



PRISM Tri-Board Executive Summary – 2006

Introduction

Recognizing that effective teaching is critical for the improvement of student learning, the focus of this project was to build capacity with mathematics teachers, Grades 7 to 10. Two research-based resources were used: *Professional Resources and Instruction for Mathematics Educators (PRIME)* - researched by Dr. Marian Small at UNB, published by Thomson Nelson and *LessonLab* - developed by Dr. James Stigler at UCLA, published by Pearson Professional Learning. These resources addressed one of the main themes that emerged from the work of the Expert Panel: “Teachers of mathematics need professional learning opportunities that strengthen their competence in both mathematics content and the methodology for teaching it.”... (Leading Math Success Expert Panel Report 2004, p. 34)

Research Questions

The project attempted to address the following questions:

1. Were remediation programs more effective for some students than others?
2. Did the use of a developmental continuum improve student understanding for students at risk, specifically those enrolled in MAT1L?
3. Did instructional/assessment strategies change following exposure to a developmental continuum?
4. Which influenced teaching practices more, the use of a developmental continuum, or the use of a developmental continuum along with the establishment of professional learning communities through the use of *LessonLab*?

Methodology

A total of 55 teachers from the Brant Haldimand Norfolk Catholic District School Board, Halton Catholic District School Board and Hamilton-Wentworth Catholic District School Board took part in the joint project. The teachers represented a cross-section from Grades 7-10.

Training was provided as outlined below:

- The “*PRIME*” group of 14 teachers from all three participating boards received three days of in-service training on *PRIME*.
- The *LessonLab* group of five teachers from HCDSB received five days of in-service training on *LessonLab* and participated in a half-day book study on “The Teaching Gap” by James Stigler.
- The “Both” group of 11 teachers from BHNCDSB and HWCDSB received the three days of in-service on *PRIME*, the five days on *LessonLab*, as well as the half-day book study on “The Teaching Gap” by James Stigler.
- The remaining 25 teachers from all three boards formed a control group which served as a basis of comparison to ascertain the effectiveness of the use of a developmental continuum and/or participating in a PLC in changing teacher attitude and practice.

Teachers completed a survey (*Mathematics Teaching Practices Questionnaire and Teacher Efficacy Questionnaire*), at the beginning and end of the study, on beliefs and practices for teaching mathematics, which was designed by Dr. John Ross of OISE and used with permission. Teachers completed evaluations at the end of each in-service session which allowed them to comment on the effectiveness of the session. Some teachers also took part in small focus group sessions. Their responses were coded, summarized and grouped into themes.

Students completed a survey, *Student Beliefs about Mathematics* and *Mathematics Learning and Mathematics Self-Efficacy*, at the beginning and at the end of the study, about their attitudes and feelings toward mathematics. Report card data on Number Sense was collected from the June, 2005 and November, 2005 assessments for students whose teachers received some form of



training. In addition, the *PRIME* diagnostic tool, for both Number and Operations, was administered to students whose teachers received *PRIME* training. The diagnostic tools were administered in the at the beginning of the project (Fall, 2005) to collect baseline data and again at the end of the project (Winter, 2006) to look for change.

Findings

Student attitudinal survey results showed no differences between the first and second survey administration. The results indicate a very marginal increase in student performance in average raw scores on the *PRIME* Number and Operations diagnostics. The Number diagnostic showed an average change of ~ 0.72 , while the Operations diagnostic showed a higher average change of ~ 1.17 .

Analysis of the teacher surveys showed there were no significant differences found in the attitudes and confidence between the groups of teachers who received in-service sessions and the group of teachers who did not participate in any in-service. There was also no significant difference in response between the groups of participants at the beginning of the study and their responses at the end of the study.

Analysis of the teacher evaluations and focus group sessions indicated that teachers:

- learned several ways to engage their students in learning about mathematics; specifically, by using more activities and manipulatives in the classroom. All students, including those at risk, were able to participate in investigations by using manipulatives.
- shifted their teaching from procedural to investigative.
- no longer answered student questions immediately, as they were encouraging students to find their own answers and helping students to look critically at their work.
- began to see that allowing students to find solutions for themselves increased student confidence and attitude toward mathematics.
- found it interesting to see the different solutions students produced, as it allowed them to understand student thinking and therefore teach more effectively.
- improved their mathematics knowledge as a result of the in-service sessions.
- felt that in order for students to feel successful, teachers needed to have confidence in teaching mathematics and these research-based products (*PRIME* and *LessonLab*) increased their comfort and confidence levels.
- found the in-service sessions they attended effective because they were implementing what they learned in their classrooms and were sharing their experiences with other teachers.
- both experienced and inexperienced, felt that working with a team of colleagues made this professional development more beneficial than any other they had received.
- felt it was a positive experience to work with professionals from other school boards.

Recommendations and Next Steps

- Allow enough time for measurable change to take place. This project was short in duration, with insufficient time to indicate growth of the students.
- From the onset, it is important to assign a person whose primary responsibility is to ensure a structured approach for data collection and analysis.
- Scorer reliability of diagnostic tools is a factor to consider for data to be completely accurate. Consider more training in marking of diagnostic tools prior to implementation or have a group of expert markers who score all of the diagnostic tests.
- Level of readiness to participate in lesson study must be higher than that of other initiatives that focus solely on content exploration. The teachers with a higher level of readiness benefit more from the lesson study process.



- Participants from all three boards found both *LessonLab* and *PRIME* to be a valuable professional development experience. Each of the three boards will offer further training for teachers beginning with those teachers who formed the control groups for this project.

Suggestions for Further Research and Study

Several aspects were identified that warrant further investigation:

- Is there a link between the type of assessment questions used in the classroom and a student's ability to move through the phases of a developmental continuum?
- While this project has changed mathematics teaching practice for those involved, assessment has likely remained unchanged. Students' academic achievement may not improve until assessment changes are made. We recommend that it is time to convene a provincial expert panel on assessment *for learning*.
- What is the most effective way to implement lesson study on a larger scale in an Ontario context? Would there be a benefit in creating an Ontario database of public research lessons which could be analyzed by participants prior to the writing of their own research lesson?