Huron-Perth Catholic District School Board Collaborative Inquiry Project

SMART Board Lesson Study

Final Report

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Rationale

In the fall of 2008 the Huron-Perth Catholic District School Board purchased 9 SMART Boards for use in secondary mathematics classrooms. As a board it was felt that a collaborative research project such as Lesson Study would allow us to gauge the effectiveness of the SMART Boards as a teaching tool and the impact on student learning while training staff on the use of this technology.

Research Question

Our project was guided by the following research question:

> How does the use of SMART Boards affect student engagement and achievement in secondary school mathematics?

Our hope was to find a positive correlation between the use of SMART Boards and student achievement and engagement.

The Process

Grade 9 and 10 teachers of both applied and academic level courses from the board's two high schools were asked to participate in the project during the second semester of the 2008-2009 school year. Six of a possible seven teachers agreed to take part, 3 from each school. This represented 1 grade 9 applied, 4 grade 9 academic, 2 grade 10 applied and 3 grade 10 academic classes and approximately 170 students.
During the first semester teachers had received some training on the basic use of SMART Boards, SMART Notebook software, and on-line resources. Further training specific to SMART Boards and their use was provided at meetings held throughout the project's duration.

The Lesson Study project unfolded as follows:

In late February teachers met for a half day. They were presented with the board's Grade 9 EQAO Mathematics data from the previous three years and were instructed to use the data to determine the area of greatest need. The consensus was that the Lesson Study project should focus on Measurement/Geometry and "Problem Solving."
With this in mind teachers began to create a common diagnostic assessment that was administered to all students in all participating classes as well as a common assessment tool (i.e. Rubric.)

Over the following two week period teachers administered the diagnostic assessment in their individual classes. They also chose a representative sample of 5 students from each class. These students were used as “marker students” throughout the project. That is, only the data from marker students would be collected and analysed for this project.

Following the administration of the diagnostic assessment teachers met for another half day session. This meeting consisted of a brief training session regarding SMART Boards and Notebook software as well as a group marking session. During the marking session Teachers were asked to share their marker students completed diagnostic assessments and were to come to a consensus regarding the level of achievement assigned to each student. The results were recorded as base line data. Participating teachers were asked to reflect on the results and ways that they may best meet the needs of their own students and the group as a whole in preparation for the next half day session.

The following session (again one half day) was dedicated to the creation of a lesson and summative assessment. The lesson was to be research based and was to make use of the SMART Board (where applicable) as the major mode of delivery. The group use the 3-part lesson template found in the TIPS 4RM document as a starting point. Due to the fact that four different courses were involved and the curriculum expectations vary from course to course teachers arranged themselves into two groups. One group worked on grade 9 applied and academic. The second group decided that there was too large a difference between the content covered grade 10 applied and academic to create a common lesson. Therefore, this group chose to focus on grade 10 academic Unfortunately, those teaching grade 10 applied were also teaching one of the other courses being focused on. Due to this fact and time constraints it was decided that grade 10 applied would be left out of the study.

In the spring of 2009 participating teachers delivered their lessons and administered the summative assessments in each of their targeted classes. The completed summative assessments were brought to another have day session and group marking ensued.

The grade 10 academic teachers felt that their results were skewed by the fact that the content area being studied at the time of the summative assessment was typically more difficult for students than the material covered at the time of the formative assessment. This group felt that the results would be a better reflection of student achievement if the lesson study took place over a much shorter period of time. They asked if they could “redo” the lesson study within one unit of study. They agreed to still focus on “Problem Solving” but the content area became trigonometry. As a result the grade 10 group was given an two additional half days of release time. The first of these was dedicated to creating the formative assessment, lesson, and summative assessment that would constitute their new lesson study project. The second half day was dedicated to group marking of both the formative and summative assessments and recording the data.

The grade 9 applied and academic teachers did not share this same concern. They recorded the results of the summative assessment in order to compare them with the base line data collected from the formative assessment.

The final half day session included all participating teachers. Teachers met to review the data and discuss the results. As well, another SMART Board training session was presented. At this time we were informed that due to time constraints and final summative assessment practices at one of the schools it was not possible for the grade 10 academic class at that school to complete the lesson study summative assessment. Therefore, that classes data is not include in this report.

Empirical Data

Below in table format is a summary of the data collected for each participating class that completed the entire Lesson Study cycle. Further below this data is presented in a series of graphs.

Note: Due to the fact that some classes/teachers were unable to complete the project those remaining were asked to include one additional "Marker Student". In order to not skew the results these additional students were to be randomly selected.

School 1

MPM 2D

- 2 classes both classes were given the same diagnostic at the beginning of the Trigonometry Unit
- Class 1 then studied right angle triangle trigonometry with the SMART Board as a major component of curriculum delivery.
- Class 2 studied the same material without the use of the Smart Board.
- The teacher of both classes was the same.
- Both classes then wrote the same summative assessment.

Class 1 (SMART Board)		
Student	**Diagnostic** (Level of Achievement)	**Summative** (Level of Achievement)
SB-A	1	3
SB-B	R	2
SB-C	1	R
SB-D	3	4
SB-E	3	3

Class 2 (Traditional)		
Student	**Diagnostic** (Level of Achievement)	**Summative** (Level of Achievement)
Tr-A	3	4
Tr-B	2	4
Tr-C	2	4
Tr-D	1	4
Tr-E	1	R

MFM 1P

- 1 class participated in the study.
- A diagnostic was used focusing on measurement and problem solving.
- A SMART Board was used as a major component of curriculum delivery in the subsequent unit of study.
- The summative assessment was written
- Below are the results.

Class 1 (SMART Board)		
Student	**Diagnostic** (Level of Achievement)	**Summative** (Level of Achievement)
A	4	4
B	3	2
C	2	2
D	1	4
E	R	3

MPM1D

- 2 classes participated in the study.
- A diagnostic was used focusing on measurement and problem solving.
- Where applicable a SMART Board was used as a major component of curriculum delivery in the subsequent unit of study.
- Below are the results.

Class 1 (SMART Board)		
Student	**Diagnostic** (Level of Achievement)	**Summative** (Level of Achievement)
SB-A	3	3
SB-B	3	3
SB-C	1	4
SB-D	3	4
SB-E	3	2

Class 2 (Traditional)		
Student	**Diagnostic** (Level of Achievement)	**Summative** (Level of Achievement)
Tr-A	3	4
Tr-B	4	4
Tr-C	1	1
Tr-D	2	4
Tr-E	4	4

School 2

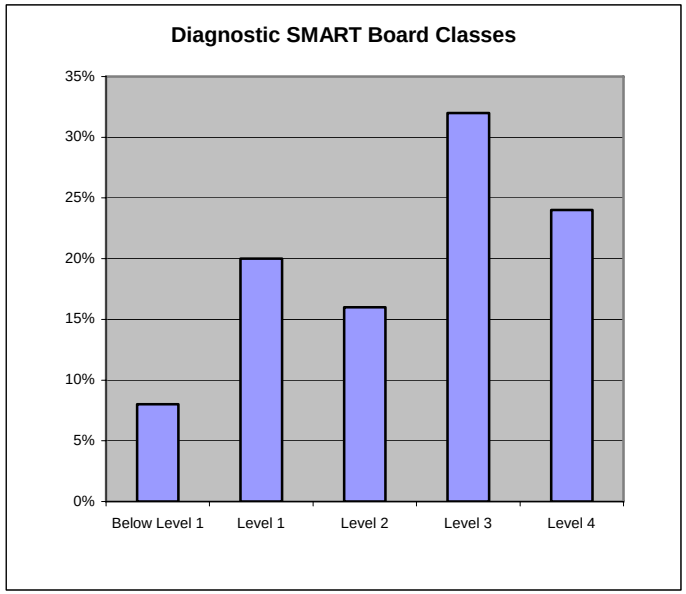
MPM 1D

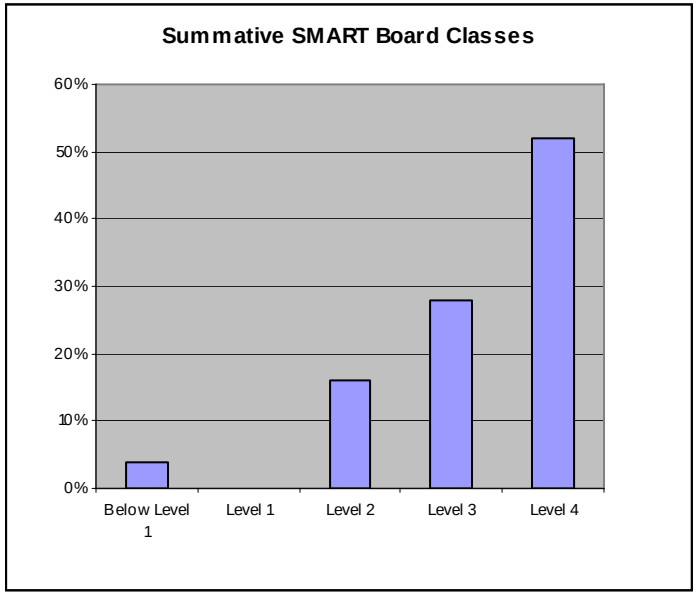
- Two different teachers taught these classes.
- A diagnostic was used focusing on measurement and problem solving.
- In both classes a SMART Board was used as a major component of curriculum delivery in the subsequent unit of study.
- Below are the results.

Class 1 (SMART Board)		
Student	**Diagnostic** (Level of Achievement)	**Summative** (Level of Achievement)
A	1	3
B	2	4
C	2	4
D	4	4
E	4	4

Class 2 (SMART Board)		
Student	**Diagnostic** (Level of Achievement)	**Summative** (Level of Achievement)
A	4	4
B	3	4
C	2	3
D	4	4
E	4	4

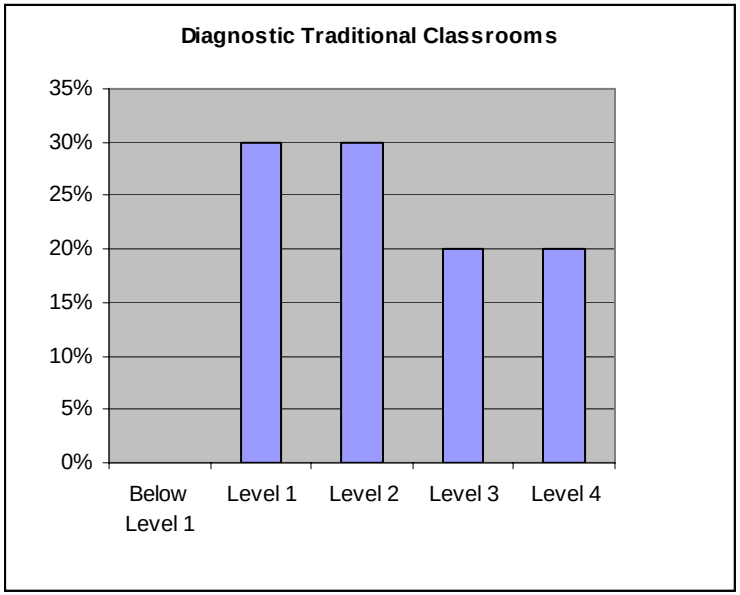
Diagnostic vs Summative SMART Board Classrooms

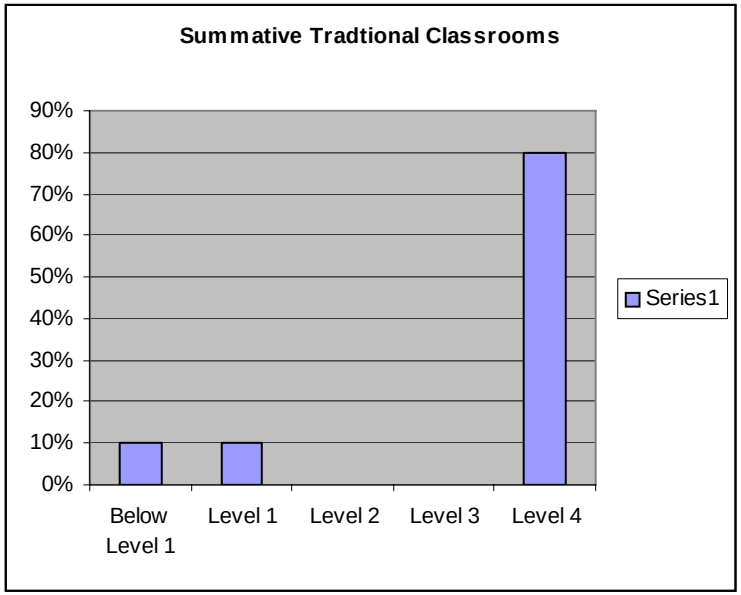




The graphs above show that the percentage of students in SMART Board classrooms achieving Level 3 or higher increased from 56% percent to 80%. This would seem to indicate that SMART Boards have a positive influence on student achievement.

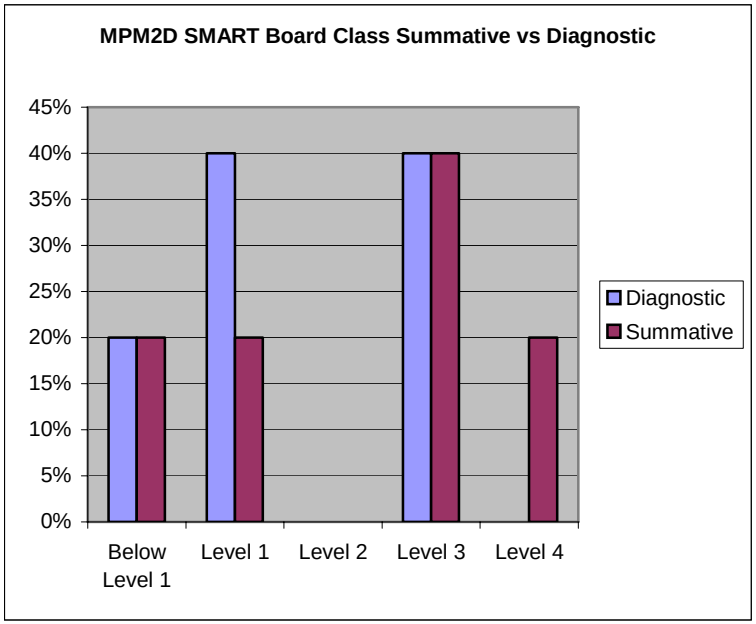
Diagnostic vs Summative Traditional Classrooms

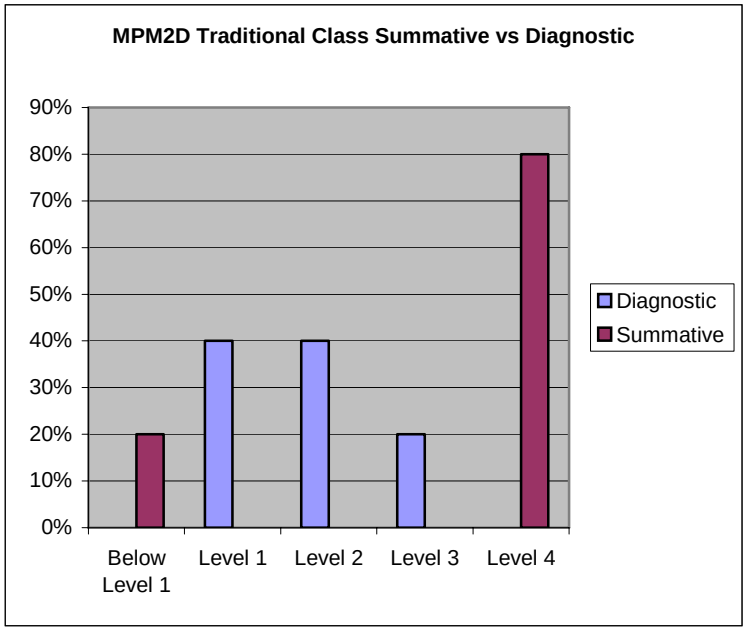




The graphs above show that the percentage of students in SMART Board classrooms achieving Level 3 or higher increased from 40% percent to 80%. It may, therefore, seem that traditional teaching approaches have more of a positive effect on student achievement than do SMART Boards.

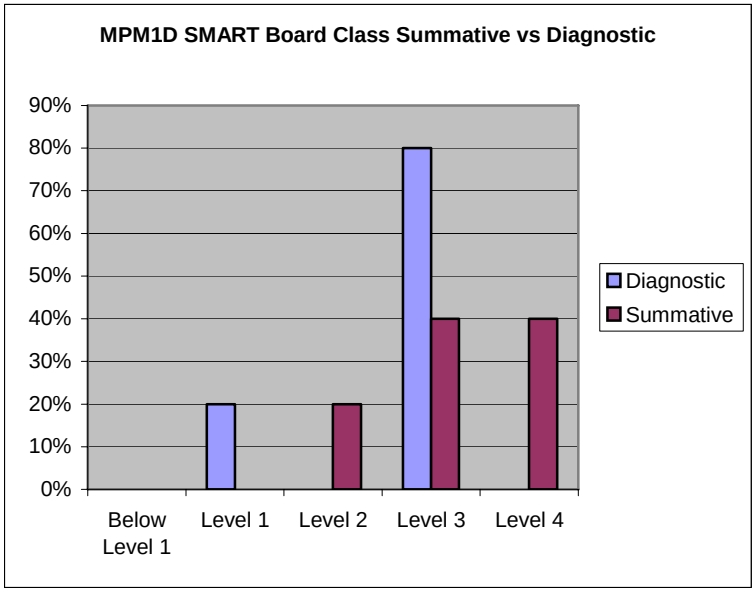
MPM2D SMART Board Class vs Traditional Class

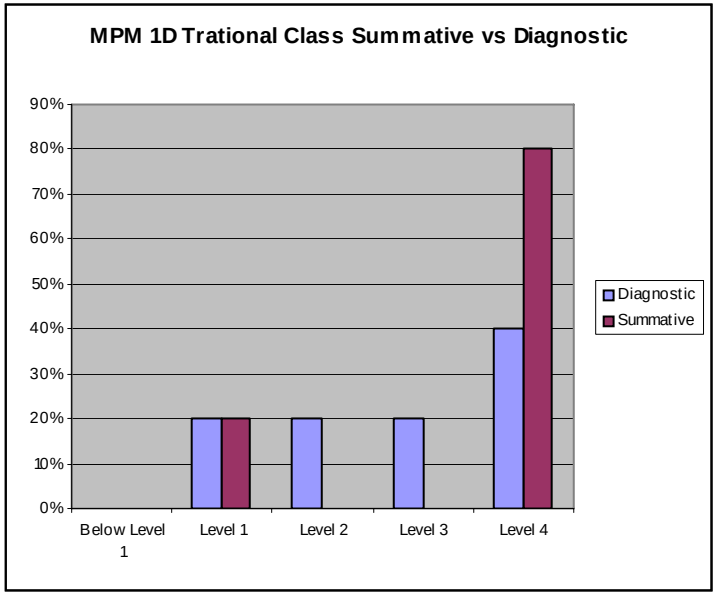




The graphs above show the diagnostic and summative assessment results for two grade 10 academic classes taught by the same teacher. The class on the left made extensive use of the SMART Board. The class on the right did not use SMART Board technology for this portion of the course. In this particular course with this particular teacher it appears that more traditional teaching strategies are more effective than using a SMART Board as the main vehicle of curriculum delivery.

MPM1D SMART Board Class vs Traditional Class





The graphs above show the diagnostic and summative assessment results for two grade 9 academic classes taught by the same teacher. The class on the left made extensive use of the SMART Board. The class on the right did not use SMART Board technology for this portion of the course. Due to the small sample sizes in this course and the way in which the data is distributed, it is difficult to say if SMART Board delivery of curriculum is more or less effective that more traditional practices. An argument could be made either way. If the goal is to have students achieve at Level 3 or higher then it could be argued that the strategies are in fact equal. If, however, we take into account that no students in the SMART Board class finished lower than level 2 it could be argued that SMART Board delivery of curriculum is more effective

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Anecdotal Data

At the final session participating teachers shared their own observations as well as informally collected anecdotal feedback from their students. Two main themes emerged.

Teachers felt that there was no question that the use of a SMART Board positively affects student engagement in mathematics classrooms. They were somewhat concerned with the effectiveness when it comes to student learning. It was felt that as teachers become more familiar with and comfortable with this technology it will become an effective tool in helping improve student achievement.

Students concurred with teachers. They did report that the SMART Board does improve their attentiveness in class and does make math more interesting. Furthermore, students felt that there is a potential that many difficult concepts could be taught more effectively using the interactive nature of this tool. Some indicated a belief that overtime teachers will become more adept at teaching with SMART Boards.

Observations & Conclusions

At best we feel we have no choice but to say that our findings are inconclusive. Therefore, despite our best attempts, we have not answered our research question. Whether or not the use of SMART Boards improves student learning of the mathematics curriculum is yet to be determined. It is our belief that more data over needs be collected over a longer period of time before this question can be answered. We plan to continue to track report card data in an effort to ascertain if there is any correlation between student learning in mathematics and the use of SMART Boards and associated technologies. On the other hand, we do believe that the anecdotal data does clearly indicate that SMART Board use does positively affect student engagement in mathematics classes provided teachers are adept at using the technology.

Recommendations

We would like to make some recommendations to anyone who would be interested in undertaking this type of collaborative study in the future. Firstly, have teachers commit to the project in writing. This should help to avoid situations where entire classes drop out of the study part way through. Secondly, be understanding of the needs of the teachers and there students. In other words do not make the task too demanding for teachers and make every effort to have the project fit their timelines. (i.e. fit each cycle of lesson study into one unit of study.)

Appendix A: Diagnostic Assessment Exemplars

Appendix B: Summative Assessment Exemplars