EXPLORING THE IMPACTS OF MATH PLATO INTERVENTION ON KAILUA HIGH SCHOOL STUDENTS

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INTRODUCTION

In recent years the mathematics scores, and mathematical interest, of students in the United States have been declining. This decline is taking place during a time when sixty percent of jobs require mathematical thinking and reasoning (Boaler, 2008). At Kailua High School mathematics interventions have been put in place to offset the decline of mathematical understanding and interest of the students. One intervention, Math PLATO Intervention (MPI), hoped to accomplish this by creating a more intimate learning environment, as well as by using a variety of teaching methods for a select group of students.

Although Kailua High School students have made gains on the mathematics portion of the Hawaiʻi State Assessment (HSA) in recent years, these gains have not been enough as to raise Kailua High School to a "passing" level. A school is considered passing if they meet Adequate Yearly Progress (AYP), which is measured by student performance on AYP indicators. These indicators are reading, mathematics, and graduation and retention rate. Within these indicators are the following disaggregated student groups: (1) economically disadvantaged; (2) students with disabilities; (3) students with limited English proficiency; (4) Asian/Pacific Islander; (5) Hispanic; (6) Black; (7) Native American; and (8) White. If a school has at least forty students enrolled in a disaggregated student group, then the school must "meet" the participation and proficiency rate requirements for that group. In order to meet the participation rate a school must have 95% participation in each applicable disaggregated student group (State of Hawaiʻi Department of Education, 2010). The proficiency rate that a school must meet changes over time. The percentage of students who earn a score within the “Meets” or “Exceeds” ranges of the HSA determine the school’s proficiency rate. Table 1 summarizes the minimum passing proficiency rate by school year. Table 2 summarizes the proficiency level score ranges for the Hawai‘i State Assessment (Hawai‘i Department of Education, n.d.).

Table 1
Minimum Passing Mathematics Proficiency Rate by School Year

School Year	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011
Proficiency Rate	≥28%	≥28%	≥28%	≥46%	≥46%	≥46%	≥64%

Table 2
Proficiency Level Score Ranges for the Hawai‘i State Assessment

		Proficiency Level			
		Well-Below	Approaches	Meets	Exceeds
Subject	Mathematics	100-276	277-299	300-335	336-500
	Reading	100-276	277-299	300-339	340-500

In addition to these low scores, the failure rate of the Algebra I students at Kailua High School over the past four years has remained steady at approximately thirty percent. During the 2007-2008 school year, the Kailua High School mathematics department decided to make a concerted effort to increase their “substandard” scores. Our department decided to add a mandatory Algebra Topics/Geometry Concepts (AT/GC) prerequisite to Algebra I to be taken immediately before enrollment in Algebra I. This was intended to create a deeper understanding of concepts by requiring the students to have mathematics everyday, all school year long. This was also designed to help compensate for the removal of Pre-Algebra from Kailua High School's course offerings.

After nearly one and a half years of implementing the AT/GC prerequisite, the Algebra I teachers noticed that the failure rate of the Algebra I students had remained the same. It was then decided to implement a second intervention in order help these students succeed. This intervention was a repeat course for those who failed both Algebra Topics and Geometry Concepts. Rather than having the students sit through Algebra I during the second semester of the school year after having failed the first semester, students were enrolled into the repeat course. This allowed them to have extra time to learn and practice the concepts required in order to succeed in Algebra I. The first repeat Algebra Topics/Geometry Concepts course was offered during the second semester of the 2008-2009 school year.

After the implementation of the AT/GC prerequisite and the AT/GC repeat course, the failure rate of the Algebra I students remained high and their HSA scores remained below the minimum passing proficiency rate. In an effort to lower the percentage of students failing Algebra I, and raise the student proficiency rate on the mathematics portion of the HSA, a third intervention was implemented during the 2009-2010 school year. This intervention is called Math PLATO Intervention (MPI).

Math PLATO Intervention was added to the Kailua High School course offerings during the second term of the 2009-2010 school year. MPI was designed to expose the students to the same content as the Algebra I course, while infusing lessons on the computer based mathematics program called PLATO. Figure A summarizes the possible student mathematics schedules during various school years.

Figure 1

Possible Student Mathematics Schedules at Kailua High School

School Year	Term 1	Term 2	Term 3	Term 4
2006-2007	Algebra I	Algebra I		
2007-2008	Algebra Topics	Geometry Concepts	Algebra I	Algebra I
2008-2009	Algebra Topics	Geometry Concepts	Algebra I	Algebra I
	Algebra Topics	Geometry Concepts	Algebra Topics repeat	Geometry Concepts repeat
2009-2010	Algebra Topics	Geometry Concepts	Algebra I	Algebra I
	Algebra Topics	Geometry Concepts	Algebra Topics repeat	Geometry Concepts repeat
	Algebra Topics	Geometry Concepts (MPI)	Algebra I (MPI)	Algebra I (MPI)

The intent of Math PLATO Intervention was to help the “bubble” students find success in mathematics. The bubble students are those who apply themselves in their mathematics courses, but consistently earn low scores. Keeping this in mind, MPI had an intentionally low student to adult ratio, with the largest section having ten students. The class met everyday during the second, third and fourth terms of the school year. MPI was offered during three of the four periods of the school day. Due to staffing issues, it was not offered during all periods of the school day. Although students were participating in

MPI, their transcripts read Algebra I with the appropriate number from the list of Authorized Courses and Code Numbers (ACCN), which are used by all public schools in Hawaiʻi. This is one way to ensure that students will have access to the same courses, and quality of courses, no matter what Hawaiʻi public secondary school they attend (State of Hawaiʻi Department of Education, 2006).

As stated earlier, the bubble students were purposefully selected to take part in this program. More specifically, three criteria were used to identify these bubble students:

1. The student was enrolled in Algebra Topics during the first term of the 2009-2010 school year and earned a grade of D or F in that course.
2. The student showed a desire to learn as evidenced through their homework completion rate and classroom behavior.
3. The student maintained regular school attendance for the first term of the 2009-2010 school year.

Parents of the selected students were asked to sign a consent form, and students were accepted on a first come, first served basis. The students' names remained on the roster of the traditional Algebra I teacher even though they were physically in another class. Traditional Algebra I refers to the Algebra Topics/Geometry Concepts/Algebra I/Algebra I course sequence.

The teachers selected to teach the MPI course had been members of the Kailua High School staff since 2008. During the 2008-2009 school year, Teacher A taught two sections of traditional Algebra I, and two sections of the repeat course. Teacher B taught two sections of Geometry and worked as a Part Time Teacher (PTT) in the repeat course for the other two sections. During the first term of the 2009-2010 school year, Teacher A taught two sections of Algebra I and was a PTT in various mathematics classes for the other two sections. Teacher B taught two sections of Arts & Communications, and was also a PTT in various mathematics classes for the other two sections. During Terms 2, 3 and 4 of the same school year, both teachers replaced their PTT sections with MPI. Even though Teacher A and B were officially the MPI teachers, on paper they were still labeled as PTTs. Both teachers have earned a Bachelor of Science Degree in Engineering, and entered the teaching profession as a second career. Teacher A earned her teaching certification during the 2009-2010 school year, and Teacher B is currently enrolled in a teacher-training program. Prior to working at Kailua High School, Teacher A had taught one year of Pre-Algebra at another high school, while Teacher B had no prior teaching experience. Their experience teaching mathematics, though limited, and the fact that they were already on the payroll at Kailua High made them convenient choices to teach Math PLATO Intervention.

There are two key differences between Math PLATO Intervention and the traditional Algebra I courses at Kailua High School. The first is the student to adult ratio, which impacts class size. I use student to adult ratio in lieu of student to teacher ratio because not all adults in the classroom are trained teachers. Algebra I has approximately a 26 to 1 student to adult ratio, while MPI has approximately a 5 to 1 ratio. The overall class size of an Algebra I class ranges from 24-28 students, where MPI ranges from 4-10. The second difference is the teaching methods. Algebra I teachers typically follow a similar set of strategies each day- bell work, correct homework, lecture and present examples on a new topic, then student small group work. MPI uses methods such as whole group learning, small group learning, peer tutoring, and PLATO computer sessions.

The purpose of this study is to evaluate the Math PLATO Intervention program by examining adherence to program objectives, effects of class size on students, changes in student behavior, and student mathematics content knowledge. This study is largely based on qualitative data collected from students and teachers, although some quantitative data is included as a reference.

LITERATURE REVIEW

This paper serves as a program evaluation of the Math PLATO Intervention program approximately one year after its inception. The goal of the program was to improve student mathematical achievement by providing students with a more intimate learning environment, and by using a variety of instructional strategies. This literature review will focus on the impact of class size reduction, instructional strategies, and methods of program evaluation.

Impact of Class Size Reduction

Class size has been defined in many ways. The simplest definition is the number of students physically present in a single teacher's classroom at any given time (Tienken & Achilles, 2006; Zurawsky 2003). Of course, the number of students on a roster is not necessarily the number of students physically present in the classroom everyday (Blatchford, 2003). The average American classroom is home to twenty-four students and one teacher (Delavan, 2009). Both the STAR and SAGE projects propose that student achievement would increase if schools reduced their individual class sizes. Delavan claims that it is human nature to congregate in smaller groups, thus reducing class size seems logical. Hanushek argues that the cost of reducing class size does not outweigh its benefits.

When people meet socially they have a natural tendency to gather in groups of six to ten (Delavan, 2009). Why do we force students into a learning environment that is more than double the group size in which they naturally feel comfortable? In the workforce, supervisors and administrators have an average of seven employees that report directly to them (Berliner & Biddle, 1995). Why is it that classrooms are filled with 24 students, leaving the teacher "in charge" of more than three times the number of people than the average professional supervises? Take into account the emotional and social maturity of students compared to people in the workforce, and this number seems absurd.

Smaller class size affords more opportunities for student learning (Hoxby, 2000). With fewer students in the class to care for, the teacher has more time available to invest in each student. In one study, Blatchford (2003) found that in smaller classes the students were more likely to interact with the teacher, they were given more one-on-one time, and the teachers tended to be more focused on the students. In this case, a small class was defined as having an average of 19.4 students. Zurawsky (2003) claims that students enrolled in small classes are under constant pressure to participate, thus making them more involved. However, class size alone does not guarantee student success. One has to consider external factors such as socioeconomic status, community and family support, and school location in order to fully analyze what promotes student success (Darling-Hammond, Ross & Milliken, 2006/2007).

There are some clear drawbacks to class size reduction. Biddle & Berliner (2002) state,

> In many cases, extra teachers would have to be hired if class sizes were cut, and – given the looming shortage of qualified teachers to serve our growing public school populations – it may be difficult to find those extra teachers let alone the funds to pay their salaries. Furthermore, many schools would also have to find or create extra rooms to house the additional classes created by small-class programs, and this would require either modifying school buildings or acquiring temporary classroom structures. (p. 17)

The costs of class size reduction must be paid for up front. Zurawsky (2003) states,

> There is no doubt that even if there are long-term savings from less in-grade retention, reduced dropout rates and higher adult earnings, the front end costs can be considerable. (p. 2)

The true benefits of class size reduction may not be seen until the students participating in smaller classes enter the workforce many years later (Krueger, 2003). This is a huge leap of faith on the part of the taxpayers, politicians, and educators.

Smaller class sizes result in a larger number of classes. More classes require more teachers to teach those classes. Delavan (2009) finds that if schools reassign some of their non-classroom (auxiliary) teachers, then the number of teachers still required will increase by fifty-three percent. This is assuming that class sizes are being dropped from twenty-four to twelve students. This means for every new teacher needed, the funding entity would have to find approximately $51,009 to pay his or her salary. This is based on the average United States teacher salary in 2006 (Education America Network, 2000-2010). California found they had to hire thousands of teachers at the beginning of their class size reduction movement in 1996 (Zurawsky, 2003). Krueger (2003, p. F34) claims, "the number of teachers hired per student is the main determinant of the economic cost of education." The higher the number of teachers needed, the higher the cost of education.

The amount of extra space needed to house these additional classes also increases the cost of education. Even if schools carefully utilize all their available space, more schools may have to be built to house the extra classes created by the reduced class sizes.

Assuming that class sizes will be cut in half, fifty percent more space will be needed. California found that in order to accommodate their class size reduction movement in the mid-1990s, they had to either find or build classrooms (Zurawsky, 2003). Biddle & Berliner (2002) go on to say that some California schools have to “cannibalize” other school facilities such as libraries and art rooms in order to accommodate the extra classes. Other schools have even had to fund the purchase of portable classrooms with their operating budget.

We can also look at general changes in the education system to see the effects of class size reduction on student achievement. From the 1950s to 1999, the average class size in the United States decreased from 30 plus students to about 22 students. However, educational outcomes have remained flat, and in some cases have even gotten worse (Finn & Petrilli, 1999). Greene, Forster, & Winters (2005) stated that from 1970 to 2001 the student teacher ratio in American classrooms dropped from 22.3 to 15.9 students per teacher. However, test scores and graduation rates over this period of time have remained flat.

Hoxby (2000) studied the effects of class size reduction on student achievement in Connecticut. Hers was a longitudinal study based on test score data already collected by the state. The test data came from school year 1986-1987 through school year 1997-1998. She focused on elementary schools because elementary schools have made a conscious effort to keep class sizes small. The sizes of elementary school classes have remained consistent with that of pedagogical and empirical research. Hoxby chose to base her research on the state of Connecticut for two reasons; it had longitudinal test data available, and the number of students in their elementary schools was consistent with the purpose of this study. Two strategies were used; natural randomness in population, and abrupt changes in class size when a class must be added or subtracted. Using both strategies, Hoxby found that reduction in class size has little or no effect on student achievement.

One of the most popular class size reduction experiments was called the Student/Teacher Achievement Ratio (STAR). The study took place in Tennessee from 1985 to 1989. Approximately 11,600 Kindergarten through Grade 3 students, and 1,300 teachers were randomly assigned to three different types of classrooms. The three types of classrooms were (Biddle & Berliner, 2002):

1. *standard class* – one certified teacher, 20 plus students
2. *supplemented class* – one certified teacher, one teacher aide, 20 plus students
3. *small class* – one certified teacher, approximately 15 students

The students were to stay in the same type of class over the course of the experiment, although there was some movement due to family transiency and students dropping out of the program for various reasons.

The study found that over the course of the experiment, the achievement of students in the standard and supplemented classes were similar. That is, there was no positive or negative affect on student achievement due to the addition of a teacher's aide in the classroom. On the contrary, there was a marked difference in achievement for the early grade students enrolled in the small classes. These students had substantially higher levels of achievement, and the longer they were enrolled in a small class, the higher their achievement (Biddle & Berliner, 2002). The STAR project showed that class size reduction is of greatest benefit to students if the students enroll in smaller classes beginning in kindergarten (Zurawsky, 2003; Hanushek, 1998).

In 1996-1997 in Wisconsin a project called the Student Achievement Guarantee in Education (SAGE) was started. This class size reduction experiment was also centered on the early grades (K-3), but specifically sought the effects of class size reduction on disadvantaged students. For this reason the SAGE investigators focused on school districts where at least 50% of the student population lived below poverty level (Biddle & Berliner, 2002). SAGE included four different interventions: (1) reducing K-3 class size to a 15:1 student to teacher ratio; (2) establishing "lighted schools" which had a longer than normal school day; (3) developing a rigorous curriculum; and (4) refining staff development and accountability (James, Jurich & Estes, 2001). Participating schools received $2,000 per low-income student enrolled in a SAGE class. As with STAR, SAGE students showed an increase in test scores, reinforcing that class size reduction positively affects student achievement.

California also began a class size reduction program in the 1996-1997 school year. As a part of this program, primary schools received funding if they agreed to reduce class size in the early grades to no more than twenty students (Berliner & Biddle, 2002). Each school received $650 or $800 per child enrolled in a small class. California soon discovered they lacked the space, and the number of qualified teachers, to fully support the program (CSR Research Consortium, n.d.). This resulted in the hiring of unqualified teachers, and some funds being used to purchase extra classroom space. Preliminary results show the students in the program made a small gain in achievement as a result of reduced class size (CSR Research Consortium, n.d.; Berliner & Biddle, 2002).

A study conducted in England followed students in small classes from pre-K to Grade 6. Researchers found from pre-K to Grade 3 as class size increased, student attainment decreased (Blatchford, 2003). Similar results were found for Grades 4-6 (Tienken & Achilles, 2006).

From 2001-2004, Emma C. Attales Middle School intentionally reduced their class sizes in hopes that it would positively affect their student achievement (Tienken & Achilles, 2006). The school contained approximately 420 students in grades 6-8, and 34 teachers, including those in special education. The school had homogeneous classes for mathematics and language arts "high ability" students, as well as a "gifted and talented" language arts program. The other classes were not intentionally grouped, but because of scheduling limitations, some classes ended up fairly homogeneous. Although there are weaknesses in the research methods, the early results were encouraging. The student end of the year failure rate decreased to 1%, the writing scores on the districts speculative essays increased, and the number of students enrolled in extra mathematics and language arts support classes decreased (Tienken & Achilles, 2006). This suggests that class size reduction can also have positive results at the middle grade levels. As of the date of this paper, there has been little research conducted at the high school level.

Hanushek (1998) argues that the increased cost of reducing class size does not ensure increased student achievement. He comes to the following six conclusions:

1. We have extensive experience with class size reduction and it has not worked.

2. International experience suggests no relationship between pupil-teacher ratios and student performance.
3. Extensive econometric investigations show no relationship between class size and student performance.
4. Project STAR in Tennessee does not support overall reductions in class size except perhaps in kindergarten.
5. The quality of the teacher is much more important than class size.
6. While silver bullets do not exist, far superior approaches are available (pp. 2-5)

Drawing on research conducted in the United States and abroad, Hanushek concludes that class size reduction has little to no effect on student achievement. However, there is a continuing argument about how to measure student achievement, and the quality of those measurements.

In his study, Hanushek only focuses on student achievement levels as a result of class size reduction. He does not explore the social and psychological impacts of class size reduction on students and teachers. Columbia University's Mailman School of Public Health (2007) stated that high school graduates who participated in smaller classes gain "an average of 1.7 quality-adjusted life-years and generates a net $168,431 in lifetime revenue." Not only could class size reduction have positive effects on student achievement, but it could also produce long term returns. However, class size reduction has not been proven as a "cure all" for students' wellbeing.

Best Practices in Mathematics Instruction

There has never been a more critical time to learn mathematics than now. The career opportunities that await today's youth are becoming more technical and reliant on mathematical knowledge. Boaler (2008) states,

> If young people are to become powerful citizens with full control over their lives then they need to be able to reason mathematically-to think logically, compare numbers, analyze evidence, and reason with numbers. (p. 7)

Teachers now find themselves responsible not only to teach the youth, but also to inspire them to continue on their mathematical journey. Teachers must be effective, engaging, and motivating.

One way to engage students in mathematics is to vary the type of instruction in the classroom (Checkley, 2006). A few ways this can be done is by integrating technology into the classroom, encouraging student collaboration, and posing problems that have multiple solutions and multiple ways to solve them. In today's society, students are exposed to television, computers, and other technology at an early age. By integrating technology into the classroom, teachers are providing their students with an alternate way to explore problems using technology with which they are familiar. Technology can be used as a tool for problem solving, as well as a way to generate exploratory mathematics environments (D'Ambrosio & Katsburg, 2008). For example, a graphing calculator may be used to explore the vertical and horizontal shifts of a parabola when slight changes are made to its equation. Further still, the Geometer's Sketchpad program can allow students to explore the properties of three-dimensional objects by rotating them. By using technology the students are advancing their mathematical knowledge, as well as becoming more technologically savvy.

Another way to vary instruction is by using student collaboration. Barnes (2000, p. 145) defines collaboration as "students working together, usually in small groups, on a shared activity and with a common goal." Research has shown that when the frequency of collaboration in a classroom increases, so does the student achievement (D'Ambrosio & Katsburg, 2008). Students may be grouped flexibly, depending upon the purpose for grouping. They may be grouped for peer tutoring, brainstorming, role-playing, or problem solving (Cole, 2008). While participating in groups students are being exposed to different strategies to problem solving, they are actively involved with their classmates and the mathematics, they are sharing ideas, and they are verbalizing their understandings. Small group collaboration can also build student self-confidence, enabling students to feel more comfortable when the time comes to share out with the whole group (Tanner & Jones, 2000). All of this enhances the mathematical understanding of students, as well as their social skills. When students graduate and are exposed to the "real world," they will be expected to collaborate in order to solve problems. Cole (2008) states,

> Only in the U.S. classrooms are individuals expected to find every answer, solve every problem, complete every task, and pass every test by relying solely on their own efforts and abilities. (p. 8)

If students are exposed to and participate in collaborative groups while still in school, they will be better prepared for their futures.

Presenting problems that have multiple solutions, or multiple approaches to solve them, will also increase student engagement. Many students believe that there is only one way to solve every problem, and if they "follow the rules" they will arrive at the one and only correct answer (Fuson, Kalchman, & Bransford, 2005). Teachers who present "steps" to their students in lieu of allowing the students to work towards their own solution paths encourage this misconception. By being allowed to use their own approach to problem solving, students develop their thinking skills as well as learn that it is possible to arrive at the same conclusion through different avenues. This teaches the students that not only could there be different ways to solve a problem, but that some problems could have more than one "correct" solution. It can be very empowering for students to see their thought processes being validated in the classroom.

Increasing student communication also encourages engagement and learning. By having students communicate their mathematical understandings, they are forced to organize their thoughts and strategies, and are put in a position where they have to defend the rationale behind their problem solving process (D'Ambrosio & Katsburg, 2008). One way to encourage student communication is through teacher questioning. Effective teachers know how to pose questions in order to test student content knowledge, stimulate the thought process, and maintain control of the classroom (Tanner & Jones, 2000). When students are asked to explain, they must reflect on their learning and refine their thoughts. Students can communicate their understandings within student groups, as part of a whole class discussion, or in a written reflection. By continuously questioning their students, teachers can also provide students with immediate feedback and determine the impact of their teaching.

Now more than ever it is important that students have a strong foundation in mathematics. Teachers can increase the level of student mathematical success by providing quality instruction. Research suggests this can be done by varying the types of instruction in the classroom, encouraging student communication, and posing higher order questions.

Program Evaluation

Royse, Thyer, Padgett, & Logan (2006, p. 5) define a program as "an organized collection of activities designed to reach certain objectives." Fitzpatrick, Sanders & Worthen (2004, p. 5) define evaluation as "the identification, clarification, and application of defensible criteria to determine an evaluation object's value (worth or merit) in relation to those criteria." Payne (1994) states that the goal of an evaluation is to,

> determine the impact of the program on participants at the site by understanding the meanings it has to them; why it has those meanings; and how it affects behavior, actions, and interactions in that context. (p. 131)

There are different purposes for program evaluations, as well as different approaches when conducting a program evaluation.

In a broad sense, the purpose of a program evaluation is to assist stakeholders in the decision making process for that program (Spaulding, 2008). The evaluation could be used to improve on a program in the developmental stage, to facilitate rational comparisons between multiple programs, or to build knowledge of effective program design (Payne, 1994). Evaluations may also be used to rally support for, or opposition against a program (Worthen, 1990). The conclusions drawn from a program evaluation are specific to that program, and in most cases will not be generalizable (Fitzpatrick et al., 2004).

When conducting a program evaluation, the stakeholders must decide whether the evaluator will be external or internal. Internal evaluators are usually employees of the company being evaluated, while external evaluators tend to be someone hired to come in and complete the evaluation (Spaulding, 2008). An external evaluator is said to increase the objectivity of an evaluation. However, an internal evaluator may have unique insights into the program that will aid them in the evaluation process. The role that the evaluator plays may vary depending upon the needs of the stakeholders and the intended use of the evaluation.

Spaulding (2008) lists four different types of evaluations; objective-based, goal-free, expertise-oriented, and participatory orientated. In an objective-based evaluation, the program creators and evaluator work together to create objectives on which the evaluator will focus. These objectives, and thus the success of the program, are measured by detailed benchmarks that state quantitative goals that program participants must reach. Worthen (1990) outlines an approach similar to an objective-based evaluation called the performance-objectives congruence approach. This approach evaluates how successful a program is in attaining its objectives. Any discrepancies found between the objectives and the performances are used to modify the program.

A goal-free evaluation approaches the situation knowing that some of the results of the evaluation may not fall within predetermined objectives. Practitioners of this type of evaluation believe that the unexpected data collected from the evaluation is just as important, and sometimes more important, than the expected data. Some goal-free evaluators make it a point to remain ignorant of the program's objectives while conducting their evaluation (Worthen, 1990). In this type of evaluation, the evaluator has minimal contact with the program stakeholders (Fitzpatrick et al., 2004).

In an expertise-oriented evaluation the evaluator is an expert in the content and serves more as a judge of the program. Similar to the judgment-oriented approach, the experts observe the program in action and arrive at a judgment based on their expertise and a predetermined set of criteria. (Spaulding, 2008; Worthen, 1990). This type of evaluation is often used by agencies that are considering granting accreditation to institutions, services, or programs.

Finally, in a participatory-oriented evaluation the evaluator seeks to involve, and engage with, the participants in the evaluation process. These evaluators are more concerned with who the program serves, rather than the aspects of the program itself. Stakeholders often develop and collect their own data, from which they draw their own conclusions. The level of evaluator participation varies depending upon the type of study, and the situation at hand (Royse et al., 2006; Payne, 1994).

The evaluator must determine what approach to evaluation they will be conducting, formative or summative. In formative evaluations data is collected, analyzed and used as the program is taking place (Spaulding, 2008). Summative evaluations collect data such as state assessment results and content area test scores. Interviews and surveys could also be used in summative evaluations if the questions posed ask the participants to summarize their experiences or perceptions of the program. Formative evaluations generally aid in program improvement, while summative evaluations are used to aid in program adoption, continuation or expansion decisions (Fitzpatrick et al., 2004; Payne, 1994; Royse et al., 2006). Payne (1994) goes on to say that formative evaluations collect data frequently, while summative evaluations collect data on a limited basis. Using mixed methods, both formative and summative, in an evaluation allows for a broader range of data collection, which in turn leads to a greater fulfillment of the needs of the stakeholders (Payne, 1994).

ADDITIONAL DETAILS ON MATH PLATO INTERVENTION

In early September 2010, the Kailua High School mathematics department was asked by administration to produce another solution for the low HSA mathematics scores of their students. Already in place were mandatory pre-requisite classes to Algebra I and a repeat course for those students who did not find success in the pre-requisite course. The department informally discussed this solution for two weeks, and met over October break to formally decide on the solution. Math PLATO Intervention was created over October break, and implemented the following week. The planning process for this course, from conception to implementation, was less than one month.

Math PLATO Intervention is the third in a series of interventions implemented by the Kailua High School mathematics department. It was designed to help students who were not successful in the traditional Algebra I setting by placing them in a reduced class size environment, and infusing computer based lessons and assignments into the curriculum.

PLATO is computer based mathematics program. It is available in a range of mathematics subjects, and each subject is broken into modules. Each module covers a certain topic within that subject, providing tutorials, practice problems, and summative assessments on that topic. A student must go through the tutorial session, which contains practice problems, before they can gain access to the summative assessments. The summative assessments are multiple choice, and the students are given multiple opportunities to pass. These assessments are used to measure student understanding on a specific module. Once the students score a certain percentage on the summative assessment, they are able to move on to the next module.

The original intent of Math PLATO Intervention was to promote success in the bubble mathematics students at Kailua High School. It was hoped that by participating in this course the MPI students would pass their mathematics courses, gain a deeper understanding of algebraic mathematics concepts, and build student mathematical self-confidence. This confidence would help them to succeed in their future mathematics classes, strive on the Hawaiʻi State Assessment, and continue on the path of mathematical learning.

The three Algebra Topics teachers selected the students enrolled in Math PLATO Intervention. The students selected had to meet the three criteria mentioned in the introduction. At the end of Term 1, the Algebra Topics teachers were asked to identify students who met the three criteria. During intercession, all six regular education mathematics teachers collaboratively made decisions in regards to the intent of MPI, class size, class structure, and curriculum.

The class size of MPI depended upon a few things. First, we wanted to keep the class size manageable for the MPI teachers. Since these students had a history of failing mathematics courses, we knew they would come into class with a number of challenges. From experience we knew that these students needed to a great deal of support. For this reason, we wanted to create classes with a small number of students. The mathematics department requested that any available Educational Assistants (EAs) and Part Time Teachers (PTTs) be placed in the MPI class, in addition to the MPI teachers, in order to provide adequate support to these students. Secondly, we thought that a smaller class size would help to promote the success of all the students. Finally, since we were shuffling around students and teachers, we had to make sure that the class size of the traditional

Algebra I course was a fair number for the traditional course teacher. We felt that the traditional Algebra I classes should not exceed 28 students. All of these factors contributed to the decision to limit the MPI class size 4-10 students.

Kailua High School received funding from Title 1 in order to institute this program. The purpose of Title 1 is to provide academic support for students who are labeled low achieving. This may include students who are from a disadvantaged minority group. The salaries of the Part Time Teachers who taught the MPI course, and well as the PLATO program itself, were purchased with Title 1 funds.

Prior to the start of the course, the mathematics department decided that the MPI curriculum should not be something that would overwhelm the teachers. As it is our department's practice to collaboratively plan our courses, we felt it was fair and efficient to use the traditional Algebra I curriculum in our MPI classes. This meant that the students would cover the same topics whether they were enrolled in MPI or traditional Algebra I. We were fortunate in that the PTTs hired to teach MPI were also experienced mathematics teachers. Because they were only being paid as PTTs during the periods they taught MPI, we felt it was unfair of the school and the department to expect them to carry a full teacher load. Part Time Teacher pay is at least five dollars an hour less than regular teacher pay, depending upon the person's qualifications. Part Time Teachers are also not allowed to work for more than seventeen hours a week. For the PTTs chosen to teach MPI, the seventeen hours must include all course planning and preparation, in class time, as well as study hall and time spent grading.

In order to lighten the workload of the MPI teachers and keep the content consistent, the mathematics department decided that the summative assessments taken in

MPI would be the same ones taken in the traditional Algebra I classes. The Algebra I teachers would provide the assessments to the MPI teachers for use in their own course. Summative assessments ranged in length, depending upon how many topics were being tested. Each problem on a summative assessment was graded on a 2 or 4-point scale, depending upon the difficulty of the problem.

As for the formative assessments, the MPI course would use a blend of traditional assignments as well as computer-based assignments. Since MPI was funded through Title 1, we needed to make sure we used the resources provided by Title 1. This included all PTTs, even those who were not the official MPI teachers, as well as PLATO. However, as mathematics teachers our intuition and experience told us that these students would not receive all the content required for the course if they used PLATO exclusively. We made the decision to have the Algebra I teachers provide all the formative assessments given in the traditional classes to the MPI teachers. The MPI teachers used their professional judgment to decide which of these assessments they would use in their course. Some assignments were modified, and some were eliminated altogether. As for the PLATO modules used in the course, the MPI teachers made the decision as to which modules were appropriate. Formative assessments were graded on a 4-point scale.

We decided that the grading scale of the MPI courses should be the same as the traditional Algebra I classes, since the MPI students were working towards earning the same credit as the traditional Algebra I students. On paper, the MPI students were still enrolled in the traditional Algebra I class, even though they were physically in another classroom. The reason for this is the MPI teachers were technically PTTs, and are therefore not allowed to have their own class. Because the traditional Algebra I teachers were still technically responsible for the MPI students, we felt that the students should be held to the same course policies as the traditional students. The overall grade of all Algebra I students was weighted eighty percent on their summative assessments, and twenty percent on their formative assessments.

After all of these decisions were made, the Algebra Topics teachers created lists of students who met the three criteria for the Math PLATO Intervention. Based on the lists of students compiled by the Algebra Topics teachers, and the decisions made as a department, the MPI classes were created. Parents of the selected students were asked to sign a consent form, and students were accepted on a first come, first served basis. Students were accepted until the maximum capacity was reached for that period. Schedule changes were completed with the registrar and the students began MPI at the start of Term 2.

The vision of MPI began to shift immediately after it's implementation. Teachers were pressured by administration to accept student that did not meet the selection criteria. Because the traditional Algebra I teachers were ultimately responsible for the MPI students, the MPI teachers felt obligated to teach the same curriculum as the traditional teachers. This undermined the vision of creating a different learning environment for the MPI students.

METHODOLOGY FOR THE EVALUATION

As the Primary Investigator (PI) in this evaluation, I took on different roles during this process. Not only was I evaluating a program, but I was also the former teacher of some of the MPI students, and the colleague of the MPI teachers. I was aware that my role as a teacher at Kailua High School may affect some of the responses of the students and teachers. Before assigning the journal prompts and beginning the individual interviews and focus groups I assured each student that I was not going to discuss their responses with anyone at school, nor would their responses have an adverse, or positive, affect on their grade. I also encouraged the MPI students who happened to be my former students to be honest about their experience in my class, as it would only help me become a better teacher. During my interactions with the teachers, I maintained professionalism and did not express my personal thoughts or opinions.

During the evaluation process I served an internal evaluator of the MPI program. As a member of the Kailua High School mathematics department, I had intimate knowledge of the MPI process and classroom setting. I was also personally connected with the MPI teachers and some of the students, which increased my knowledge and understanding of the MPI classroom interactions. However, as I was not directly involved in the daily activities in the MPI classroom, I maintained some of the objectivity that an external evaluator would possess.

At first, I took a participatory-oriented approach to this evaluation. I was concerned with the students' content knowledge, as well as any other effects that the MPI program was having on them. I involved the students in the evaluation process by asking them questions about their daily activities, pros and cons of the course, and how they felt MPI was helping develop them as a student. I also developed the data collection instruments, collected the data, and drew conclusions from the data based on my own analysis.

As the evaluation process progressed, I took a more objectives-based approach. I wanted to know if the MPI program was staying true to its identity at conception. Did the small teacher to student ratio hold? Was the student selection process followed? Was PLATO being used and did it help build student understanding? Although I could not fully remove myself as a participant in the study, I feel as though my own objectives changed as the study progressed.

In regards to formative versus summative evaluation approaches, I used mixed methods. My evaluation took a partially formative approach because I collected and analyzed data as the program was taking place. Since MPI is only in its second year, some of the data I collected is being used to modify the program. The evaluation was summative in the sense that it will be used, alongside other data sources, to determine if Kailua High School adopts the MPI program on a permanent basis. As of now MPI is operating on a three-year trial basis, assuming the funding is provided every year.

Participants

There were twenty student participants in this study, and three teacher participants. All twenty students were enrolled in Algebra Topics, Geometry Concepts, and Algebra I during the 2009-2010 school year. The twenty students involved in this study represent the entire student population of Math PLATO Intervention. Two of the teacher participants were described in the introduction. The third was the 2010-2011 Geometry teacher for some of the 2009-2010 MPI students. She was a long-term substitute for a mathematics teacher who was on maternity leave. She worked at Kailua High School previously as a PTT, but had never run her own classroom.

Of the twenty MPI student participants, three were selected to participate in individual interviews. Math PLATO Intervention teachers were asked to identify one high ability, one medium ability, and one low ability MPI student. The MPI teachers made their decision as a group, and submitted three names to me. This allowed to me to collect data that better represented the MPI class.

Student H was a female freshman identified by her MPI teacher as a high ability student. This ability level was determined by using a relative comparison between all the MPI students. During the first term of the 2009-2010 school year, Student H was enrolled in my Algebra Topics class. Based on my experiences with her, I felt that Student H was a capable student who often allowed her personal and social lives to interfere with her learning.

Student J was a male 10R who had been identified by his MPI teacher as a mid-level performing student. The term 10R means that Student J had been enrolled in high school for three years, but had only earned enough credits to be considered a sophomore. He was enrolled in my traditional Algebra Topics course during the first term, before being selected to participate in MPI. Student J was also enrolled in my traditional Algebra I course during the 2008-2009 school year, which means that MPI served as a repeat of Algebra I for him. When Student J was enrolled in my class, he was easily distracted, oftentimes completing one problem, if any, during a sixty-five minute period.

Student T was a male senior who was identified by his MPI teacher as a low ability student. In order to earn enough mathematics credits to graduate, Student T was enrolled in two mathematics courses for the entire second semester of the 2009-2010 school year. Not only was he taking MPI Algebra I, but he was also repeating Algebra Topics/Geometry Concepts. He had taken Algebra Topics/Geometry Concepts during the first semester, but did not complete it with a passing grade.

Eight of the twenty MPI students were also selected to participate in a focus group. The three students who were individually interviewed participated in the focus group, as well as five other students who were asked to volunteer for the focus group by the MPI teachers. In total, there were five freshmen, two sophomores, and one senior in the focus group. Five students were male, and three were female.

Data Sources

The data sources for this study consisted of:

1. Student surveys
2. Student journals
3. Individual student interviews
4. Student focus group
5. Individual teacher interviews
6. Teacher journals

During Term 3, all MPI students were given a survey. The intent of the survey was to collect data on the thoughts and dispositions of the students. This data would be used as baseline data for the MPI students. The results of the survey were also used to form the journal prompt and interview questions posed to the students and teachers. The survey used a Likert scale and was administered during class. Questions were developed based on my research topic and a handout I was given in EDCS 632. This is a Qualitative Research Methods course offered at University of Hawai‘i at Manoa. The handout listed the following four guidelines for constructing Likert scales.

1. Each statement should be phrased in words which are familiar to the respondent, rather than technical jargon.
2. Each statement should express a clearly positive or clearly negative attitude.
3. Number of positive and negative statements should be roughly equal.
4. Each statement should yield information needed.

The students had the choice of identifying themselves on the survey. The same survey was given to the students at the end of the school year, and the results were compiled, analyzed, and compared to the first survey. Appendices A and B display complete survey results by question, number of students answering, and percentage of students answering.

During Terms 3 and 4, the MPI students were asked to complete a series of journal prompts. All MPI students completed the journal prompts as a part of their normal coursework. Students had the choice of remaining unidentified on each of the journal prompt responses. The students were given approximately one journal prompt per week over the course of ten weeks. Merriam (2009, p. 169) stated “collection and analysis should be a simultaneous process in qualitative research." Therefore, I read the journal responses prior to creating the next journal prompt. This aided question development, and allowed me to uncover emerging themes in the data as it was collected.

Math PLATO Intervention teachers were also asked to respond to journal prompts. Each MPI teacher was emailed the journal prompts, and their responses were emailed back to me. Journal prompts were developed based on previous responses and themes emerging from the data. Teachers were given approximately one journal prompt per week over the course of ten weeks.

The three students already described took part in individual interviews. Each student participated in one individual interview, which lasted approximately 20-30 minutes. The individual interviews were conducted in mid-late April. The interviews took place during the normal school day, and were completely voluntary. Students were made aware that the purpose of the interview was to determine how successful Math PLATO Intervention was up until that point.

The focus group of eight MPI students, which included the three individual interviewees, met twice, once in late May, and again in early October. The focus group meetings took place during the normal school day, and were completely voluntary. Each focus group meeting lasted 45-60 minutes. Appendix C contains a full list of student journal prompt and interview questions.

Math PLATO Intervention teachers were also individually interviewed twice. The first interview took place in late April, and the second in early November. Interview questions were formed based on teacher journal responses, student journal responses, and discussions from the student focus group. The length of each interview was 30-45 minutes. Interviews were conducted during normal teacher work hours. A complete list of teacher journal prompt and interview questions can be found in Appendix D.

All interviews were semi-structured (Merriam, 2009). As the interviewer, I created a list of interview questions that I used to guide the interview. The questions had no predetermined order or wording, and were used to explore areas of interest. These areas included student mathematical knowledge, and student self-perception. The semi-structured format allowed me to use follow up questions when faced with new ideas from the interviewee, as well as adapt to the situation at hand. All interviews were transcribed and coded for themes. Interviewees were informed that my role during this process was purely as a researcher. Ideas and feelings discussed in the interviews would not be shared with other classmates or colleagues, nor would it affect student-teacher relationships.

Analyzing the Data

The student surveys were administered by the MPI teachers, and returned to me upon completion. I tallied the responses, and arranged them in a table. The table included the percentage and number of students who answered each statement, categorized by their response type. The results from the first and second survey were compared, and any significant differences were noted.

The student journal responses were analyzed as they were given. I read the responses and looked for patterns within them. Based on these patterns, I decided what journal prompt to give next. If there was no recognizable pattern, I chose a question from a list of student journal prompt questions that was generated prior to the program evaluation. At the end of the school year, after all the journal prompts were answered, I read through all of the responses again. This time I looked for themes that occurred over time.

Prior to interviewing the students individually, I created a list of interview questions. The majority of these questions were also used as journal prompt questions. During the interview I tailored my questions based on the students' responses. Each interview was audio recorded, and I also took notes during the interview. I transcribed each interview within two days of holding them. At that point, I read through the interview transcription, as well as my notes, and looked for any emerging themes.

Since the student focus groups occurred after some other data had been collected, I tailored my questions in order to collect additional data on emerging themes I noticed in the student journal responses, individual student interviews, teacher journal responses, and teacher interviews. A number of questions posed in the focus group were previously posed as student journal prompts and individual student interview questions. The rest of the questions were tailored based on the focus group responses. The focus group meetings were transcribed within one week of them occurring. I listened to the focus group a number of times, as well as read through the transcriptions. I looked for emerging themes, or further support to existing themes based on previous journals and interviews.

Like the student interviews, I prepared a list of interview questions prior to individually interviewing the teachers. The interviews were audio recorded and notes were taken during the interview. Each interview was transcribed within one week of them occurring. I read through the transcriptions and my notes, and looked for emerging themes or additional support for existing themes.

Teacher journals were completed through email. I printed, and read through, each teacher journal response before deciding on the next prompt. The prompts were based on previous journal responses, and emerging themes from other data sources. At the end of the year, after all the prompts were answered, I reread all the teacher journal responses and looked for new emerging themes or additional support for existing themes.

While collecting data, I began to look for commonalities between the data source results. I designed further data collection with the intent of gaining support for, or refuting, these commonalities. As data collection ended, I reduced the number of themes I focused on. Each data source was coded for themes, and the frequency of each code was noted. Themes with a low frequency were eliminated. I chose to include the themes with high frequency of occurrences from multiple data sources.

OUTCOMES OF THE EVALUATION

Pre-MPI: Student Selection

The Kailua High School mathematics department created three criteria to determine the eligibility of a student for the MPI program. The purpose of the criteria was to help the department focus on the students who we felt needed this service, and also who would take full advantage of this service. Those three criteria were:

1. The student was enrolled in Algebra Topics during the first term of the 2009-2010 school year and earned a grade of D or F in that course.

2. The student showed a desire to learn as evidenced through homework completion rate and classroom behavior.

3. The student maintained regular school attendance for the first term of the 2009-2010 school year.

At the start of the program, the teachers held to these three criteria. Informal meetings were held between the MPI teachers and the traditional Algebra I teachers in order to ensure the students selected met the three criteria.

Over the first few weeks of the program, the mathematics department was asked to accept additional students into the program who did not fit the criteria above. Most of these students were seniors who needed to pass their current mathematics class in order to graduate on time, and did not meet criterion 2 and 3 above. Counselors began to look at the program as a “last chance” for these students. They felt that the smaller class size, and increased individual attention would give these seniors the extra support they needed in order to earn their credit. The MPI teachers decided to take on these extra students because they wanted to help the students succeed, and because they felt the MPI classes could handle the increase in students.

During the 2010-2011 school year, teachers took a slightly different approach to student selection. It was decided to start the MPI program earlier in the school year in order to provide additional support to these students. Students were selected after the first five weeks of the school year. Algebra Topics teachers selected students who they noticed had low basic mathematics skills, but a desire to learn. Some teachers also selected students who had a low grade as a result of poor attendance. Although most students met the original three criteria, Algebra Topics teachers tended to be more lenient on student selection the second time around. Like in its first year, counselors continued to see MPI as a “last chance” course for some students. They continue to enroll students in the course who may not necessarily meet the three criteria.

When asked why they believe they were selected to be in MPI, one student wrote in her journal, the teachers “can help me more often.” Others wrote, “Because I failed my other class”, “I need a little more attention”, “I need to learn my work in a different way”, and “this class would give me a better benefit.” Students recognized that though they were completing their work in the traditional classroom setting, they were struggling with the content. They also felt that the MPI class would give them the support they needed in order to reach their maximum potential.

During MPI: Daily Activities and Instruction

When asked about the purpose or intent of MPI, mathematics teachers agreed that it was to offer more support to those students who had the potential to succeed, but were not doing so in the traditional Algebra setting. The course would also teach students the mathematical content using varying types of instruction. As stated in a journal by one teacher, MPI is "for those students who've failed multiple times, or for behavioral reasons, just can't fit in with the other students." Another teacher stated that the purpose of MPI is,

> to help students that *[sic]* were not proficient in whatever class get proficient by providing a different type of instruction besides just teacher led/textbook and incorporating the PLATO program to do that.

My interpretation of the data gathered from student journals, student interviews, student focus groups, teacher journals, and teacher interviews leads me to state that the following supports occurred in the MPI classroom:

1. Organization
2. Immediate feedback & assistance
3. Flexibility
4. Chunking & extended time

In her first interview on April 28, 2010, MPI Teacher A stated that all MPI students were provided with a binder purchased by the school in an effort to keep them more organized. The teacher noticed because of the binders that some students "are more responsible about their homework," and "they're aware of what we've done because it's in their binder." At the beginning of the 2010-2011 school year, a former MPI student and focus group member commented that the binder was a great tool for organization. He said that this year he does not use a binder and tends to throw everything in his backpack haphazardly.

Teacher B stated that they are able to provide students with instant feedback, which is not always possible in a traditional setting. In his first interview on April 29, 2010, Teacher B said in the traditional setting,

> if they made a mistake it would go uncaught for a while. Or if they did something good it wouldn't be rewarded right away. A lot of the students…need that instant feedback.

Student J said of his teachers, "Whenever you ask a question they answer it until you get it. They give you as much help as you need." Numerous students also wrote in their journals that the MPI teachers were able to provide them with more help than they were receiving in the traditional setting.

Teachers were also supportive by increasing their flexibility with the MPI students. Students were given extended time on their tests, allowed to use notes on all tests and quizzes, and allowed to correct and retake their summative assessments for a higher grade. Homework deadlines, and test correction and retake deadlines were not as harshly enforced with the MPI students as they were in the other classes. Teacher A said they were more willing to accept late work from the MPI students because she knew those students were usually the ones who were not responsible with their work. A lot of them did the work, but never handed it in. If she noticed the assignment completed and in a student's binder, she would accept it for full credit.

The pacing of the course was also flexible. This is different from the traditional mathematics classes where teachers plan as teams and teach the same lesson on the same day. This includes administering summative assessments on the same day. On October 8, 2010 Teacher B commented in his interview,

> And the pacing was more flexible. I never had to give a test on a certain day. It wasn't like there was a bunch of MPI classes I had to stay coordinated with. So if I had to spend an extra day reviewing, I always had that freedom.

Flexible pacing also created some problems for the MPI teachers. Both MPI teachers stated in their interviews that if they taught the course again, they would focus on keeping the class on pace with the traditional class. Teacher A commented,

> I think the other thing is we want to keep them on track. Like on a pace that's somewhat close to what the regular kids are doing. Um, I guess if we were in an ideal world where budget and class time and teachers wasn't an issue, than I could go at a really, really slow pace and let these kids go individually like the principal wants us to do. You know spend two weeks on combining like terms because some of them would need that. But in an ideal world they would have two years to finish algebra, you know. Maybe I'd have these kids until they finish the program and then at that point they would leave. And then yeah, then I think those kids could do well. But as far as our current situation, we're limited by the minutes, by the structure of the school system; we have to keep them on track. (Second Interview, October 8, 2010)

Teacher A wanted to provide students with as much time as they needed to master a concept, but recognized that the education system has boundaries and expectations. Teacher B also recognized that they (MPI teachers) were allowing their "slower" students to hold the class back. By waiting for these students to master concepts, the MPI class fell further off pace with the traditional Algebra I class. Teacher B stated,

> We need to do more as far as keeping the students on track. It just wasn't practical to tailor the curriculum to each individual student. So I think we'd be more set in our curriculum, and the students who were falling behind, instead of holding us back, holding the whole class back, we would have to find someway on enforcing, or making those students come in after school to get caught up. (Second Interview, October 8, 2010)

I also found that varying types of instruction were used in the MPI classroom. Students participated in traditional lecture style classes, as well as small group work and computer based lessons. The way the information was presented in MPI was also modified.

The content in MPI was broken up by topic instead of spiraling like the traditional setting. This is defined as chunking, or breaking up large topics into smaller, digestible pieces. When the content spirals, the students are practicing a large number of topics at once. It is not uncommon to take notes several times a week on several different topics in the traditional Algebra I setting. In MPI, the teachers chose to spend more time on each topic, and to test each topic individually. In traditional Algebra I, most tests covered a minimum of three topics. Teacher A stated in her interview that,

> we chose to go by topic because in the past we had seen more success when this kid would learn this one topic very intensely and then they would tend to do well on those tests on that one specific topic. (First Interview, April 28, 2010)

There are drawbacks to chunking content and assessments this way. When asked what she would have done differently when teaching MPI, Teacher A responded,

> As far as assessments, I think some of the students can't handle huge, cumulative tests. I don't know if by breaking it up am I doing them a disservice? Because maybe they're going to go on to college and maybe they're going to have cumulative tests there. But for the sake of them getting through the class, not getting totally discouraged, I felt that maybe if I'd broken up the big assessments, you know into little, maybe chew on two topics instead of eight topics or something like that. So that's definitely one thing I'd probably want to, breaking up the assessments, is one thing I'm thinking about or might change but I'm not sure. I'm not sure because I want to prepare them for college also but I don't know. (Second Interview, October 8, 2010)

Teacher A wanted to support her students but was unsure if this would be helpful to them in the long run. Another drawback was the wait time between learning new topics, or "chunks" of topics. Since MPI spends a larger amount of time on each "chunk", the students who understood the material easily were forced to wait for their classmates to catch up. Teacher B commented, "The kids who mastered the topic in one day just had to repeat it and repeat it."

The MPI teachers took a similar chunking approach to their lectures. Teacher A stated, "We try to make the notes a little more concise…so they can understand it." Teacher B said, "we tried to make it really simple…tell them explicitly to do this, and then do this, and then do this." When comparing the MPI class to the traditional setting, a student wrote in his journal, "It's a lot more easier to get the stuff I'm learning in her class." Another student wrote, "People in this class needs to be explained slowly, so they understand it better."

While some students benefit from being told exact procedures to follow, this discourages them from using multiple ways to solve problems. If students are accustomed to working through problems on their own, then if they forget the procedure, they will still have the tools necessary to figure the problem out. In an interview with Teacher B, we discussed using multiple strategies to solve problems. Below is an excerpt from that interview.

> PI: Say, for example, like solving equations, multi-step. Sometimes, it's not exactly you have to do this one, this one, this one. Did you make the students go in that particular order?
>
> B: In fact we did, yeah. And that's one thing I've noticed differently in my class that's not MPI right now, is that the students are able to say, "hey, I don't have to put the variable always being positive." But in MPI we really had to enforce, you know, just to cut down the number of places where they could go wrong. For example, when solving equations with variables on both sides, I had the students

> identify the side with the larger number, and put all the variables on that side so that there was always a positive coefficient.
>
> PI: So would you say at any time was there ever a time when you would encourage them using, solving anything, solving a problem, in multiple ways. Or you said this is the “right” way to do it.
>
> B: I think there were definitely times where there were more than one way and it depended on the students. But we encouraged them to pick the one that was best for them. So it’s not that we didn’t teach the other ways, but we taught them to stick with the ways that work best for them.
>
> PI: So would you say “Here’s three different ways, pick the one you like and just go with it”? Like, never mind the other two.
>
> B: I would say that’s a pretty fair description. In fact, the example that comes to mind is solving an equation with a fractional coefficient. Do you cross multiply or to multiply by the reciprocal. And for the majority of the students I think actually cross-multiplying was the easier method.

Teacher B says he taught different strategies to solve problems, but encouraged the students to concentrate on learning the one strategy they preferred. This point was reinforced in the focus group when one student commented that if they don’t “get it” one way, the teacher shows them another way. Another focus group member stated the teacher “shows us different numbers, but she also shows us different ways to do it and we choose the way that best fits us.” Fuson, Kalchman, and Bransford (2005) state,

> If mathematics learning is not grounded in an understanding of the nature of the problem to be solved and does not build on a student’s own reasoning and strategy development, then solving problems successfully will depend on the ability to recall memorized rules. (p. 222)

The MPI teachers frequently integrated small group work into the classroom. Most of the time each group would have a adult who would sit with it the entire period. Some days the MPI teacher would present the lesson and the PTTs and EAs would serve as tutors in their small groups. Other days each PTT or EA would be responsible for teaching his or her small group the lesson. Student H wished that “all people were in small groups in the classroom.” She goes on to say that in small groups, “if one of us has a strong point in a certain thing but someone else doesn’t, we try to help that other person.” Student J says working in groups is “more fun. (But) I get the same stuff done.”

As evidenced by the survey given at the end of Term 3, 67% of the MPI students agreed or strongly agreed to the statement “I prefer to work in a group.” At that time, 60% of the MPI students agreed or strongly agreed to the statement “I prefer to work alone.” This is an anomaly as some students would have had to agree to both statements. By the end of the school year, the percentage of students who preferred to work in a group jumped to 82%, while those who preferred to work alone dropped to 36%. In my opinion, this evidence suggests that the strategy of small group work was a positive instructional method for this group.

Students also completed lessons on the computer through the use of PLATO. As stated in both MPI teachers’ journals, the MPI students spent about 30 minutes per week on the computer. Teacher B writes, “the ‘application’ and ‘mastery test’ sections are valuable tools for our class.” Teacher A explains that PLATO has been used as a supplement to the curriculum, and also to preview or pre-teach a concept. Teacher B says PLATO promoted interactivity in the class. When using PLATO the students can’t use the excuse “I’ll do it at home” because they literally don’t have access to it at home. Teacher B also said that PLATO gives students instant feedback in regards to correct and incorrect answers.

When asked about doing work on PLATO Student H stated,

> it teaches you so you can have notes and stuff, and then it helps you practice, and then you take a test. Like right after. So it's fresh in your brain. (Individual Interview, April 27, 2010)

Student J stated, the computer,

> is right next to you. You can see it better, you can hear it better, and you can still ask questions (of the teacher)…there's also practice before you do the actual test. (Individual Interview, April 22, 2010)

Student J also said he thought the teacher was more beneficial to his learning. He said, "When I do the computer thing I do it kind of fast. Quickly. I forget what I learned already." He admits to enjoying completing PLATO lessons, but he feels he learns and retains more from teacher instruction. When asked if they felt the lessons completed on PLATO increased their understandings a focus group member said, "Not really cause was like a different thing. Like we would be on y intercept and it would be on adding something. Like a whole different subject." Another student said, "they didn't show you easy, medium, hard on the computer. They just showed you easy. Then you went out and did the harder ones and didn't know what to do."

The MPI teachers had the same concerns with the PLATO software. Teacher A stated that PLATO allows students to rush through the tutorial session without really listening to it. The function of the tutorial session is to teach the students the concepts and procedures they need in order to master that module. The MPI teachers also commented that some of the modules contained in PLATO did not align with the curriculum they were teaching. In some cases, PLATO provides only the most basic type of problem on a specific topic, leaving the students without the tools to conquer the more difficult ones. This is one of the reasons why the MPI teachers used PLATO to pre-teach topics, and not as the main source of instruction for topics.

Student Self-confidence & Self-perception

The Math PLATO Intervention teachers identified student J as a student with medium ability. Below is an excerpt from his individual interview with me, the Primary Investigator (PI).

> PI: Do you feel confident? Do you feel scared when you get the work?
> J:I guess confident. Cause I don't care. I know I'm going to do good.
> PI: You know you're going to do good. So you feel confident in math. Did you always feel that way?
> J: No.
> PI: When did that start happening? When did you feel your confidence getting…
> J: When I started paying attention.
> PI: When you started paying attention. So would you say that was this year? Was it…
> J: When I first got to this class.
> PI: Oh, when you first got to that class. When you were in my class in the beginning of the year not so much?
> J: No.

Student J pointed out that he did not always feel confident in mathematics, and that he began to feel his confidence rise during his time spent in MPI. He also says "I know I'm going to do good." This shows that his current perception of himself as a mathematics student is strong, even if though his MPI teachers thought of him as a medium performer. In the focus group another student said, "Math is easy." When asked if they would be able to complete a problem if I gave it to them on the spot, the majority of the focus group immediately answered "yes." One student said he would probably need some assistance. This shows that the students were confident in their mathematical abilities, and not afraid to ask for help if need be.

When asked about any changes in self-confidence or self-perception that they may have seen in their Math PLATO Intervention students, Teacher A responded,

> There's, I see a difference in there, like how they feel about math. Well one is how they feel about math, I would say before all of them hated math. Well maybe one didn't, but now a majority of them will say maybe they don't love math but they feel like they can do it. They feel like they can, even if they may have failed this one test, they probably did well on another test. And it was like, once they saw that success they got more happy, more optimistic, they felt more empowered, I see more smiling than I ever did before in class. Sometimes too much but um they're, I think, they seem more motivated because they've done well, and they know what it feels like. So they want to try to get that again. So there's a little more motivation, not as much as we want, but there's more motivation there. And I definitely don't hear "I hate math" anymore. I never hear that. And then, you know sometimes they say they used to say, "everything is hard", but now it's more like "I get this, this one I have more trouble with." So there's plusses and minuses, it's not just all minuses. Some things they get, some things they don't. I don't get the sense that they all feel like they're losers, in that sense. They don't feel totally negative about their abilities…They no longer feel like, 'I can't do this. I never want to do this. What's the point?' it's like 'How do we do this? How can I improve? What can I do to make things easier?' Which is a lot better than 'I don't even want to try. I don't care.' It's not 'I don't care' anymore. Their attitudes have improved. They're definitely more confident about their math. (First Interview, April 28, 2010)

When asked the same question, Teacher B stated,

> Um, yeah. I think a lot of times the kids still have that reflex of when they see something hard they say 'I don't know how to do this.' But with prompting, with asking, they realize they will know how to do it. And that 'I don't know how to do this' is not an acceptable answer in a math class. I think we have that expectation of them. (First Interview, April 29, 2010)

Teacher A and Teacher B noted that students feel that they can complete their assignments if they put effort into it. The students have seen success, even if not consistently, and they strive to attain that success again. Also the MPI students "don't feel totally negative about their abilities", which unfortunately is a common feeling amongst the traditional Algebra 1 students. The MPI students know the content, although sometimes the teachers need to prompt them in order for them to retrieve it. One student writes, "I'm doing better than I did in all my other math classes!"

However, my interpretation of some of the data suggests that the levels of student self-confidence and self-perception did not change as the year progressed. At the end of Term 3 (early March), the students were asked if they felt confident in mathematics via a survey. At that time 12 of 15 MPI students agreed with that statement, and 3 of 15 strongly agreed. At the end of Term 4 (late May), 8 of 11 MPI students agreed, and 1n of 11 strongly agreed. The percentage of students reacting positively to this statement showed no change. However, the raw number of students that responded negatively to this statement decreased by one. Due to time constraints at the end of the school year, fewer MPI students completed the survey at the end of Term 4 than at the end of Term 3.

Immediate Effects of Class Size Reduction

The MPI class was designed to have no more than 10 students per period, giving it approximately a 5 to 1 student to adult ratio. Because of scheduling issues, Period 1 ended up with 11 students, Period 2 had 5 students, and Period 4 had 4 students. This gave Period 2 a 5 to 2 student to adult ratio, and Period 4 a 2 to 1 student to adult ratio. Period 1 held to the 5 to 1 student to adult ratio. Throughout the school year, these numbers fluctuated as students withdrew from school or the program, and as more students got placed in MPI. The most commented on aspect of the reduced class size by the students, was the decreased amount of distraction.

Student H was a freshman selected to participate in MPI after struggling with Algebra Topics during term one. They were identified as a high ability MPI student. Below is an excerpt from her individual interview.

PI: You’re pretty smart?

H: Like in the other class I didn't really think I was but that's because there was a lot of distractions. Like there's a lot of students down there. And up here there's not much, I mean I talk to Student C sometimes, but there's a lot of distraction down there and also there's less people so she can help. It's easier to understand because she doesn't have to help everybody, as much students. She only has a little bit so it's easier to understand things.

PI: So you're saying there's a lot of distraction in the other class because it's so big….

H: And it's easier to help a small class then it is a big class.

PI: Easier for the teacher?

H: Yes.

PI: You also said that you're pretty smart. So do you think when you were in the other class you were still pretty smart and it was just the distractions that got to you? Or…

H: I'm pretty smart; yea it was just the distractions. But up here, we also get more help. So that also helped my smartness.

PI: Your smartness. When you were in your first math class in the beginning of the year, how confident did you feel about your ability in math?

H: It was ok.

PI: It was ok? What do you mean by ok?

H: Well, like, 'cause there are a lot of smart people down there and I got distracted really easily, so I felt dumb when it comes to tests because I wouldn't pay attention because I was distracted. Got bad grades and other people around me were getting good grades, unless they were also distracted. So, being up here kind of helped it because I wasn't distracted so much. My grades got better because I've been paying attention.

PI: Ok. From what I'm hearing you say, you're mentioning a lot about being distracted. So that is one big difference for you between your first class and this class. Are there any other big differences between your original math class and your class now?

H: I'd have to say, not to be mean, but there are a lot of irritating people down there. I mean there's sometimes where I'm irritated in there, because we kind of go back and forth sometimes. But there's less irritating people in here then there are down there. So, 'cause when you're in a bad mood you really don't want to do anything, and if you're irritated a lot, or if I'm irritated a lot I wouldn't want to do anything. Just sit there.

Student H admits that she tends to get distracted in class, but also that there is less distraction in MPI. Student H also mentions that it is easier for the students to get the help they need because the teacher has more opportunity to help each student. This is due to the smaller class size of Math PLATO Intervention in comparison to the traditional class.

One student wrote in their journal, "The class size is good. There is no one distracting you when you do your work." Others write that the MPI class has "less distractions, less students." Another goes on to say "there's a little bit of people and I pay attention a lot better." Yet another student said, "The class is small and quiet, perfect for learning."

During the focus group, I asked the students what they like best about the MPI class. Their response was as follows.

L: I like that there's less kids in the classroom.

M: Less distractions.

N: The teachers have more time for you.

PI: So you like it because the teacher has more time for you, and you two are saying that there are less distractions.

H: I think they both fit together. The less people there, there's less distractions and more help.

PI: What about you guys?

O: Kind of the same. Exactly the same.

PI: So what kind of distractions were there in your other class?

M: Too much talking.

N: Too much kids, and only one teacher.

PI: So were you a part of the distraction in the other class?

M: Yea.

L: He was.

H: Most of the time.

Although the students do like to socialize, they recognize that the decreased amount of distraction in the MPI class has helped them to succeed. Some students who were labeled as one of the "loud kids" in their previous class have now become more focused and less distracting to the other students and themselves. The entire MPI class makes an effort to complete their work with accuracy. Teacher A commented, "I like the small setting. I feel like when they're more focused it makes my job easier and I can provide more support."

As compared to the traditional classes, both MPI students and teachers noticed that there was more student-teacher time in MPI. Teacher A wrote in their journal "The biggest benefit of smaller class sizes has been the increased time spent with each student individually." They later went on to say in an interview that the increased amount of one on one time was on of the greatest success of MPI in its first year. Teacher B wrote "The amount of individualized attention made it possible to ensure that each student learned something everyday, on each level of instruction." Student J commented, "whenever you ask a question they (MPI teachers) answer it until you get it. They give you as much help as you need." A student in the focus group mentioned, "Teacher A would work with me on top a certain topic, like just me and her, so I would understand it more." Another focus group member said, "(this class is) small, so we can get more attention from the teachers, so you understand how to do the work better."

Teacher-Student Relationship

Both MPI students and teachers commented on the relationships they developed over the course of the MPI class. With the exception of a few students, the majority of people directly involved in MPI felt they created positive teacher-student relationships.

Many students felt as though their MPI teachers cared about them as a person and not just as a mathematics student. One student wrote, "This class has great teachers that really care about you." Compared to their previous mathematics teacher one student wrote in their journal, "I feel more comfortable working with her (MPI teacher)." One student wrote that their teacher should help students "that need help and protect them from bad things." Most students recognized that their teacher wanted them to succeed in mathematics and many went on to make comments about their teacher caring about them holistically. Student H stated in her interview,

> H: And if we don't feel good she kind of notices. Like that day I was crying, she asked if I needed to go see the counselor and stuff. So she's also there for us if it's not about math too.
>
> PI: Ok. So she cares about (yeah) you in general (yeah) not just you in math.
>
> H: That's how I feel. I feel like she at least, like, yeah she cares. She puts in effort into helping us with our actual, outside the math class too.

According to the survey taken by the MPI students at the end of Term 3, 100% of those who completed it agreed or strongly agreed with the statement, "My math teacher cares about my success in their class." At the end of the school year, all but one student agreed or strongly agreed with statement. From this I can infer that the MPI teachers were consistent in encouraging and offering support to their students.

The MPI teachers also had positive comments on their relationships with their MPI students. Teacher B stated, “Being able to connect with each of the students on a personal level meant that they knew someone was personally responsible for helping them succeed.” They go on to say, “I think these are the students who need me the most and I feel that I have made a difference for them.” Teacher B recognizes his role as a teacher, as well as a caring adult figure, in the lives of their students.

Teacher A said,

> I can be more flexible with it (attendance) because I have that one on one connection with the kids so I can sit them down more often and have a heart to heart. And figure out what’s going in their lives or what can I do to help them, or do we need to do to get them to class… The students feel comfortable enough to take risks that they probably wouldn’t have taken in a regular class such as calling out answers and doing problems on the board in front of the class. I feel that most of my students know that I care about them and want them to do well. (First Interview, April, 28, 2010)

Through her actions, Teacher A shows her students that she cares about them as individuals. They take the time to get to the root of the problem, and do not assume that it is purely mathematics related. When interviewed in early October, both Teacher A and Teacher B said they still felt connected to their now former MPI students. Teacher A said she has had extremely pleasant interactions with all the former MPI students she has seen. Teacher B has had similar experiences. He said, “Even actually a couple students who have graduated, who were seniors, I’ve seen around and they’ve been happy to see me.”

One of the negative comments made by a student in their journal was that teachers should “come to school and teach and not act like jerks when a student doesn’t understand something." From this I can infer that this student felt that they were being treated unfairly or being put down by their teacher. Another student wrote that even if students "don't like a teacher they still respect them." This leads me to believe that this student did not get along with their teacher. However, they still recognized the teacher as an authority figure and treated them as such.

When asked about the teacher's role and attitude in the MPI class the students were split. They all recognized that the MPI teachers had different teaching styles, and some students preferred one to the other. Below is an excerpt from the focus group.

> PI: Do you feel the same way that they feel about the amount of help?
>
> M: Yea.
>
> J: Whenever I ask, Teacher A helps.
>
> PI: You had 13 students in your class?
>
> M: Yea.
>
> H: We had four! And two of them left because they're seniors.
>
> PI: You feel you got enough help in Period 1?
>
> N: From Teacher A, not Teacher B.
>
> M: Nah, Teacher B was helpful too.
>
> J: But he like expects you to know how to do it.
>
> M: The only thing about him, if you don't know how for do 'em then he no help, but if you know how then he help you.
>
> PI: So for you guys that had more than one teacher, what is the difference between the two teachers? Do you like one better or certain things better?
>
> O: Yea. Teacher A is way better.
>
> (other students agree)
>
> PI: Why?

M: Nah, they're even. He's more challenging. He wants you to get it. He doesn't give you as much information as Teacher A.

O: He expects you to get it.

PI: So what do you guys think is better?

M: Teacher A helps us through it, and if you don't know how to do it with Teacher B then he gets mad at you.

H: Yea, cause you're *supposed* to know how to do it.

PI: And Teacher A doesn't get mad?

A few students: No.

H: Sometimes she gets frustrated if it's something we're supposed to know like that (snaps) already. Then she gets a little frustrated, but she's not like mad. I don't know about the other teacher but I'm just saying Teacher A.

Student Behavior & Responsibility

The majority of the students selected for MPI did not have pre-existing attendance problems, or extremely bad study habits. Their actions led their traditional Algebra teachers to believe that they had the potential to succeed if placed in a smaller class setting with additional supports. Throughout the MPI course, the teachers and students were asked if they had noticed any changes in behavior as a result of being in the MPI course.

Student H was quoted earlier as saying, "being up here (MPI) kind of helped it because I wasn't distracted as much. My grades got better because I've been paying attention." Student J said in his interview that he pays attention more in class, and he asks questions frequently. He says that both of these behaviors increased when he joined MPI, and that mathematics is easy "if you pay attention" and he finds himself "asking questions all the time" in order to understand a topic better. Both students admitted that their level of focus in mathematics class increased when they enrolled in MPI.

When asked why they did not pass Algebra Topics in the first term, the focus group responded as follows.

> C: I never passed cause I never did go to your class.
>
> PI: That’s true.
>
> H: And when you did you walked out anyways.
>
> PI: Not always.
>
> O: I was talking too much.
>
> M: Too much friends in that class.
>
> L: I was bad.
>
> PI: So do you guys think you’re going to pick up the same bad habits next year?
>
> C: Um. No.
>
> H: I might, honestly.
>
> C: If I have friends.
>
> PI: So the two of you are basically saying that if you have friends in that class then,
>
> O: Yea. Cause in (MPI) class I didn’t know that much people.
>
> J: Uh, when I used to go to class, I always missed a few minutes of it, and the day before, so I guess I never really knew what to do. If I keep going school and doing it, I should know what to do.
>
> M: Yea. I’m doing better. Better than I was in your class.

Students were aware that their behavior had improved after enrolling in MPI, but they admitted that they might revert back to their old “bad” habits when they returned to the traditional setting.

Three months after instituting MPI, Teacher A writes,

> Even though I get to counsel my students frequently because of the smaller class sizes, I am still finding that students are lacking responsibility about their schoolwork, lack discipline to fully maintain the attention and focus needed to effectively learn, and lack the will and motivation to do their best. They seem to be used to failing and are "ok" with it. (Teacher Journal, April 14, 2010)

This piece of evidence suggests that at that time, the MPI students were still holding on to the "bad" habits that they had in the traditional Algebra setting. Two weeks later, Teacher A stated in her interview,

> I would like to say that their attendance has improved, but it goes in waves. So, I don't know if we can say that. But they are more aware of the attendance policy. They are definitely more aware of it, and they talk about it, and they apologize. Like they're actually sorry when they're late, or when they're absent they try to come in and make up stuff. You know, most of them. They're definitely respectful. They're a lot more respectful; they take criticism, constructive criticism a lot better than they did when maybe in the first term when I saw them in the regular class setting. They work together a lot better. The work environment is quieter and they're more productive. I would say 90-100 percent of the time, they're productive in class. And that's a big difference for most of these kids.

The comments from Teacher A's interview leads me to believe that the students were working towards being more responsible for their learning, but were not yet reaching their full potential. Although the level of student productivity increased, the students still fell into the habit of not doing work, or using class time effectively.

When Teacher B was asked if he saw any changes in student behavior, he responded,

> No, not really. Actually, I think a lot of the behaviors are still there. It's pretty hard to correct what we do. But I think some if it is, I guess they have more opportunities to behave correctly. I wouldn't say the behaviors changed, but they have more opportunities to behave correctly. 'Cause I'm always calling on them, and they have a chance to act appropriately and help out their classmates. But I don't think I've seen a lot of change over the course of the class. (First Interview, April 29, 2010)

He goes on to say that because of the way MPI is structured, “they’re (students) kind of pushed in the direction of making the right choice. But I don’t think it’s changed (student behavior).” Teacher B also acknowledges that certain “bad” student behaviors have decreased over the course of MPI, but they have not completely disappeared. Students still have the urge to be unfocused in class, not complete assignments, and speak inappropriately or at inappropriate times.

As stated earlier, Student T was a male senior placed into MPI by his counselor. He needed to earn his third mathematics credit in order to graduate on time. Teacher A said that he remained unfocused throughout the course of MPI. When asked, he was quick to agree to participate in the individual interview. However, after many reminders and a few scheduled meetings, Student T failed to take part in the interview process. Unfortunately, his lack of responsibility stayed with him until he graduated, nearly forfeiting the privilege to take part in the commencement ceremony by failing to show up for detention with the Vice Principal.

After nine weeks of the 2010-2011 school year, mathematics teachers were asked to comment on the current behaviors of the 2009-2010 MPI students. Because of the block scheduling at Kailua High, a number of the MPI students would not be enrolled in mathematics until second semester. Therefore, data was only collected on the handful of MPI students who were enrolled in Geometry for the first semester of the 2010-2011 school year.

Student J was identified by his MPI teachers as a medium performer. During his interview in late April 2010, Student J said that he attended mathematics class regularly, with the only absences being due to sickness. He also commented that he made a point come to MPI class on time, something he struggled with in the traditional class. When asked how he thought he would do in Geometry the following school year he said, "Uh, it depends. If think if I sit in the front of class, pay attention I shouldn't have a problem." He said that he knew the class would have more students and that he would just "listen to what they have to say (teacher) a lot better." He said that he attended study hall, but only if he was absent and missed a test or quiz. During the focus group in May 2010 he mentioned that he asked a lot of questions during class. Below is what Student J's Geometry teacher said of him.

> He's quiet, but he doesn't really do any work. He comes to class late and it's rare that he comes on time, which is strange because I have him for 4th period (after lunch). In class he makes like he does the work but I've caught him a few times where he was just playing with his calculator after I asked him to start on his class work. In the beginning of the quarter he would always ask to go to the bathroom and as of lately I've asked him to complete a certain number of problems before I let him go, which in most cases he doesn't end up doing. His attitude is good, I haven't had any trouble with him besides trying to get him to do some work in class, and to turn in homework. His attendance has not been that great. He's been absent more than a few times here and there, but he doesn't come back with a note to excuse them. And the current grade I have for him right now is an F and it's just below a 50%. I sent two progress reports home so far, and he hasn't come in for study hall either, so I'm not sure if he knows the material and just doesn't want to do the work or not because lately when I ask him to do the problems, it seems like he gets it. (Teacher Journal, September, 20, 2010)

Based on his Geometry teacher's comments I believe that Student J has reverted back to his behaviors pre-MPI. He does not turn in assignments consistently, he doesn't attend study hall to make up work from absences, he is consistently tardy for class, and he does not ask for help while in class.

Student O was a participant in the focus group. He admitted that he was very social in the traditional setting, and due to the lack of friends in MPI this behavior decreased. During the focus group he stated that when entering Geometry he would probably become more social if there were people he knew well in his class. Below is what his Geometry teacher had to say of him based on the first nine weeks of the 2010-2011 school year.

> Since the beginning of the quarter, he went from not completing and turning in work to completing and turning in his work. He improved greatly. His attitude is also improved. Before he would not want to do anything in class and would do about 5 problems at the most, and now he tries to complete his work in class. His attendance is good. But his grade is an F because he wasn't able to come in for help. I called home and his guardian said he is unable to stay afterschool to receive extra help because he catches the school bus, but I've asked him to come in before school, wiki or lunch and so far he hasn't. But he was able to stay afterschool this past Thursday to get help. So I hope he keeps coming in so that he can raise his grade. (Teacher Journal, September, 20, 2010)

Based on this teacher's observation of Student O I can come to one of two conclusions. The first is that the student does not have any close friends in the class, so he is able to stay focused while in class. The second is that the student realizes the importance of earning a passing grade, and getting an education and is choosing to remain focused in class. In either case, the student did reach a point in the quarter where he realized that he needed to make a change if he hoped to pass the class.

Student M also participated in the focus group. He admitted that he needed a great deal of assistance when completing his work in MPI, and that he was not embarrassed to ask for the help he needed. His attitude and behavior were always positive during class. He stated in the focus group that while enrolled in MPI he began to exercise more self-control in regards to speaking out of turn. Student M was enrolled in my Geometry course for Term 1 of the 2010-2011 school year. He would come to class tardy about once a week, which unfortunately is not uncommon for students in Period 1. While in class, he was not afraid to ask his peers, or me, for help when needed. He completed his assignments on time, and was earning a C for the majority of the first term. Due to an incident that occurred outside of class, he withdrew from Kailua High School about six weeks into the school year. If he had stayed, I feel that he would have continued the positive behaviors with which he had begun the school year.

Student C was enrolled in my Algebra Topics class before entering MPI. She attended my class about once every five days. After entering MPI, her attendance became consistent. Her Geometry teacher says of her,

> Her work ethic has improved after I called home and she has been coming in for help to raise her F, and her percentage is slowly going up. But I keep encouraging her to come in if she needs more help and to continue to turn in her work. And her attendance is not a problem, she comes to class everyday. The only problem was that she wasn't turning in work, but that is slowly getting better. (Teacher Journal, September, 20, 2010)

It seems as though Student C immediately fell back into her pre-MPI behaviors, with the exception of attendance. After a follow-up by her teacher, she began to exhibit more of the behaviors she had while in MPI. Teacher A commented, "I saw her in study hall. That's huge thing for her!"

Student Content Knowledge

As there was no admittance or pre-test given to the MPI students, there is no data to make a straight comparison between student content knowledge at the beginning and end of the MPI course. In regards to the Hawai'i State Assessments scores, there is no data that links MPI directly to them. As the HSA is only required of sophomores, it is unfair to compare one year to the next as a completely different group of students take it every year. Furthermore, only four sophomores were enrolled in MPI during the 2009-2010 school year. It is unreasonable to accept these scores as representative of the entire MPI class.

The only data directly relating MPI to student content knowledge is the progression of their grades over time. Table 3 illustrates each MPI students' term grades beginning with Term 1 of the 2009-2010 school year, and ending with Term 1 of the 2010-2011 school year. Unless otherwise indicated, all students were enrolled in Algebra Topics for Term 1 of the 2009-2010 school year, and entered MPI during the second term. Unless otherwise indicated, all students were enrolled in Geometry for Term 1 of the 2010-2011 school year. "No math" indicates that that student was not enrolled in any mathematics course for that term. Students' individual grades on the final exam are also included here. The final exam was a cumulative assessment of all the topics covered in Algebra, and as such should give a fair description of the students' content knowledge and retention at the end of the 2009-2010 school year.

The fact that only two of the twenty students enrolled in MPI failed the Algebra 1 course is encouraging. The traditional Algebra 1 classes saw an average failure rate of 30%. However, excluding the student who did not take the final exam and the student who should have been placed in a special education resource room, nine of the remaining eighteen MPI students failed the final exam. Since MPI students were allowed to use notes and given extra time on the final exam, I interpret this as a gross lack of student understanding of the concepts being tested. Table 4 displays the final exam scores of MPI and traditional Algebra I students broken down by letter grade. “Non-taker” refers to those students who did not complete the final exam due to absences.

Table 3

MPI Students’ Term and Final Exam Grades

Focus Group Member?	SY ‘09-‘10 Term 1	SY ‘09-‘10 Term 2	SY ‘09-‘10 Term 3	SY ‘09-‘10 Term 4	SY ‘09-‘10 Final exam grade	SY ‘10-‘11 Term 1
Yes	F	C	D	D	F	No math
No	F	D	C	B	B	No math
No	F	A	A	B	C	No math
Yes	F	C	D	D	F	No math
No	F	C	D	C	C	Graduated
No	F	C	C	F	F	Withdrew
No	F	B	D	D	F	Graduated
No	F	A	C	D	C	No math
Yes	F	C	D	D	F	F
No	F	F	F	F	F	C*
No	F	C	B	D	F	B
Yes	F	A	C	C	C	F
No	F	A	B	D	F	Graduated
Yes	F	D	C	C	C	Withdrew
Yes	F	A	B	B	F	No math
Yes	D	C	D	D	D	Graduated
No	D	C	D	D	D	Dropped out
Yes	No math	D	D	D	F	No math
No	No math	No math	F**	D	D	Graduated

*At the beginning of the 2010-2011 school year, this student was tested and placed into special education.

**This grade is for traditional Algebra. This student entered MPI during Term 4.

Table 4
Final Exam Scores by Letter Grade Earned

Final Exam Letter Grade	Number of MPI Students	Percentage of MPI Students	Number of Traditional Algebra I Students	Percentage of Traditional Algebra I Students
A	0	0%	7	6%
B	1	5%	18	15%
C	5	25%	28	23%
D	3	15%	23	19%
F	10	50%	34	28%
Non-Taker	1	5%	11	9%

The MPI and traditional Algebra I classes saw roughly the same percentage of students earning a grade of C or D on the final exam. However, the percentage of MPI students earning an F on the final exam was 22% higher than that of the traditional students. The traditional classes also saw 16% more of their students earning a grade of A or B when compared to the MPI class. Even though the MPI students were given extended time on their final exam, it seems to me that the traditional students had a better understanding and retention rate of the topics that were tested.

However, the MPI teachers were under pressure by administration and the mathematics department to hold to the Algebra I curriculum. In my opinion, it is unrealistic to expect the MPI students, who have a history of failing mathematics courses, to learn the content as well as the traditional students.

DISCUSSION AND RECOMMENDATIONS

Conclusions

The purpose of Math PLATO Intervention was to increase the mathematical content knowledge, and raise the Hawai‘i State Assessment scores of Kailua High School students. During its first year, I conducted a program evaluation based largely on qualitative data collected from the MPI students and teachers. The data suggests that MPI did little to raise the mathematical content knowledge of its students.

In regards to teaching content using varying types of instruction, in my opinion the data suggests that MPI did this successfully. Students used PLATO, worked collaboratively, participated in whole and small group discussions, as well as participated in traditional lecture style classes. Previous research indicates that varying instruction is an effective way to increase student engagement and achievement. As far as infusing the course with PLATO, based on the data I can say this did not occur. Although PLATO was used, it was used very minimally. This was due to incompatibilities between the software and the curriculum, as well as time constraints.

It is difficult to determine the effect that the reduced class size had on the mathematical success of the MPI students. Based on the students' term and final exam grades, it seems as though the students performed as they normally would, or slightly higher. Although the majority of the students passed the MPI course, half of them failed the final exam administered at the end of the course. This suggests that the students did not retain the content they were taught throughout the school year. This is inconsistent with prior research conducted on the level of student achievement in reduced class sizes. However, nearly all of this previous research was conducted at the primary level, and was continued longitudinally for at least three years. MPI was evaluated during its inception year, which amounted to three fourths of a school year. Previous research also had the students starting in the small class setting at the beginning of the year, while the MPI students were transferred into that setting ten weeks after the school year started.

The data collected gave light to some other impacts of class size reduction. Both the MPI students and teachers noticed an increase in student self-confidence, a change in student behavior, as well as an increase in individual student attention from the teacher. The classroom setting also encouraged positive teacher-student relationships, and allowed for a decrease in distractions.

Although there were some positive results to the first year of Math PLATO Intervention, it still remains to be seen whether the benefits outweigh the costs. In order to continue this course, Kailua High School must continue to receive and utilize its Title 1 funding on this program. This takes away from possibly creating new programs in other content areas, as well as offering more support to other teachers through the use of PTTs.

There is also great room for improvement as far as the logistics of the class. The mathematics department was given less than one month to plan and implement the program. It seems that the pace of the traditional Algebra I class is too fast for Math PLATO Intervention, yet the MPI teachers lack the class time to slow the pace for their students. Because the student selection criteria has not been followed by all parties involved, some of the MPI students are not taking full advantage of the opportunity being presented to them. Specifically, there are students who do not attend class regularly and have an extremely low desire to learn and succeed.

Implications and Recommendations

Thus far, there is not enough evidence to support that Math PLATO Intervention has achieved its goals of decreasing student failure rate and increasing Hawai‘i State Assessment scores. The logistical aspect of the course needs refining, and the objectives of the course need to be agreed upon by the mathematics department as well as administration. This will result in lower number, if not zero, students using MPI as an “easy” credit.

Since the program is constrained by staffing, funding, and time, the changes the program directors (MPI teachers) can make are limited. The teachers recognize that the pace of the traditional class is too fast for their students, yet they lack the time and funding to slow the pace for their students. MPI teachers encourage student collaboration, but they also encourage students to memorize procedures. In regards to instructional strategies, the MPI teachers are doing a decent job presenting content in different ways. However, the restraints they are under are preventing them from fully exploring these different strategies. The MPI teachers know that their students require more time to learn the content, yet administration expects them to teach the same content by the end of the school year as the traditional Algebra 1 course. Because the funding for the program is not guaranteed from year to year, the MPI teachers can not provide their students the extended time and support that some of them need to truly understand the content.

As for further research, there needs to be something put in place to measure the content knowledge of the MPI students. This could be done using a pre- and post-test. This test can also be administered to the traditional Algebra 1 students and the results compared to that of the MPI students. The HSA scores of the MPI students can also be compared over time. However, as there are different students that take the test every year, this may not render a clear picture of student content knowledge.

Another aspect of the program that should be researched is the success of the MPI students after reintegration into the traditional setting. Since MPI is seen as an early intervention, students are not to remain enrolled in it for more than one school year. In my evaluation I had the opportunity to monitor just four of twenty MPI students in their mathematics class immediately following Math PLATO Intervention. This was due to the fact that some of the MPI students graduated or withdrew from Kailua High School, and others were not enrolled in mathematics until second semester. It may be informative to see if having mathematics first or second semester of the year following MPI makes a difference in the students' behavior, confidence level, and content knowledge.

In my opinion, in order to have a fair shot at success MPI must be budgeted by the school as a separate entity. This will remove some of the current restraints on the program such as funding and staffing. Furthermore, MPI would not be part of the mathematics department, but an independently operating entity. The teachers would be free to tailor the curriculum to the needs of their students, without being pressured by administration or the mathematics department to keep the students "on track." This would allow for extended time for the students, as well as place the responsibility of the students on the program. For those needing longer than one year to complete the course, the ACCN could be changed to something more appropriate, for instance "Basic Mathematics" or "Mathematics Workshop."

Furthermore, the mathematics department and registrar would not have to go through the juggling act that is scheduling students into MPI. This would be handled during the standard registration period. Scheduling these students for MPI at the beginning of the school year could remove some of the stigma that comes from being placed into MPI one to two months after the school year starts.

Until all stakeholders agree upon the objectives and logistics of Math PLATO Intervention, there will be no fair indication of the program's success. Thus far, the program has not been granted the freedom to fully explore it's unique circumstances. The mathematics department has been given limited time and resources to plan and implement the program. Although class size reduction, varied instruction, and increasing student communication have been proven in some cases, MPI has yet to see these successes. At this point in time, it has not been proven that the benefits of MPI outweigh its costs.

REFERENCES

Barnes, M. (2000). Effects of dominant and subordinate masculinities on interactions in a collaborative learning classroom. In J. Boaler (Ed.), *Multiple perspectives on mathematics teaching and learning,* (pp. 145-170). Westport, CT: Ablex.

Berliner, D., & Biddle, B. (1995). *The manufactured crisis: Myths, fraud, and the attack on America's public schools.* Reading, MA: Addison-Wesley.

Biddle, B., & Berliner, D. "What research says about small classes and their effects." *WestEd Policy Perspectives, Winter 2002.* Retrieved October 2, 2010 from http://www.wested.org/online_pubs/small_classes.pdf

Blatchford, P. (2003). *Class size debate: Is small better?* Maidenhead, U. K.: The Open University Press. Retrieved October 3, 2010 from University of Hawaiʻi at Mānoa ebrary catalog.

Boaler, J. (2008). *What's math got to do with it? How parents and teachers can help children learn to love their least favorite subject.* New York, NY: Viking Penguin.

Checkley, Kathy. (2006). *Priorities in practice: The essentials of mathematics grades 7-12: Effective curriculum, instruction and assessment.* Alexandria, VA: Association for Supervision & Curriculum. Retrieved October 3, 2010 from University of Hawaiʻi at Mānoa ebrary catalog.

Cole, R.W. (2008). Educating everybody's children: We know what works-and what doesn't. In R.W. Cole (Ed.), *Educating everybody's children: Diverse teaching strategies for diverse learners (2nd Edition, Revised and expanded)* (pp. 1-40). Alexandria, VA: Association for Supervision and Curriculum Development. Retrieved October 3, 2010 from University of Hawaiʻi at Mānoa ebrary catalog.

Columbia University's Mailman School of Public Health (2007, October 17). Reducing Class Size May Be More Cost-effective Than Most Medical Interventions. *ScienceDaily*. Retrieved November 29, 2010, from http://www.sciencedaily.com-/releases/2007/10/071016131350.htm

CSR Research Consortium (n.d.). *Class size reduction in California: The 1998-1999 evaluation findings.* Retrieved October 2, 2010 from www.classsize.org/summary/98-99/

D'Ambrosio, B.S., & Katsburg, S.E. (2008). Strategies to promote equity in mathematics education. In R.W. Cole (Ed.), *Educating everybody's children: Diverse teaching strategies for diverse learners (2nd Edition, Revised and expanded)* (pp. 123-140). Alexandria, VA: Association for Supervision and Curriculum Development. Retrieved from University of Hawaiʻi at Mānoa ebrary catalog.

Darling-Hammond, L., Ross, P., & Milliken, M. (2006/2007). High school size, organization, and content: What matters for student success? In Loveless, T. & Hess, F.M., (Eds.), The 2006/2007 *Brookings Papers on Educational Policy* (pp. 163-203). Washington D.C.: Brookings Institution Press.

Delavan, Garrett. (2009). *The teacher's attention: Why our kids must and can get smaller schools and classes.* Philadelphia, PA: Temple University Press.

Education America Network (2000-2010). *US teacher salaries.* Retrieved October 2, 2010 from http://resource.educationamerica.net/salaries.html/

Finn, C., & Petrilli, M. (1999, January). One size does not fit all. *Teacher Magazine.* Retrieved from Thomas B. Fordham Institute Website: http://www.edexcellence.net/detail/news.cfm?news_id=168

Fitzpatrick, J.L., Sanders, J.R., & Worthen, B.R. (2004). *Program evaluation: Alternative approaches and practical guidelines*. Boston, MA: Pearson Education, Inc.

Fuson, K.C., Kalchman, M., & Bransford, J.D. (2005) Mathematical Understanding: An Introduction. In M.S. Donovan, & J.D. Bransford (Eds.), *How students learn: Mathematics in the classroom* (pp. 217-256). Washington, DC: National Academies Press. Retrieved October 3, 2010 from University of Hawai'i at Mānoa ebrary catalog.

Greene, J. P., Forster, G., & Winters, M. A. (2005). *Education myths: What special interest groups want you to believe about our schools-and why it isn't so.* Lanham, MD: Rowman & Littlefield Publishers, Inc.

Hanushek, E. (1998). *The evidence on class size.* Rochester, NY: The University of Rochester. W. Allen Wallis Institute. (Occasional Papers 98-1).

Hawai'i Department of Education (n.d.). Scale Score Ranges by Proficiency Level. Retrieved November 7, 2010 from http://www.alohahsa.org/resources/ScaleScoreRange.pdf

Hoxby, C. (2000). The effects of class size on student achievement: New evidence from population variation. *The Quarterly Journal of Economics, **115***(4),1239-1285.

James, D., Jurich, S., & Estes, S. (2001). *Raising minority achievement: A compendium of education programs and practices.* Retrieved October 2, 2010 from http://promiseofplace.org/research_attachments/james.pdf

Krueger, A. (2003). Economic considerations and class size. *The Economic Journal, **113***, F34-F63.

Merriam, S. (2009). *Qualitative research: A guide to design and implementation.* San Francisco, CA: Jossey-Bass.

Payne, D.A. (1994). *Designing educational project and program evaluations: A practical overview based on research and experience*. Norwell, MA: Kluwer Academic.

Royse, D., Thyer, B.A., Padgett, D.K. & Logan, T.K. (2006). *Program evaluation: An introduction*. Belmont, CA: Thomson Brooks/Cole.

Spaulding, D.T. (2008). *Program evaluation in practice: Core concepts and examples for discussion and analysis*. San Francisco, CA: Jossey-Bass.

State of Hawaiʻi Department of Education (2006). *Hawaii State Department of Education Authorized courses and code numbers catalog*. Retrieved April 16, 2010 from http://doe.k12.hi.us/curriculum/accn/ACCN_2006_2010_rev3.pdf

State of Hawaiʻi Department of Education (2010). *Guide to the 2010-2011 Hawaiʻi State Assessment (HSA) and Adequate Yearly Progress (AYP).* Retrieved November 7, 2010 from http://arch.k12.hi.us/school/nclb/hsa.html

Tanner, H & Jones, S. (2000). *Becoming a successful teacher of mathematics.* New York, NY: RoutledgeFalmer.

Tienken, C.H., & Achilles, C.M. (2006). Making class size work in the middle grades. *AASA Journal of Scholarship and Practice, **3***(1), 26-36.

Worthen, B. (1990). Program evaluation. In H. Walberg & G. Haertel (Eds.), *The International Encyclopedia of Educational Evaluation* (pp. 42-47). Toronto, ON: Pergammon Press.

Zurawsky, Chris. (2003). Class size: Counting students can count. *Research Points, **1**(2),* 1-4.

APPENDIX A

MPI Term 3 Survey Results

Statement	Strongly disagree	Disagree	Agree	Strongly Agree	Total # answered
1. I enjoy learning math.	1 7%	3 20%	10 67%	1 7%	15
2. My teachers think that I can do well in math.	0 0%	2 15%	3 23%	8 62%	13
3. I look forward to going to math class everyday.	2 13%	3 20%	7 47%	4 27%	15
4. I get enough time with my teacher during class.	0 0%	0 0%	10 71%	4 29%	14
5. I am good at math.	3 20%	4 27%	6 40%	2 13%	15
6. I come in for extra help if I need it.	1 7%	3 20%	9 60%	2 13%	15
7. I feel stressed during tests.	1 7%	6 43%	3 21%	4 29%	14
8. I prefer to work alone.	2 13%	4 27%	7 47%	2 13%	15
9. I enjoy learning new things.	0 0%	3 20%	9 60%	3 20%	15
10. Doing homework is important.	1 7%	3 20%	10 67%	1 7%	15
11. I participate in class discussions.	0 0%	0 0%	11 73%	4 27%	15
12. I feel nervous when I take a math test or quiz.	1 7%	8 53%	2 13%	4 27%	15
13. I come in for test corrections when they are offered.	2 13%	7 47%	5 33%	1 7%	15
14. I do my homework on a regular basis.	1 7%	3 21%	9 64%	1 7%	14
15. I do well on my math tests/quizzes.	0 0%	3 20%	10 40%	2 13%	15
16. I feel confident when in math class.	0 0%	3 20%	9 60%	3 20%	15
17. I prefer to work something out than have someone tell me the answer.	0 0%	5 33%	7 47%	3 20%	15
18. I prefer to work in a group.	2 13%	3 20%	7 47%	3 20%	15
19. My math teacher cares about my success in their class.	0 0%	0 0%	8 53%	7 47%	15
20. My math teacher answers my questions during class.	0 0%	2 13%	9 60%	4 27%	15

APPENDIX B

MPI Term 4 Survey Results

Statement	Strongly disagree	Dis-agree	Agree	Strongly Agree	Total # answered
1. I enjoy learning math.	0 0%	2 18%	7 64%	2 18%	11
2. My teachers think that I can do well in math.	0 0%	2 18%	4 36%	5 45%	11
3. I look forward to going to math class everyday.	1 9%	1 9%	7 64%	2 18%	11
4. I get enough time with my teacher during class.	0 0%	2 20%	6 60%	2 20%	10
5. I am good at math.	0 0%	5 45%	5 45%	1 9%	11
6. I come in for extra help if I need it.	0 0%	4 36%	7 64%	0 0%	11
7. I feel stressed during tests.	1 9%	2 18%	7 64%	1 9%	11
8. I prefer to work alone.	0 0%	7 64%	3 27%	1 9%	11
9. I enjoy learning new things.	0 0%	3 27%	5 45%	3 27%	11
10. Doing homework is important.	1 9%	0 0%	9 82%	1 9%	11
11. I participate in class discussions.	0 0%	3 27%	7 64%	1 9%	11
12. I feel nervous when I take a math test or quiz.	0 0%	1 9%	10 91%	0 0%	11
13. I come in for test corrections when they are offered.	1 9%	2 18%	7 64%	1 9%	11
14. I do my homework on a regular basis.	1 9%	3 27%	7 64%	0 0%	11
15. I do well on my math tests/quizzes.	1 9%	4 36%	5 45%	1 9%	11
16. I feel confident when in math class.	0 0%	2 18%	8 73%	1 9%	11
17. I prefer to work something out than have someone tell me the answer.	1 10%	2 20%	7 70%	0 0%	10
18. I prefer to work in a group.	0 0%	2 18%	8 73%	1 9%	11
19. My math teacher cares about my success in their class.	0 0%	1 9%	8 73%	2 18%	11
20. My math teacher answers my questions during class.	0 0%	0 0%	8 73%	3 27%	11

APPENDIX C

Student Journal Prompts & Interview Questions

1. What are the reasons why you think you were chosen to be in Math PLATO Intervention.
2. Think about the class your math class from first term. Now think about your current math class. Which class do you prefer? Why do you prefer it?
3. On a scale of 1 to 5, 1 being really easy and 5 being really hard, how challenging do you think this math class is? Why do you feel this way? Give at least two examples to support your choice.
4. Describe what a confident person looks like. How do they behave? How can you tell that someone is confident?
5. Think of someone who you think is successful. What makes them successful? What characteristics do they have?
6. What do you think it means to be successful in math class?
7. Describe yourself as a math student.
8. How would your math teacher describe you as a student?
9. What grade are you currently earning in math? What are the reasons you are earning this grade?
10. Describe the role of the teacher in your math class.
11. Describe the role of the student in your math class.
12. What are your feelings regarding returning to a larger math class next year? What are the reasons you feel that way?
13. How has your attitude toward math class changed throughout the year?
14. How do you approach your math work? Math class?
15. Describe how you have taken initiative in regards to your math class.
16. How has this class prepared you for your next math class?
17. Describe what you do if you do not understand a math topic.
18. Describe the kinds of support you receive in regards to your math class.

APPENDIX D

Teacher Journal Prompts & Interview Questions

1. Describe your typical MPI student.
2. On average, how many minutes do the MPI students spend a week on PLATO?
3. In what ways has PLATO impacted the mathematical understanding of your students?
4. In what ways has the size of your MPI class impacted your instruction?
5. What are the greatest successes of MPI thus far?
6. Describe the challenges you have faced in regards to MPI.
7. How do you define student success in the MPI class?
8. Do you feel that MPI is adequately preparing your student for their future math classes? Please explain.
9. Describe the level of engagement of the MPI students during various in class activities.
10. What supports, if any, do you feel the MPI students need?
11. In what ways has student responsibility developed over the school year?
12. Describe any changes in student self-perception you have observed in your MPI students.
13. Describe any changes in student behavior you have observed in your MPI students.
14. In what ways, if any, have you made allowances for your MPI students?
15. Describe the role of the teacher in the MPI classes.
16. Describe the role of the student in the MPI classes.
17. Explain your level of satisfaction in regards to teaching Math PLATO Intervention.
18. Describe the teaching strategies you use with your MPI students.