Objective 5	At least 80% of project participants will demonstrate an increase in their self-rating of the amount of class instruction devoted to the process standards based on a pre-project and post-project survey.
Objective 6	At least 80% of the participants will report a greater use of the tasks posted in the Georgia Framework as measured by results of a pre and post-project survey.
Objective 7	At least 80% of project participants will report that participation in the project had a positive impact on their classroom instruction based on a professional growth survey administered at the end of the project.

Participant Demographics

The workshop consisted of several individuals in the education field across the Columbus Regional area. 100% of those participants were females. The majority (60%) of individuals were African American, while 30% were Caucasian. 95% of those who participated in the workshop were teachers and the other 5% stated that they were "other". 40% of the respondents stated that they had been teaching for 11 to 26 years, 35% replied 6 to 10 years, and the other 25% responded 0 to 5 years.

Discussion of Results

Of the three process objectives, none were met. Objective 1 was not met, as only 20 individuals participated instead of the desired 30. Objective 2 was not met, as there were difficulties in coordinating the meetings. Meetings did take place at some of the demonstration lessons, but communication to organize the meetings was not sufficient. Objective 3 was not met as a limited number of lessons were produced. Considering that the original objective with 30 participants called for 40 demonstration lessons, with 20 participants, 26 or 27 demonstration lessons should have been created. However, only 20 demonstration lessons were created. These results show that services were provided to participating faculty, but significant panel attrition limited the effectiveness of the programming.

Of the four outcome objectives, only one was met. Objective 4 was met, with exactly 80% of participants showing increases in mathematics content knowledge. Objectives 5 and 6 were not met, as participation in the post survey was too low. Only two teachers returned the post survey and neither of them had the number to be able to match it with the pre survey. Objective 7 is not able to be evaluated as these results are reported directly to the Teacher Quality Office. The results indicate one successful objective, though this somewhat underrepresents the total of the work achieved during the grant period.

Results of Objectives

The objectives' results are reported in the following table:

Table 1.B			
Process Objectives		Met	Not Met
Objective 1	Only 20 out of the desired 30 participants took part in the program. Sign-in sheets were provided by the CRMC to document this.		✓
Objective 2	Coordination was difficult and small-group meetings only occurred during the demonstration lessons.		✓
Objective 3	Considering the lower participation, there should have been at least 26 or 27 demonstration lessons, but only 20 were conducted.		✓
Outcome Objectives		Met	Not Met
Objective 4	Exactly 80% of participants showed increases in mathematics content knowledge. Evidence of this is provided in <i>Table 2.A</i> and <i>Table 2.B</i> in the appendices section.	✓	
Objective 5	Only two teachers returned the post survey and neither of them had the number to be able to match it with the pre survey.		✓
Objective 6	Only two teachers returned the post survey and neither of them had the number to be able to match it with the pre survey.		✓
Objective 7	To Be Determined by Post-Test Results from Teacher Quality.		

Conclusions

Results from the programming for *Connecting Content and Process Standards to Build Conceptual Understandings in Mathematics* showed significant improvement in the performance of faculty regarding subject matter knowledge. Efforts to implement the follow-up activities resulted in high levels of panel attrition resulting in a failure to meet five of the six grant criteria.

These findings allow for a number of key recommendations to the staff of the Columbus Regional Mathematics Collaborative. First, it is important to recognize the impacts of panel attrition on any follow up activity. The initial grant proposal criteria resulted in performance objectives that would be extremely difficult for organization to meet based on the limitations provided by the population being served. Future efforts should account for this appropriately.

Second, measurement of key objectives regarding implementation might include or incorporate administrators at the participating schools as part of the program implementation. This would allow the program to marry the class evaluations already taking place in the schools of participating faculty with the objectives of the Columbus Regional Mathematics Collaborative in order to produce superior results. This could potentially lower levels of attrition and provide for a broader base of support for mathematics education amongst school administrators and department chairs.

Third, the results indicate high levels of learning across the curriculum during the seminar sessions. However, the item analysis indicates that some content areas will need more attention than others in future iterations. Efforts should be made to explore question items to improve overall quality and performance on these objectives.

The evaluation of the *Connecting Content and Process Standards to Build Conceptual Understandings in Mathematics* shows that at the core the grant achieved the central mission of improving educator knowledge focused on content. Significant work needs to be done in order to improve follow up activities and retention in subsequent programming efforts in order to provide the same high level of service throughout the school year.

Appendices

Appendix A – Table 2.A: Content Knowledge Improvement

Table 2.A shows the results for objective 4. It demonstrates the results from the pre and post-test. The results include the number of correct answers from the knowledge content section and the improvement scores after the workshop was conducted. 80% of the individuals were expected to show an increase on the content knowledge section. Exactly 80% of the project participants met the expectations. There was also an improvement of approximately 5 questions. The results show that the Columbus Regional Mathematics met their expectations on the content topics addressed in the workshop.

Table 2.A				
Content Knowledge Improvement				
Participants	Content: Pre-Test	Content: Post-Test	Content: Improvement	Content: Average Improvement
1	42	49	1	7
2	51	60	1	9
3	53	71	1	18
4	40	54	1	14
5	41	53	1	12
6	50	63	1	13
7	62	21	0	-41
8	49	73	1	24
9	58	60	1	2
10	42	74	1	32
11	62	80	1	18
12	63	74	1	11
13	63	72	1	9
14	62	11	0	-51
% Increased			80%	5.5

Appendix B – Table 2.B: Pre-Test and Post-Test Results by Item

Table 2.B shows the results for objective 4. It provides the results of the number of correct responses from the pre and post-test by each individual question from the content knowledge section. It is important to note that all questions showed improvement after the workshop was conducted with the exception of question 16. No one answered this question correctly on both the pre and post-test. The results reveal that participants need additional help on making change.

Table 2B			
Pre-Test and Post-Test Results by Item			
	Pre-Test Correct Answers	Post-Test Correct Answers	Improvement
Question 1	0	7	Yes
Question 2a	3	19	Yes
Question 2b	3	19	Yes
Question 2c	3	19	Yes
Question 2d	3	18	Yes
Question 2e	0	15	Yes
Question 3a	1	13	Yes
Question 3b	0	12	Yes
Question 3c	1	6	Yes
Question 4	0	11	Yes
Question 5	8	10	Yes
Question 6	3	9	Yes
Question 7	6	13	Yes
Question 8	11	19	Yes
Question 8a	3	13	Yes
Question 9	5	16	Yes
Question 9a	5	9	Yes
Question 10	14	19	Yes
Question 11	1	6	Yes
Question 12	6	9	Yes
Question 13	9	10	Yes
Question 14	2	4	Yes
Question 15	2	11	Yes
Question 16	0	0	No
Question 17	9	10	Yes
Question 18	14	18	Yes
Question 19	11	14	Yes
Question 20	2	10	Yes
Percentage of Questions Showing Improvement			95%