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TCNJ/RTC M.Ed. Program Leadership: Instruction
RESEARCH PROJECT PAPER
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What is the impact when our students write journals in an inclusive Algebra I class?

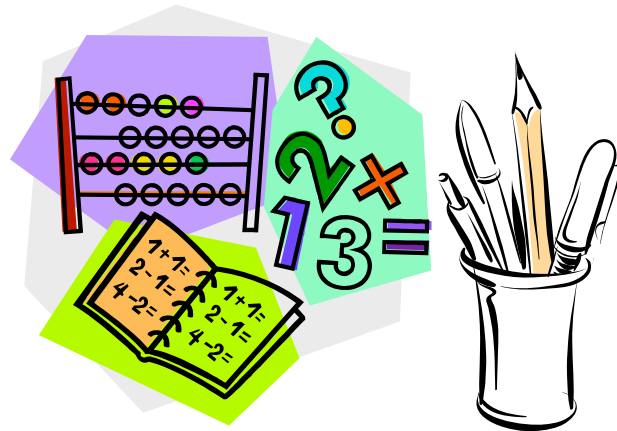


Table of Contents

I.	CONTEXT	p. 1 - 5
II.	REVIEW OF RELEVANT LITERATURE	p. 6 - 12
III.	METHODOLOGY	p. 13 - 15
IV.	FINDINGS	p. 16- 28
V.	IMPLICATIONS	p. 29 - 31
VI.	OBSTACLES	p. 32 - 35
VII.	EMERGING QUESTIONS	p. 36 - 42
VIII.	CONCLUSION	p. 43 - 45
IX.	BIBLIOGRAPHY	p. 46- 48
APPENDICES:		
A.	IMPLEMENTATION PLAN	p. 49 - 54
B.	SUBJECTIVITY	p. 55 - 57
C.	STUDENT JOURNAL	p. 58 - 62
D.	JOURNAL REVIEW NOTE SHEET	p. 63
E.	STUDENT SURVEY QUESTIONS	p. 64
F.	JOURNAL PROMPTS	p. 65 - 66
G.	PARENT PERMISSION LETTER	p. 67 - 68
H.	STUDENT PERMISSION SLIP	p. 69
I.	CO-TEACHER PERMISSION SLIP	p. 70

Question: What is the impact when our students write journals in an inclusive algebra I class?

I. CONTEXT

For the past five years I have been working as a special education teacher in a Central New Jersey suburban regional high school. This is my first teaching position in special education after receiving an Endorsement in Special Education from Rutgers University in 2002. Since starting this position in September of 2002, the majority of my teaching experience has been as an in-class support teacher for Algebra I and II. Additionally I have served as an in-class support teacher in Geometry, Chemistry, and English and have taught several sections of resource room Pre-Algebra, Life-Skills Mathematics, and Study Skills.

Prior to this position, I worked ten years as an Adult Basic Education (ABE) Teacher teaching English as a Second Language and high school equivalency classes. It was this experience, as an ABE teacher, that piqued my interest in answering; why have many adults developed a phobic relationship with mathematics?

This new career in Special Education began when I was forty-seven years old, however, chronological age didn't take away the enthusiasm I felt for this newly chosen field. I was filled with the idealism of any college graduate pursuing a new career, and excited to help students discover what I had found, that anyone can learn mathematics, a theory I have believed in since personally fighting through the ravages of higher-math phobia at the age of nineteen.

I had envisioned inclusive math classes employing the methods learned during graduate school including differentiated instruction, cooperative learning, and alternative assessment but instead found a very traditional climate. The math inclusion classes had seats in neatly ordered rows, a mainstream teacher in-front of class lecturing, with no evidence of cooperative learning. The class syllabuses were distributed stating the mathematics department policy that grades would be based on 60% test grades and 40% quiz grades. In addition, it became obvious that only if I were confident and assertive, would I earn my place as a respected co-teacher and equal partner. Instead, I was nervous and intimidated by my own fears and anxieties and wondered many times that first year if I had bitten off more than I could chew by starting a new career in mid-life. I had so much to learn about being a special education teacher at the high school level as well as relearning the mathematics! I concluded that changes would have to wait until I became comfortable in my own skin and with the responsibilities of this new job.

This high school, as described by the National Center for Education Statistics on www.nces.ed.gov (2008) as a large suburban high school, takes in two very diverse school districts, one a small ethnically diverse borough with a distinct downtown business district and the other a sprawled-out mainly White middle class to affluent suburban township. According to www.njk12.org website for our school district, the statistics for the 2006-2007 school year show the school population was 1031, with 10.6% classified special education students. The High School Proficiency Assessment (HSPA) results for the 2005-2006 school year in mathematics show 46.2 % of Blacks and 52.95 % of Hispanics being partially proficient, as opposed to only 4.3% of our White

students being partially proficient. Our special education population was 70.8% partially proficient.

In an effort to improve test scores in targeted populations and create a better learning environment, our district has provided teacher-training sessions. These sessions include *Understanding by Design* (www.grantwiggins.org) lesson planning and differentiated instruction and we will begin block scheduling in 2009-2010, changes that many teachers do not support but that I feel are positive.

When initially deciding on a topic for research, I wanted to study something that would help me gain insight into the poor showing from special education and minority students on the HSPA, as well as my personal journey to understand math phobia. Additionally, I wanted to choose a topic that would address some of following questions and issues stemming from my colleagues and my experience the past five years in mathematics inclusion classes. We often face difficulties motivating students to complete class work and homework. Many students show a lack of interest and/or a preoccupation with personal problems which keep them from focusing during class. Another very distressing issue is that over half of the students in the Algebra I and II inclusion classes fail the teacher-generated, department- created, curriculum-based, multiple choice midterm and final exams, regardless of who teaches the class. Sousa (2006) states that information is most likely to get stored in memory if the learning makes sense and has meaning to the learner. Why do so many of our students forget what they have learned? Is it that the sense and meaning initially needed for memory retention was never present? Perhaps, did these failing students never initially process the information to the level of higher-

order thinking? If our students can express mathematical thinking in writing, will the math make more sense and have greater meaning therefore be stored into long term memory? Do we not help our students find enough connections to prior learning?

For every graduate course I have taken in the past eight years, the readings have encouraged the use of journal writing as an alternative assessment. Only one of my partners has used journal writing in the Algebra classroom and our success was limited due to assigning the writing as homework and only a few times per marking period. Since this time, I have wanted to further explore journal writing using it more frequently and during class time. Journal writing seems the perfect outlet to encompass the wide array of questions, in my mind, regarding the learning of mathematics.

As I enter this “*journey with journals*,” along with the relationship between sense and meaning and the evaluation of prior learning, I will keep in mind the following questions and issues as I design journal prompts and embark on the study of math journals in the Algebra I classroom. Will journal writing provide insight into the mathematical reasoning of those students classified as having learning disabilities in mathematics? Is gender a factor? Will students with disabilities in writing be turned-off by journal writing? Will students find explaining their problem to a partner helpful? Will journal writing inform my teaching? Will behavior problems improve if students have an outlet to express their feelings? Will journal writing improve student motivation? Will journals provide insight into those students who experience math anxiety and negative attitudes toward math? Will those students reluctant to raise their hands to ask questions during

class, feel more comfortable asking questions in their journals? Will I gain insight into why some students have difficulties with retention of multiple steps in problem solving? Will students enjoy reflecting on how classes are taught? Will writing journals help students develop higher-level thinking skills? Can I gain insight into why many students do not complete homework or class work? Can I gain insights into how to differentiate instruction in the future?

The Algebra I class I'll be using for research has 24 students; 11 classified and 13 regular education students, and is one of three algebra inclusion classes that Bill, the content teacher, and I teach together daily. The classroom represents the precise ethnic break-down of the school-wide population, 42% minority/58% White, non-Hispanic.

II. REVIEW OF RELEVANT LITERATURE

Currently, public education officials, school administrators, and politicians are working to smooth out the wrinkles in “No Child Left Behind” (NCLB) the federally mandated, standards-based reform law enacted in 2002. At the high school level, in mathematics, conforming to this law means that we teach the state required core curriculum standards throughout the first three years of high school with the outcome that all of our students will be able to pass the HSPA (High School Proficiency Assessment) given in March of their junior year. Although NCLB has been controversial from the outset in public discourse and within education circles, this law has created some positive changes by engaging public schools to create improved learning environments so that all of our students can find success. For the high school mathematics classroom one of the methods for improvement, recommended by the New Jersey Department of Education, is to incorporate journal writing into the mathematics curriculum as an alternative assessment.

The power of writing as an instrument of the mathematics curriculum was realized during the 1980s as part of the writing across-the-curriculum movement (Pugalee, 1997). Additionally, interest was sparked by the 1989 report of The National Council of Teachers of Mathematics (NCTM) stressing writing as an important learning tool.

In the 1980s and 1990s, educators focused on the value of writing in content areas to increase students’ understanding of the subject matter, however currently educators are focusing on its merits as an assessment tool.

Mayer & Hillman (1996) found that asking students to write math journals furnishes information about their thinking not immediately evident from more traditional means of assessment. In an anonymous 2000 study of math journal writing in “The Mathematics Teacher”, The National Council of Teachers (NCTM) Curriculum and Evaluation Standards is cited as follows, “ The assessment of students’ ability to communicate mathematics should provide evidence that students can express mathematical ideas by speaking, writing, demonstrating and depicting them visually”. Journal writing is a form of assessment that can incorporate all of these modes of learning. On the State of New Jersey Mathematics Curriculum Framework website it is stated that “teachers can often find out more about the students’ thinking and degree of understanding from journals than from most other methods of assessment.

Although new federal mandates dictate that schools show improved yearly performance in mathematics, what has encouraged most applications of journal writing in the mathematics classroom are reports released by the NCTM. The NCTM has recommended increased attention to “student communication of mathematical ideas orally and in writing” (Dougherty, 1996) and that “teachers should help students become more precise in written mathematics” (Mason & McFeetors, 2002). Aspinwall & Aspinwall (2003) cite the NCTM 2000 report stating that students should relate their everyday language to mathematical language and symbols. Metacognitive gains have been noted in Goldsby & Cozza (2002) who cite the same NCTM 2000 study when they state; “Students gain insights into their thinking when they present their methods for

solving problems, when they justify their reasoning to a classmate or teacher, or when they formulate a question about something that is puzzling them”.

Dougherty (1996) and I are in solidarity when she makes the point that homework papers of drill and no thrill are not a good indication of student learning, however often the level of understanding is assessed in the mathematics class through expository, daily homework review. Dougherty (1996) states, unless you can scrutinize each student’s work, you don’t know their level of understanding of the material, or what effort level was put forth.

Writing in mathematics can not only be used as a tool for learning but also for assessment of higher level thinking. Dougherty (1996) found that journal writing forced her first-year algebra students to think more deeply rather than just memorizing steps for solving. Silver (1999) writes that the NCTM has stated for forty years that a shift is needed “toward mathematical reasoning- away from merely memorizing procedures”.

There are few negative outcomes found in the literature on the use of math journals in the classroom. However, limitations of math journal writing on problem solving were studied by Jurdak & Zein (1998) who found that journal writing impacts only one of their four major components of problem solving, labeled as “the resource” component. This component includes conceptual understanding, procedural knowledge, and mathematical communication (Jurdak & Zein, 1998). This same study found that, although their control group of students felt that they understood math at a higher level through journaling, it didn’t impact their grades. The authors believe this is a reflection of using

traditional test composition which doesn't measure deeper thinking. Chapman (1996) found that students who have been successful on tests and quizzes don't necessarily understand major mathematical concepts. Studies on students' attitudes towards math journal writing and gender issues in journal writing are scant.

What qualities do the teachers share who have implemented journal writing? Who is reluctant to try it? In a study by Silver (1999), 43 % of NCTM teachers surveyed said they had never heard of or used writing-to-learn (WTL), a discovery-based method. This survey found that younger women teaching at the elementary level made the greatest use of discovery methods and they were twice as likely as high school teachers to discuss these methods with colleagues even though a higher percentage of high school teachers had been trained in WTL methods. Quinn & Wilson (1997) found that poor student writing discouraged many high school teachers from using writing in the teaching of mathematics. All other studies cited in this paper, agree that journal writing in the math classroom has elicited positive results in mathematics achievement.

The following questions must be answered before implementing journal writing in the mathematics classroom. **How do you get started? Should the student's journal daily, biweekly, or weekly? How much time should the students spend writing each entry? What kind of prompts should be used? How should it be assessed? Will the learning environment improve?**

How do you get started? Brandenburg (2002) suggests teachers start slowly, using just one period or group of students due to the time needed to respond to each journal. In addition, Brandenburg (2002) warns that the negative attitudes many students have towards writing can be emotionally difficult to deal with when first implementing writing in the mathematics classroom.

How often? How much time? According to the website www.About.com as well as *The Math Teacher* (2000) suggests 5-10 minutes of class time for journal writing. The more academically rigorous math classes were able to assign the writing for homework. Journal writing can be used as little as bi-monthly or as much as a daily assignment every night for homework. Due to the time restriction of our 40-minute class, I plan to use 5-10 minutes for journal writing three times a week, and will take heed of Brandenburg's (2002) warnings by starting out with just one period of Algebra I, in order to read and comment on all journal entries. Since the lack of homework completion is a major issue in our Algebra I inclusion classes, I will not assign any entries as homework.

What kind of prompts? Aspinwall & Aspinwall (2003) state that open-ended prompts give teachers valuable insight into students' perceptions and knowledge, and information essential for planning effective instruction. Dougherty (1996) and Burchfield et al (2007) both use three kinds of prompts:

1. [mathematical content](#); 2. [process](#); and 3. [affective/attitudinal](#). Since these three types of journal prompts are closely aligned with the open-ended prompts students are expected to manipulate on the HSPA, I will use them as models in my research. I will base my prompts on Dougherty's (2006) but will change the content to reflect what we are learning in our own classroom. The following examples are from Dougherty (2006).

- **Mathematical content** (applications to real life): **“I found out something last night, “said Sammi. “A number raised to an odd power is always odd.” Do you agree with Sammi? Why or why not? Support you answer.**

Process (problem solving): **Give an example of an equation that is difficult for you to solve and explain what makes it difficult.** In Brandenburg’s 2002 study of journaling in her high level algebra II class, her students became mathematically literate solely using process prompts.

- **Affective** (reflection of personal attitudes and opinions): **Write a letter to your best friend describing what happens in our algebra class.**

How should it be assessed? Chapman (1996) used her students’ journals towards participation points. Russek (2007) required Standard English, others wanted their students to write without worry of grammar. Many found journal entries invaluable when used as pre-assessments and post assessments. Janzen (2005) and Brandenburg (2002) used journal writing as part of a larger portfolio assessment. Since many of my students have learning disabilities in reading and writing, and others are ESL students, I will not initially require proper English, only that they write to the best of their ability. My school district’s policy does not allow research data to be used as a grade, however, in the future I would use the journals for pre- and post-assessment informally and select a few entries to count together in place of a standard pencil and paper test.

Schick (2000) uses rubrics so that students know exactly what is expected of them and for grading effectively and efficiently. Rubrics are strongly suggested on www.glencoe.com to let students know ahead of time that they are going to be evaluated on and to guide their writing. Not for this study but in future endeavors of journal writing, I will use rubrics for grading to guide the content of students' writing. In addition to rubrics, Janzen (2005) stresses the importance of using samples of high quality final products to communicate the details of the assignments to students. Hopefully this study will produce some good examples to share with future students.

Will the learning environment improve? Dougherty (1996) saw the use of writing create an atmosphere of respect for diverse thinking and methods. Chapman (1996) found that journal writing, in her second-year algebra class, gave students reluctant to ask questions in class the opportunity to have a more comfortable way to ask for help. Chapman also found that it boosted moral and that class discussions can be enhanced when students have had to previously think about a math concept.

Journal writing creates a context in which students have to integrate algebraic concepts to communicate their ideas. In turn, this forces deeper reflections of algebraic content (Dougherty, 1996). Chapman (1996) used journal writing to awaken her students' thinking. In my Algebra I inclusion classes, it is this lack of deeper thinking that I find the most disturbing. More importantly journal writing may promote metacognitive enlightenment for my students that can serve them beyond the classroom.

III. METHODOLOGY

The sample used in this study was an algebra I inclusion class of 24 students. Two regular education students were removed from the study during the middle of data collection, one regular education girl moved to another town and one regular education boy changed his schedule and moved to another class. All 24 were part of the first nine out of a total of eighteen prompts. Twenty two students took part in the remaining nine prompts.

The 24 students can be broken down into the following subgroups:

- **14 girls/ 10 boys**
- **18 Freshman/ 6 Sophomores**

- 1. Regular Education Students – 13 students**
- 2. Special Education Students – 11 students**

Classifications:

- **Other Health Impaired (Attention Deficit Disorder) – 2 students**
- **Specific Learning Disability – 7 students
(4 of the 7 have disabilities in mathematical reasoning)**
- **Communication Impaired – 2 students**

The triangulation of data collection included:

- 1. Student Journals – (see appendix C)**

While explaining to the students the purpose of this study and asking for their cooperation in responding to all of the journal prompts assigned, I passed out the teacher-made journals.

The students were asked to come up with a pseudonym, if they wished, to be used in my thesis, and to write their pseudonyms and real names on the journal cover.

2. Journal Review Notes -(see appendix D)

After reading each student journal entry, I jotted down notes next to each student's name, summarizing or coding their responses and noting any anecdotal observations or student questions that came up during the journal writing sessions.

3. Student Survey Interview Questions Sheets- (see appendix E)

At the completion of the 18 journal prompt responses, I asked thirteen students, orally, four questions, as well as asked follow-up questions to clarify their responses. (ex. I see you didn't finish this one? What bothered you about it?)

4. Teacher Reflective Journal

Throughout the data collection period, I kept a reflective journal, recording any thoughts about the students' journal responses, my classroom observations, emerging questions, and any thoughts I had on my current or future teaching.

(See Appendix F) for journal prompts, types of prompts, and dates prompts were assigned.

Timeline

November/ Early December 2007

- Submit initial and then twice- revised research plan, rationale for study, parent letter, student letter, and co-teacher permission letter to my Superintendent's office for Board of Education approval. During this time I had two meetings with the Assistant Superintendent to discuss revisions on all of the documents listed above.

January 26th, 2008

- Attained Board of Education approval to conduct research.

January 28th, 2008

- Sent out parent permission letters (Appendix G) and had students sign students' permission slips (Appendix H). All students gave permission to use their journal contents and all students but two gave permission to use interview contents. Three parent permission slips were not returned – permission was secured by follow-up phone calls.
- Introduce my research plan to the class. Give out the teacher-made journal books. Review with students the three types of prompts and how to answer those using examples included in their journals. The students have time to decorate journals and to invent and record pseudonyms.

January 30th –March 6th, 2008

- Students write math journals.

I responded to each student journal response either showing how to correctly solve a problem or writing positive comments. *Teacher responses, Student review notes* and *teacher's reflective journal*, for the most part, would be recorded each weekend.

Late March 2008

- Survey interviews.

April 30th, 2008

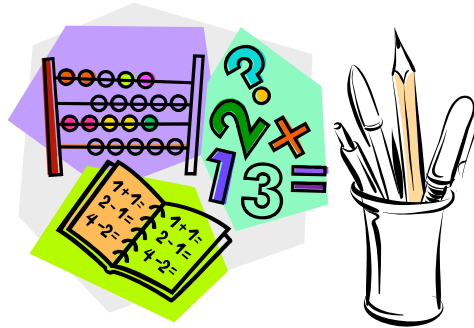
- Thesis due/presentation date.

Support

- Three collaborative group meetings with a small graduate class-support group during the research period
- Three TCNJ classes, with my advisor and classmates, during the research period
- Sharing of and discussion about the content of journal entries with my teaching partner, several times during the research period.

In order to maximize time, on each writing day, I would arrive for class a few minutes early and put the journals out on the students' desks or select a few students, before the bell rang, to distribute the journals.

What is the impact when our students write journals in an inclusive Algebra I class?



IV. FINDINGS

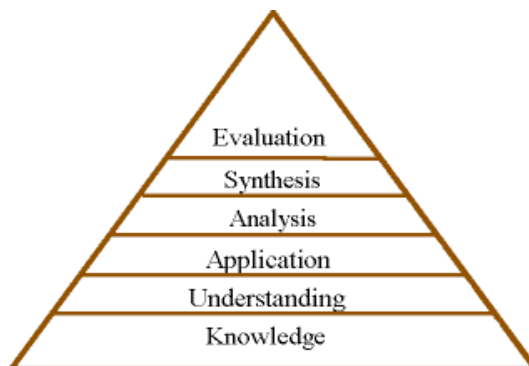
During the coding procedure four themes developed from the collected data:

- A. The work is too difficult/moving too fast
- B. Reclaiming my authentic self
- C. Receiving student feedback
- D. Math weaknesses and attitudes toward math revealed

A. The work is too difficult/moving too fast

Based on *Bloom's Taxonomy of Cognitive Development* cited from

www.Officeport.com (2008) (see diagram below) it has been my observance, over the past five years, that the majority of our Algebra I students never get beyond or to the Understanding stage (putting information into your own words). Often the students get stuck in the Knowledge or information stage. Some of my data supports this theory.



When the students were asked to answer a Mathematical Content Prompt to analyze the formulas $d = rt$ (distance = rate x time), they not only had to know what the distance formula was (*Knowledge*) but also know how to transform it to solve for rate or time (*Application*). Most students answered “yes” to the first part of the prompt, which was the correct response to , “ Sherice says, “I can find the speed we traveled to my aunt’s house if I know the distance and time. Is she correct?”” but only three students were able to explain the second part – “If so, how could she do this?” Our class had just completed a section on transforming equations, and even though they had not used this distance formula, it is a commonly applied formula, and it was assumed by me that they had been exposed to it in middle school. This prompt was invaluable. The students were not ready to be tested on transformations because most did not truly understand the concept – at this point it was too difficult. Also, from this one prompt, I knew the three students to pair up with those having difficulties. It signaled- STOP- it’s too difficult- prior learning is missing- slow down.

This class is a diverse group of learners. Some of the special education students came from years of resource room mathematics and may very well not have been exposed to any algebra prior to our class. Others are unmotivated. Seven have learning disabilities. Two of the students failed eighth grade algebra. Did we need to slow down? Did we need to differentiate? Pretest? Posttest?

Another example of the math being too difficult stemmed from a prompt about inequalities. We had been working on inequalities for a couple of days and when the students were prompted to describe a good method to solve the equation $[-5x < 25]$. This Process Prompt required problem solving on the *Knowledge* level but the written component required a higher level of thinking on the *Application* level. Seven of the initial twenty-four students were able to describe their steps however, seventeen were not. Interesting to note, BOB C., who is classified as Communication Impaired, gave an accurate description of the solution to this problem and other problems, making me wonder if her classification is accurate. BOB C.'s first language is Spanish, and often I find second language students have outlived their classifications which may have been based more on the speed of their success with second language acquisition. After this prompt, if I suspected that a math concept would be challenging, in order to optimize learning, I would ask students to work alone, and then allow them to share their journal entry with a neighbor to compare and revise answers.

B. Reclaiming my authentic self

In college I was an Urban Education major/Multi-Cultural education minor. I have always felt for the underdog and wanted to help those less fortunate than myself. I worked many years as an adult English as a Second Language and High School Completion teacher at a social service agency and have taught in inner city schools as well as a Navajo Indian school. I have always found reward in the “social worker” role that comes with teaching underprivileged children. In order to be an effective teacher I

believe that every teacher needs to have an authentic style that intertwines who they are as a person with who they are as a teacher. Part of my authentic nature as a person and teacher is to take a holistic approach to each student, meaning attempting to find out why a student behaves as he/she does by gathering information from the student, counselors, and parents before making judgments. However, this approach has been slowly slipping away from me and truly escaped my psyche one day during journal time.

One of our students, “Pigpen” daily exhibits an oppositional-defiant personality. Pigpen refuses to do work most days. He often remarks to me, after I try to cajole him into completing his work, “I’m not stupid”, “Do you think I’m stupid”? “I’m not doing it” “This is stupid”, “I don’t care”, “Who cares?” Needless to say, Pigpen is failing Algebra.

I considered turning the corner with Pigpen because he actually answered two of the attitudinal prompts, opinion prompts that require no math. Well, Prompt 11 was the third attitudinal prompt and he refused to complete it. I wanted so much to learn about him through journaling, however on this day he said it was “stupid” and he added “”Why should I”? Well, I lost it! I said sternly, in front of the class, “Maybe because you want to be cooperative? Maybe just to be a nice guy?” (Oops!).

On the drive home, I thought, you knucklehead- you did everything wrong. First you scolded him in front of his peers, something he is especially sensitive to and you overreacted. I knew why – I was tense about potentially not getting enough time in to complete my data and I was tired on this day. Okay – I forgave myself and will try to do better next time, but what about Pigpen who is only fourteen years-old and although

pretty insightful, will he know where I was coming from? I decided he deserved an explanation.

The next day I took him to back of the class room and apologized for overreacting. I explained to him that this is part of my Master's thesis and I was feeling a lot of pressure to have data from everyone and as well as feeling squeezed on time, and that both scenarios make me uptight. As expected, his whole demeanor changed from tuff guy to an empathetic person.

The greatest part of this lesson for me is that I began to monitor my behavior and journal about it. The following shows an example of this renewed intrapersonal understanding and reawakening.

Working with another teacher allows the luxury of one of us leaving the room when necessary. Usually I exercise this privilege when a student needs to be escorted to the discipline office or taken out to re-teach, test, or catch up. Yet, the day I apologized to Pigpen, a girl, in another class, was talking to her friends – she kept turning around when Bill was presenting. Normally I would signal them to shush – but today I excused myself and took the three of them for a ten minute walk. I learned more information about the personal struggles of these three students in those ten minutes than I had all year. I found out that the girl was not only pregnant but that she had a baby that lived with her boyfriend's family. She had had a fight with her baby's father outside the school that morning and needed to talk to her friends. The boy had a terrible fight with his father that morning. The other girl would be transferring the next week to an alternative program and had lost all initiative to complete class work. I had been clueless about all of this. I mostly listened without judgment on this walk as they talked.

If it had not been for troubles with Pigpen, I may not have awakened to the fact that I was losing who I was as a teacher. The pregnant girl still has good days and bad days but after sharing my experience with Bill, we both leave her alone on those off days.

Regarding Pigpen, I am reminded of Herbert Kohl's (1994) philosophy regarding children who are determined not to learn. Kohl sees the "willed not-learning" as a "conscious and chosen refusal to assent to learn". Kohl states (1994) that the accepted failing grades produced are in exchange for the passive defense of their personal and cultural integrity and further states that these students are "repository for the positive leadership and intelligence of their generation". Yes, Pigpen, with his Mohawk hairstyle and facial piercings, is trying to be true to his authentic self in an environment that unfortunately, often, needs everyone to learn the same thing at the same time.

On a day when we would have to complete multiple journal entries, I tried using background music. Who should complain? Pigpen and Elmo, the two oppositional defiant students, who are the most difficult students to motivate, and have both been suspended several times this year. They did not like the choice of John Mayer. Several students were excited for this contemporary mellow singer and the novelty of listening to music made them happy. Pigpen made fun of the music, Elmo commented on how he did not like it. I found it interesting that they needed to express themselves as if they saw themselves as the leaders of the class who needed to set the style tone for others. I did chance on a group of three for Elmo to work in this day, and he was able to produce good work and surprisingly this reluctant learner became the group leader that day.

When writing in my reflective journal, I realized the first two times that Pigpen completed his journal is when I gave him a choice between three different prompts to complete. He needs ten positives teacher comments to every negative one, and for the teacher to listen to him. After this revelation is when I went to Borders looking for a book on reluctant learners and luckily found Herbert Kohl's, *"I won't learn from you" and Other Thoughts on Creative Maladjustment*.

This renewed sense of authentic self allowed the vision needed to intervene in two boys' lives. One of our student's, who has emotional issues and is classified, from a different Algebra I class than the study group, was always silent and seemingly depressed in class. One day, in the hallway, I observed this student laughing with "Izzy Sparks", a failing student in the study group. I talked to the two of them individually, about how it would feel to be in the same class and both were enthusiastic. So, with their parents and counselors approval and Bill's cooperation, Izzy switched into the other's class. Both boys seem much happier and more comfortable in class but unfortunately, Izzy is still failing. I am still puzzled by where his difficulties are stemming from. I need to work with him, one-on-one in the future. When Izzy was journaling, he clearly had problems with the math but my hunch was then and still is that his problems are more emotionally oriented than a mathematical deficit issue. Izzy is not classified.

III. Receiving student feedback

Teachers become most effective when they seek feedback from students and their peers and use that feedback to adjust methods and plans (www.grantwiggins.org). One of the positive outcomes of student journal writing was the intimacy that formed between most of my students and me through using the students' feedback to change methods and plans. I would comment on every Content and Process Prompt entry and found when conducting survey interviews that every student surveyed read my comments and looked at the solutions I did for them. However, the Attitudinal Prompts were the greatest venue for personal and more intimate exchanges between my students and me. Most students shared with great honesty if their parents or guardians liked or disliked math, personal study habits, and their opinion on why learning Algebra is important or not important. Three classified students admitted that they never study for math tests.

The brain needs social and environmental interaction (Oberparleiter, 2004) for retention and learning. Incorporating prompts that required cooperative learning brought laughter, creativity, and joy into our Algebra class. I decided it would be more productive if I assigned groups as opposed to the problems that can occur when our students chose their own groups. I usually counted off by twos, threes, or fours, but one day chose groups by the color of their shirts. The day after one of our group projects, "Cheetah Girl" entered the class, seeing the journals out, saying, "Yeah journals, I love journals". This was music to my ears. Three students, who I knew were going through some personal family issues, were not completing entries, but participated when working cooperatively. One of my more emotionally troubled students showed a great sense of humor and leadership

skills when working cooperatively in a small group. I am further convinced that these diverse learners need to work cooperatively daily.

Journaling allowed the positive qualities, in all my students, to be showcased. A sense of trust developed as the students saw that the contents of their journals were just for my eyes and no content would be used against them (I would verbally share the contents with Bill).

The following survey question results reflected the students' positive attitudes towards this journey with math journals:

Did you find that writing helped you remember how to solve problems?

Yes	I don't know	Seeing the correct answers helped
8	1	5

Tell me about your favorite journal entry.

5 students chose the ones they received stickers on.	2 chose the content prompts	3 chose the process prompts	6 chose the attitudinal prompts
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Student feedback that informed and changed my teaching was received through an Attitudinal Prompt when our students were prompted to write about changes they would like to see in our math class. Six students wanted more review, clearer explanations and a slower pace which confirmed my suspicions that we were moving too fast through the curriculum. One girl, who was still a little angry with me for contacting her parents because she was slacking off, said she would like a younger teacher. Ouch! A couple said they would like more fun. Two of our better math students wanted stickers, fun

worksheets or some kind of reward. I cannot make myself younger but I clearly needed to allow more novelty in the class as well as accept that some of these students are only fourteen and still need school to be more fun. So, I began to use stickers on any journal entry that was complete and correct and started working with my partner to slow down the pace. The students' feedback would be a reminder to get back to some basic tenets of Special Education such as the frequent use of graphic organizers and use of mnemonics, leading to our most fun co-operative learning prompt to invent a saying to remember that y's are on top and x's on the bottom for the slope formula. The best mnemonic, a few students devised was, "Yo Xavier", which is now hanging up in our class room. Brain research shows that the brain automatically searches for patterns (Oberparleiter, 2004).

IV. Math weaknesses and attitudes towards math revealed

Journal writing turned out to be a very quick and direct way to detect mathematical reasoning issues, lack of pre-skills, and attitudes towards Algebra.

Mathematical Reasoning:

One boy (he chose no pseudonym) clearly had no background in operations with integers. This detected, I was able to sit with him and show him how to use a number line to add and subtract integers. I wrote down the rules for him to use during class and on assessments.

When prompted to solve an inequality, seven students were lost, five of whom were not surprises but, three were. As time went on I began to see patterns of weaknesses in these three. One boy would write on his journal pages, "I'm confused". I knew to work with him daily and to pair him up with a strong learner. "Catman" appeared to be one of our

star students except he rarely did homework. He was not a classified student, seemed to catch on fast to new mathematical concepts, and was an A/B student grade-wise. I had often wondered why he was in this bottom level Algebra class. Then I saw the little mistakes; sign errors, missing steps. Another of the three was able to solve most problems correctly but his lack of written explanations made me believe he struggled with higher-level understanding of the concepts and some issues with writing in general.

Pre-Skills:

Several students showed problematic reasoning when solving equations and inequalities. Bill and I noticed on tests and quizzes that the most common problem was confusion on how to move terms from one side of an equation to the other. With the journal entries as back-up proof, we knew to they needed more practice with the basic concept of how and why you move terms as well as an awareness of which students continued to have issues with this and focused some individual attention on them. Journaling has proven to be an invaluable method, analogous to an “exit slip” or “do now” for determining basic pre-skills to be reviewed or in some cases learned for the first time.

Attitudes towards math:

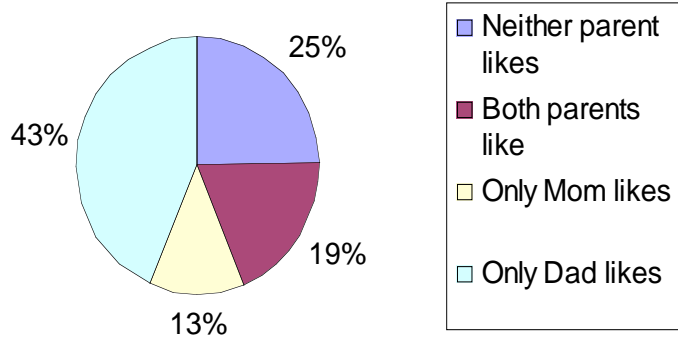
As a survey question, the students were asked if they would choose a teacher or classmate first when the mathematics is confusing. I expected them to say a friend or

classmate first, however, nine out of the thirteen students surveyed said the teacher.

Four students said a classmate may solve problems the wrong way but, that the teacher would show them the correct way. Three students, who I find to be mistrustful of teachers, said a classmate or friend first.

The most revealing answer was from a girl that said she would ask nobody – just hope she understood the next day. I now know to monitor her learning.

The following pie chart shows the results from the Attitudinal Prompt, **“My parents (or guardians) did (or did not) like algebra because...”**



I cannot come to any conclusions however one has to wonder if parents, especially Mothers, are telling their children, “ I was never good at math”. Or. “Don’t ask me, ask Dad” statements creating an excuse for their children to think they cannot or do not need to excel in Algebra. Eight students said, “I don’t know”. Could they come from homes

where positive family communication is not present? Do they dislike their parents? Do they not have enough time with parents to talk about life?

When surveyed, all thirteen students said they preferred journaling over paper and pencil tests with comments such as, they are “fun”, “less stressful”, “easier to answer”, “you had more time to think”, and “you feel more relaxed”.

V. IMPLICATIONS

The students' cooperation and enthusiasm for journaling in our Algebra I class was a wonderful surprise. Perhaps it was the novelty of journaling as opposed to taking notes during a lecture. I would like to think that my enthusiasm for the journaling and personal feedback given to each student encouraged the students' positive responses. I definitely see myself using journal writing next year but expanding the number of prompts used as well as incorporating a rubric for grading and direction.

In the future, I would to include 5 – 10 minute journal writing sessions, during class time, once or twice a week. The students would be given a rubric when they receive their journals. The journal entries would take place of one traditional paper and pencil test grade per marking period. The students would complete several entries each marking period and they could choose any five entries to be graded. I would continue to collect the journals every Friday to provide continuous feedback to and from students.

Use of the three types of prompts, content, process, and attitudinal would be repeated. I would use them at the beginning of class to see how they are doing with a new concept or at the end of class to assess how they are doing at the end of a lesson.

Currently as part of our mathematics curriculum requirements, at least once a marking period we practice responding to open-ended prompts in all mathematics classes. Therefore by the time I conducted my research our students had already responded to three open-ended prompts which helped them respond to the journal prompts with relative ease and familiarity. I agree with Mayer et al (1996). "Asking students to

describe processes and explain solutions through writing furnished information about their thinking not immediately evident from more traditional methods of assessment”.

This year, Bill and I, in an attempt to familiarize students with the language of mathematics, have asked our students to summarize chapters in their textbooks. Our students’ generally do not read their textbooks. Most homework assignments come from the companion workbook. We have not had a good return on take-home quizzes and rarely does the entire class complete homework assignments. Often over half of the class will skip homework. Therefore, I would continue to use the journals only in school.

This study was too compressed to come to any conclusions regarding the enhancement of mathematical thinking or for reflections on metacognition. . I would like use more metacognitive questions in the future. In an attempt to encourage metacognitive awareness, I asked the thirteen surveyed students why they chose a particular prompt as their favorite. I was asking them to think about their learning style, to self analyze their preferences. Reading data, planning and organizing a solution, as well as trying for the correct answer are all part of responding to a process prompt which can shine greater light on their mathematical thinking. Feedback allows students to become aware of their errors. Hillman (1996) states that feedback should highlight strengths and strengthen weaknesses.

Differentiation:

A theme that kept coming up through my reflective journaling is the need to incorporate un-graded formative assessments to pinpoint individual student difficulties with the mathematical content before, during, and after classroom presentations. Currently, we differentiate assessments, in our Algebra I classes by allowing students to choose which questions to respond to- these questions being of varying degrees of difficulty. We modify tests and quizzes as needed. However, we have not conducted any pre-assessment, aside from a pre-assessment, which involves examples from the entire years' curriculum, elicited on the first couple of days of the new school year. I would like to see pre-assessment on every unit of study, then differentiation of content and process based on those results. As a follow up to this pre-assessment, I would incorporate more diagrams, graphic organizers, and charts to those who struggle with concepts, and compact the curriculum for all learners.

Journal entries are a quick method for pre and post assessment. You prompt your students to solve a problem based on the current week's curriculum to be taught. From their entries, you can differentiate instruction. One teacher can work with students who need the necessary pre-skills while the other gets started teaching the curriculum. You can easily deduce who is ahead of the game, who has some understanding, and who is lost. This information can be used to form cooperative learning pairs and groups.

VI. OBSTACLES

Initial approval to conduct research was very trying. Unfortunately, new rules for the implementation of a research plan, including the necessity for Board of Education approval, began this school year and took me by surprise. The Assistant Superintendent for Curriculum and Instruction oversaw every detail. Prior to this year, only principal approval was needed. After one very unpleasant and contentious meeting with the Assistant Superintendent, we had two follow up meetings that were encouraging and supportive.

I would need to revise my question to reflect the qualitative results I hoped for in order that the Board of Education not become confused by expecting quantitative results. Discussion of qualitative vs. quantitative ensued in the process between the Assistant Superintendent and me, with my choice of qualitative not earning much initial respect. It was insisted upon, without mincing words, I should have not one, but two English teachers read over my Research Plan. This was a logical request but it lengthened the time period before I could get approval from the Board of Education. I wasn't aware of the requirement for parent, student, or co-teacher permission slips until meeting with the Assistant Superintendent. This was serious business and I needed to treat seeking "Board" approval generally with more respect, since in my heart I am a subversive teacher reflecting my coming of age in the 1970's. Due to the improvements, changes, and additional documents needed for Board approval, I would now begin my research in late January instead of mid-December. I felt my stress level rising with abandon until I accepted, over the next couple of weeks, that it is what it is.

The greatest obstacle in conducting this study was the lack of time. As stated previously, our periods are only 40 minutes. I lost eight days of class in the middle of this study due to three vacation days and five days of High School Proficiency Assessment (HSPA) “boot camp”(a week of practicing rubric interpretation and answering open-ended mathematics prompts). Additionally, the usual rush to get through the required course curriculum for the third making period was hanging over our heads.

I would fit in prompts whenever possible, sometimes at the beginning of class, other times at the end, each prompt taking 5 – 10 minutes. There was never time for a follow-up class discussion of a prompt. If follow up time were allowed, I could have verbally cleared up some misunderstandings of prompts and reinforced the corrections I wrote in their journals. The three days of HSPA testing were our most fun, although hectic prompt days. On these days, our freshman and sophomores had a delayed opening, since they were not taking the HSPA, so I was able to use the entire three periods for journaling. This allowed the completion of the journals as well the inclusion of longer prompts that utilized cooperative learning and *think-pair-share* techniques.

I see much merit in the implementation of current popular teaching techniques, such as cooperative learning, *Exit Slips*, formative, pre-and post-assessments, *Mind Maps*, KWL, *Word Splash*, and differentiating instruction. However, it is always very difficult to insert these into our day to day teaching since the mainstream teachers plan the lessons alone and many do not necessarily see the merit of these new techniques. However, Bill, is

open to new ideas, and stated that he enjoyed participating in the employment of some of these techniques as part of the journaling process.

The surveys were especially difficult to fit in. By the time we had completed the journals, there was so much curriculum to get to that I never wanted to disrupt student learning time. I tried to fit as many in as possible at the end of a few classes. The initial survey had six questions; however, due to time constraints I eliminated two questions after the first survey. Twice I needed to conduct two surveys simultaneously, which was not an ideal data collection technique since I could not discount the influence the two students had on each other's answers.

Initially my Research Plan for our 601 graduate class I had some grand elusions. I was going to use Excel to record journal summaries but that turned out to be way too time consuming, since the mechanics of Excel are not exactly second nature. I had initially planned to photograph the students for the research presentation as well as recorded the students' survey responses. However, not only would there not have been enough time but also the Board of Education would not have approved of any photographing or audio-taping of students.

Another time management difficulty was the writing down of prompts. I could not give them the prompts ahead of time because I wanted to base them on what we were currently learning in the class room. I had planned to have the students write down every prompt on the top of the journal page, writing the prompt on the overhead projector and

board for them to copy. It was clear, after the second prompt day that this was too time-consuming. I scrapped that idea and instructed the students not to worry about recording the prompt at all.

At first the students would have some difficulty knowing what page to write the prompt on and under what category. I included page numbers in the journals but it was still confusing for students when they were absent from class to know what page to write on. Luckily, I had separated the journal book, in three parts, by the type of prompt, separating parts by using different colored sheets of paper. So, it became much easier to say go “to the next free page in the orange section” etc. Ideally, in the future, the prompts would be created at the beginning of each marking period and the students given the prompts ahead of time. This way the teachers could differentiate by allowing some students to go ahead and complete entries and others to wait until understanding a concept.

It was my intention to stay late at work to complete note-taking and journaling but after-school tutoring, club meetings, and other work responsibilities made this difficult. I found myself correcting and responding to student journals, completing *journal review notes* and *teacher’s reflective journal* on the weekends. If something came up that I didn’t want to forget, I would jot in down somewhere right after it happened and then transfer it into the notes or journal later.

VII: EMERGING QUESTIONS

Can I entice a co-teacher next year to agree to journal writing as part of the curriculum?

Will I assert myself, after presenting my findings to the mathematics department this spring, to make it happen? Will one of my co-teachers volunteer?

Can and will I implement pre-assessments in order to differentiate instruction? Will I convince my partner(s) of their merit as well as the use of formative assessments and post-assessments?

Cooperative learning is becoming more popular in the mathematics department this year, will we expand on this? This study showed definite merits for cooperative learning to be used in an Algebra I inclusion class.

One of my special education students from the journaling study group has given his Study Skills Teacher a hard time about doing homework for our class, several times this year. This student says –“Why should I when they never check it”? “What difference does it make”? When the Study Skills teacher asked me if this was true, I told him I check homework every day. However, pondering this recently after asking this student some clarifying questions, I think what this student means is that I never check if he has the correct answers. If my hunch is correct, then his statement is true because there is not enough time to check the accuracy of each student’s answers. Could I integrate

cooperative homework strategies, where each student compares his/her answers with a classmates answers, next year?

Could I convince my co-workers of the merits of error analysis where students get partial credit back for corrections made on assessments?

Answers to the questions invoked in PART I: CONTEXT of this paper.

1. Will journal writing provide insight into the mathematical reasoning of those students classified as having learning disabilities in mathematics?

No. I would need a much longer data collection period and to direct the prompts to target specific problem solving areas that affect mathematical reasoning.

2. Is gender a factor? Maybe. I perceived the girls to be more enthusiastic about journaling but I cannot make any definitive assertions about gender from my research.

The girls, in my particular study, may like writing better than the boys. Also I had more girls than boys in my surveys and in class in general.

3. Will students with disabilities in writing be turned-off by journal writing? Not in my study. Two of the three boys that completed the fewest prompts were regular education students. The two girls with the fewest entries represented one special education student and one regular education student.

4. Will students find explaining their problem to a partner helpful? This was answered in the survey. The majority found it helpful but some found it only helpful after they had completed the problem on their own.

5. Will journal writing inform my teaching? Absolutely. Student feedback in their journals and surveys informed my teaching in a significant way. I saw not only that I was losing my authentic self, but also that I was a better teacher when I felt closer to my students. I was informed of what mathematical concepts needed review, who was struggling, and who was ready to move on, and adjusted my teaching accordingly.

6. Will behavior problems improve if students have an outlet to express their feelings? I think some behavior problems did improve but not because they had an outlet to express their feelings but that they knew that their opinions were being heard and valued.

7. Will journal writing improve student motivation? This question is way too big for my research.

8. Will journals provide insight into those students who experience math anxiety? Yes and no. Yes, I found out some students were struggling with the math that I previously thought were just unmotivated. No. Whether or not they are struggling from anxiety is again way too big a question for this study.

9. Will those students reluctant to raise their hands to ask questions during class, feel more comfortable asking questions in their journals? Perhaps, if journal writing was used year-long I would see reluctant hand-raisers feel more confident. I didn't stress as much as I could have, that they could ask me questions in the journals. I don't think journaling helped learners who do not, at any cost, want to appear foolish. Again, perhaps, if it were a year-long process, some reluctant learners may feel more comfortable with their classmates.

10. Will I gain insight into why some students have difficulties with retention of multiple steps in problem solving? On the specific questions where I asked the students to solve a multi-step problem, I could definitely make some generalizations regarding gaps in their previous mathematics education, but measuring retention is for a scholarly quantitative research study.

11. Will students enjoy reflecting on how classes are taught?

Yes, I got many enthusiastic responses when prompted for suggestions to improve our class, such as more fun and stickers, slower-pace, better explanations, and more cooperative learning opportunities, and Bill and I took all of the students' suggestions seriously.

12. Will writing journals help students develop higher-level thinking skills? I support the premise that planning, and explaining how a student solves a problem helps him/her develop higher-level thinking skills but this again requires a much more scholarly study.

13. Can I gain insight into why many students do not complete homework or class work?

Any down time with a student, was an opportunity to understand what is going on in his/her world. A teacher just needs to find the time to chat with students, make phone calls home, or seek the opinions of other school professionals, to gain insight into what personal issues may be keeping a student from performing at their best level. However, journal prompts can lead a teacher to reflect on his/her students' personal issues and follow up by spending some time talking to any student who appears to be a reluctant learner.

14. Can I gain insights into how to differentiate instruction in the future? Absolutely.

As stated under IMPLICATIONS, this journey with journals triggered concrete ideas to implement next year in regards to differentiating instruction.

I will continue to search for answers to:

1. Why do so many students fail Algebra in high school?
2. How can I bring incorporate more of my students' real-life experiences into the Algebra I classroom?
3. Is it a myth that taskmasters bring the best out in their students or is it that they have high expectations?
4. Can I become more of a collaborative teacher?
5. Can I stop some of my introverted tendencies and share more goals with my partners?

6. Will I continue to journal?

When writing this paper, I was relieved to find I had recorded complete journal entries in class 501 and when revisiting them I was reminded of some goals and ideas I wanted to incorporate into my thesis.

7. On March 3, 2008, I began the class by playing the old song *Spinning Wheel* – *what comes up must come down*....and linked it to slope. The multimedia splash was novel and I sensed the students enjoyed it. Yet on March 6, 2008, Pigpen and Elmo reacted negatively to the music. Do I perhaps need to not use music of their generation because it's too personal for them or should I accept that you can't please everyone?

8. Does the cooperative grouping help; when the concept is too difficult? Or, does it only work when direct, individualized instruction precedes cooperative learning?

9. How do I keep students from slipping through the cracks?

10. When Bill and I get our students up doing kinesthetic learning they always respond well. Do we need to do this more often? Even Pigpen likes it.

11. Why are some peoples' memories superior? Is memory the main reason some students are able to excel in high school?

12. Two girls missed writing a few journal entries due to personal issues –instead were talking and comforting each other. Could I have gotten them interested if I had asked them to journal about what they we're thinking at the moment or if I had given them a choice of emotions (happy, sad, scared...) and asking them which one reflects their current mood and why?

VII. CONCLUSION

What is the impact when our students write journals in an inclusive Algebra I class?

It is clear that I have many more questions than answers regarding student learning and teacher improvement. If I had to categorize journal writing in the Algebra I classroom as positive or negative, I would overwhelmingly chose positive. Journal writing has impacted me personally by improving my teaching. Journal writing has provided feedback on our students' difficulties with problem solving, helped me foster a closer relationship with students, and reinforced the importance of slowing down the pace of class.

The nature of many students in the Algebra I inclusion classes is that they don't have the time or motivation to complete homework. I wanted to try journaling during classroom time to see if I could get a better return, and now I have accomplished that with 90% plus participation for each prompt.

In the movie *The Freedom Writers* (LaGravenese, 2007), journals helped the teacher understand her students. There are reasons why a student is anti-social, uncooperative, or unmotivated. You must listen to them and get to know them, read and respond to their journals, and give up a little of class time for them to express their feelings- even in a Mathematics class.

Through this *journey with journals* I have learned that sometimes the work is too difficult because we are moving through the curriculum before the students get to the "Application Stage" or beyond. We need to differentiate instruction and slow down in order to allow time for the development of higher-level thinking skills. I have reclaimed my authentic self and received valuable student feedback on the curriculum and the class

format. I have gained insight into some of our students' mathematical weaknesses, lack of pre-skills, and attitudes toward mathematics.

At the time of this writing, our 2008 Presidential campaign is in full swing. I find our high school to be a microcosm of American culture and of the divisive political climate of the U.S. in 2008. I often see two distinct styles of teaching, in our district, and see them as an analogy for the extremes of Democratic and Republican Parties in the U.S. The Conservative Republicans are tuff, and see the world through black and white, right or wrong, good or bad. Liberal Democrats tend to listen with their hearts first. Too much heart with no rules certainly creates chaos and not an environment for optimal learning. Alternatively, a "prison-like" atmosphere of rules above all else leaves no time for student to student or student to teacher interactions other than discussing the lesson of the day and stifles a creative welcoming environment. Many teachers follow the rules religiously, others are subversive. In the inclusion classroom when the "liberal" meets the "conservative" conflict often happens. Should we solve this in the manner we wish our politicians would by listening to each other, validating, and compromising? Can we stop thinking in terms of black and white but in grays where most of us meet?

High stakes testing has encouraged this creation of black and white, right and wrong, good and bad, punish now, feel later environment. No time can be wasted. How can we encourage individuality? Where is the hope? Many political pundits in the media say this is the election of hope vs. fear. Let us, without cynicism, allow hope to lead us as teachers and Americans to make our country a better place to live and work in. Let's not paralyze ourselves by living our lives with the constant fear of impending doom brought on by another terrorist attack or a nuclear explosion while we insist on dominating the

world. Citing Herbert Kohl (1994). “It is up to us to negate this negativity—not through a denial of the horrible things that do exist but through the affirmation of possibility and the energy and love we can bring to our students”.

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APPENDICES: A. – I.

A. IMPLEMENTATION PLAN

According to my school district's policy, a Master's Degree candidate will be asked to share his/her findings at a monthly department meeting. Although the Special Education Department has its own quarterly meetings, as a mathematics inclusion teacher, I attend monthly mathematic department meetings, and it would be in this context that I would present my findings.

Sharing this personally valuable research data on the use of mathematics journals in the Algebra I classroom with colleagues could be a rewarding experience; however this situation also provides a fair amount of stress for me. First and foremost I don't want to come off like a "know it all" to people I presently work with or could work with in the future. Hopefully, my results will be of interest to these teachers since they work with the same population of students that I do, that is the lower level Algebra 1, Geometry, and Algebra 2 classes, but what about the higher level mathematics teachers? Will they complain that I wasted their time? Will they find my discussion irrelevant?

In fact, very few special education students perform well enough in mathematics, at our high school, to take Pre-Calculus, Calculus, or Statistics, or Advance Placement courses, and if they do qualify for the classes, so far, they have not needed a special education teacher to be present. Although, I haven't been in the higher level classes, my hunch is that they more or less teach traditionally since their students are adept at

learning, however I can share some findings from studies of journal writing in higher-level mathematics classes.

Therefore, I plan to do the same 5- 10 minute presentation as performed for the Regional Training Center presentations, then steer the presentation towards the merits of journal writing in general, sharing the following statistics:

- The National Council of Teachers (NCTM) Curriculum and Evaluation Standards has stated, “The assessment of students’ ability to communicate mathematics should provide evidence that students can express mathematical ideas by speaking, writing, demonstrating and depicting them visually”.
- Silver (1999) writes that the NCTM has stated for forty years that a shift is needed “toward mathematical reasoning- away from merely memorizing procedures”.
- For the high school mathematics classroom one of the methods for improvement, recommended by the New Jersey Department of Education, is to incorporate journal writing into the mathematics curriculum.
- “When children write in journals, they examine, express, and keep track of their reasoning, which is especially useful when ideas are too complex to keep in their heads (Burns & Sellbey, 1999).
- Dougherty (1996) found that journal writing forced her first-year algebra students to think more deeply.

- Citing the State of New Jersey Mathematics Curriculum Framework website; “Teachers can often find out more about the students’ thinking and degree of understanding from journals than from most other methods of assessment.
- Chapman (1996) found that students who have been successful on tests and quizzes don’t necessarily understand major mathematical concepts.
- Journal writing creates a context in which students have to integrate algebraic concepts to communicate their ideas. In turn, this forces deeper reflections of algebraic content (Dougherty, 1996).
- “When students perceive the teacher as an authentic and interested audience, what they write is more likely to be worth reading” (Mason & McFeetors, 2002).
- Dougherty (1996) saw the use of writing create an atmosphere of respect for diverse thinking and methods.
- Chapman (1996) found that journal writing boosted moral and that class discussions can be enhanced when students have had to previously think about a math concept.
- Chapman (1996) used journal writing to awaken her students’ thinking.

- In 1997, the Individuals with Disability Act mandated that students with disabilities are to receive the same content-knowledge as their non-disabled peers. Although our students are exposed to same content, are we teaching with diverse methods, so they can learn?
- Williams (2003) cites George Poyla's four executive processes used by mathematicians when solving problems: (1) understand the problem; (2) devise a plan; (3) carry out the plan; and (4) look back at the problem. Williams (2003) states that writing can improve students' problem solving performance.
- Dougherty (1996) states, as students analyze arguments, compare and contrast ideas, and synthesize information during writing, they are forming a knowledge base by pulling together isolated fragments.

In the future I want to encourage my co-workers and remind myself, to slow down, to get to know our students, and to share some power with our students. I am reminded of the "flight or flight" syndrome where the brain shuts down or goes to a lower level of functioning due to stress. I must encourage my partners and remind myself as well, that laughter and novelty bring about positive emotions that can deter the stress our students come to school with from personal problems, family stress, math anxiety, and lack of confidence in their thinking abilities.

Additionally, I would like to use my research presentation to talk to my colleagues about inclusion in general. Friend and Cook (2000) state that collaboration is based on shared responsibilities. In the future, I hope to encourage the incorporation of other models of co-teaching. In my ideal inclusive mathematics classroom of the future, we would pre-test students before each new unit, then, according to the results, divide the students up into two groups. The A group would work on one side of the room with me, working on the necessary pre-skills. The B group would be taught the curriculum by the regular education teacher. As my students are ready, they can work cooperatively within group B for some of the class, and with me to catch them up.

Presently, in general, at our high school the regular education teacher keeps grades, does the lesson plans, does most of the instruction, and designs the assessments. The special education teacher makes study guides, and does the individualized instruction and assessment modifications as needed. Inclusion, as an educational objective, expands and improves yearly, however our computer system is still set up so that only the regular education teacher has access to our inclusion students' class grades or personal information. We must ask the regular education teachers for the information. How can we team-teach when we do not have access to this important information? Often I equate this situation to a 1950's marriage. The regular education teacher is the boss, "the husband" and the inclusion teacher is the dutiful wife, there to support her man. With Bill, I feel like I'm in more of a modern marriage which is why I felt the most comfortable doing the research in one of our classes. Some teachers allow you to correct the students work, others do not let you near it. If you never correct their work you are robbed of details necessary to meet your students' needs.

Dieker, (2001), suggests five models for co-teaching, listed below, adapted from Friend, Reising, and Cook (1999) that reflect a continuum with the fifth level being the ideal to reach. This requires a commitment to joint planning time. Hopefully, when we move to block scheduling this will be the norm. However, in our current situation, although we have a 40 minute shared planning period each day, we rarely are able to work together. There are too many other duties pulling at us: e-mails, calls to parents, discussing students with case-workers and counselors, making photocopies, making classroom materials ...

- I. Lean and Support- one teacher leads/other assists and supports individuals or small groups
- II. Station Teaching- heterogeneous groups at classroom stations with each teacher
- III. Parallel Teaching- teachers plan instruction together but may teach to half the class or small groups
- IV. Alternative Teaching- one teacher instructs large group/ other teacher works with small group to pre-teach, re-teach, supplement, or enrich
- V. Team Teaching- both teachers share planning and instruction

I would have a hand-out ready for my colleagues and stress that we are stuck on the Lean and Support model but that our students could benefit by our implementing one or more of the other four models.

B. SUBJECTIVITY

Over the past five and a half years, I have co-taught with nine different teachers. Some teachers have complemented my personality better than others, and it is with these teachers I am the most comfortable and affective as a teacher. Other teachers have “run the show” with my permission. If I had been a more assertive, confident, and experienced person, I would have challenged them or been more willing to “rock the boat”, in order to better serve our students, however, confrontation remains personally very difficult.

I was reminded of the joy of teaching during the period of my data collection. I got to plan and implement the teaching. I got to evaluate our students’ work and bond with our students. I felt more in touch with our students personally and academically than I have since coming to the high school. I remembered something very important, I LIKE TEACHING. I want to be a teacher not just the “support” person for the students and regular education teacher.

I grew up the youngest of four girls in an authoritative and sometimes verbally abusive home. I have struggled, my entire life, with unfolding who I am apart from the little sister or underachieving, rebellious teenage daughter.

I spent a good deal of my life fighting shyness and yet it is still there down deep in the recesses of my soul. However, I am well aware that sometimes you must be willing to be unpopular in order to achieve change.

Do I want to see less traditional teaching? Yes. Am I a rebel at the core? Yes. If I want to do the best for my students I need to insist on pre and post assessments, differentiation, team teaching, formative as well as summative assessments. Would I feel more confident and comfortable teaching in the lower grades, where I am not intimidated by the intelligence and confidence of the high school mathematics department? Perhaps. Was I more comfortable and affective when I had my own classrooms in the past? Absolutely. However, there are many personal and professional paths left to explore at the high school, and I will enjoy the view as I continue my high school journey.

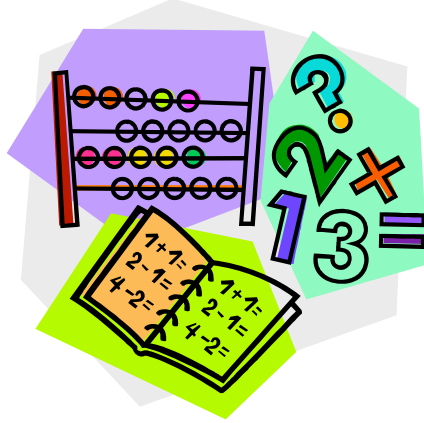
Keeping a personal journal has been a newly adopted practice this past year, and one that is definitely worth making into a habit. I have always scribbled notes on course and workshop papers and often referred back to them, however, I have never been a diary writer or poet. The fact that keeping a reflective journal could supply comfort and inform my teaching has come as a surprise. I plan to continue journaling. Next year, I will keep a reflective journal and try harder to spend time with it during the week. As well as keeping a daily reflective journal, I hope to begin journaling about what antecedents occur before students experience math anxiety.

Spending these past few months as a teacher researcher, I have been reminded that the classroom culture must be “safe, supportive, stimulating, engaging, and mutually respectful” (Firestone, 2008) for optimum learning. I have always possessed the ability

be a “reflective practitioner” (Firestone, 2008) and now I know how to use teacher research as a tool to reflect on and improve my teaching.

Earning a Master’s Degree has been a long time dream of mine. I have learned the value of setting goals and know that when I set my mind to achieving my goals, I succeed. Armed with the new found knowledge and skills I have learned in graduate school, and twenty-five years of experience as an educator, I will help my school to improve how we educate the diverse population of special and regular education students. *As the Little Engine That Could* said “I think I can. I think I can”.

APPENDIX C



MATH JOURNAL

NAME: _____

Class: ALGEBRA 1 Period:

Type 1

Clay said, "Solving an inequality is like solving an equation." "Brian said, "no, they are nothing alike." Who do you agree with?

$$\begin{array}{r} 4 - 2p = 12 \\ -4 \quad -4 \\ \hline -2p = 8 \\ -2 \quad -2 \end{array}$$

$$p = -4$$

$$\begin{array}{r} 4 - 2p \geq 12 \\ -4 \quad -4 \\ \hline -2p \geq 8 \\ -2 \quad -2 \end{array}$$

$$p \leq -4$$

I agree with Clay. Solving an inequality is very similar to solving an equation except for two things.

1. When you solve an inequality you have to remember to flip the sign if you multiply or divide by a negative number
2. There is only one answer for an equation but an inequality has a range of answers.

Day: _____ **Date:** _____ **Type:** _____

Type 2

Give an example of an equation that is difficult for you to solve and explain what makes it difficult.

$$4x + 2(x - 7) = 6x - 13 - 1$$

I get confused when I have to decide how to begin. How do I start? Do I subtract the 6x or the 4x? What side should I start with?

Type 3

Describe what is going on in your mind mathematically right now by completing the following... I feel...

I feel like I understand how to graph a line using the slope and one point but I'm worried that I won't remember how to do it tomorrow for the quiz.

APPENDIX D

Journal Review Notes

Day: _____

Date: _____

1. S		13. L	
2. J		14. Z	
3. J		15. A	
4. N		16. B	
5. A		17. J	
6. K		18. H	
7. R		19. J	
8. B		20. M	
9. A		21. C	
10.L		22. C	
11.M		23. B	
12. A		24. M	

(Full names have been removed for protection)

APPENDIX E

Date _____

Student Survey Interview Questions:

Name: _____ Today's Date: _____

1. Did you find that writing helped you remember how to solve problems? _____
Why?
2. Tell me about your favorite journal entry. Why did you like that one?
3. Would you rather keep a journal for a test grade or take a test? _____
Why?
4. Did you find it helpful to share how to solve a problem with a partner? _____
Why?

APPENDIX F

Prompts

Type 1. Mathematical-Content Prompts (green)

Ex. What do you think is the difference between a function and a relationship?
How are they alike?

Type 2. Process Prompts (orange)

Ex. You know several different methods to solve $\frac{2}{3}(4x + 9) = 16$, solve this problem and tell me why you chose your method.

Type 3. Affective/Attitudinal Prompts (pink)

Ex. I think I am a _____ math student because _____.

<u>Date</u>	<u>Prompt Type</u>	<u>Prompt</u>
1. Wed. 1/30/08	3	If I could change one thing about our algebra class, it would be to ...
2. Thurs.1/31	2	When I transform the equation, $y = mx + b$ to an equation that solves for b instead of for y, my first two steps are...
3. Tues. 2/5	1	Sherice says, "I can find the speed we traveled to my aunt's house if I know the distance and time. Is she correct? If so, how could she do this?"
4. Wed. 2/6	3	My parents (or guardians) did (or did not) like algebra because...
5. Tues. 2/12	2	Brian is trying to decide what would be a good method to solve an inequality. Describe your method using $-5x < 25$.
6. Tues. 2/12	1	Tamiko said the solution set to $10 > -2e$ was $-5 < e$. Charity disagreed and said the solution was $e < -5$. With whom do you agree and why?
7. Wed. 2/13	2	When Josh solves the equation $4x-3 = -2x - 15$, he says there are 3 steps? Is he correct? Show your work.
8. Wed. 2/13	3	How do you study for an algebra exam?

9. Wed. 2/20	1	Katie was absent today. What would you tell her we did today? Use at least 2 sentences.
10. Tues. 3/4	1	Ask a neighbor to define slope. Write down, in one sentence, his/her answer.
11. Tues. 3/4	3	Studying algebra is important (or not important) because
12. Tues. 3/4	2	Any slope is the $\frac{\Delta y}{\Delta x}$ (dependent variable) (independent variable) Work with your group to come up with a trick to remember this.
13. Wed. 3/5	1	Write an explanation of how to graph a line if given one point and the y-intercept, as if you were explaining it to a younger sibling or friend.
14. Wed. 3/5	2	Janice says that $\frac{12}{0}$ can't be a slope. Ricky says it can. Who do you agree with? Why?
15. Wed. 3/5	3	Write a letter of advice to a student who is going to attend this class next year. Dear _____
16. Wed. 3/5	1	I keep getting the wrong answers when I multiply and divide negative and positive integers. Help!
17. Thurs. 3/6	3	If you are confused in math class, do you prefer to ask a classmate or ask one of your teachers for help first? or Do you ask nobody for help and hope you will understand it tomorrow?
18. Thurs. 3/6	1	Write a one stanza poem about slope with your group.

APPENDIX G

Ms. T. T.
Special Education Teacher

January 28, 2008

Dear Parent(s) and/or Guardians:

I am currently studying at The College of New Jersey to earn a Master's Degree in Instruction. The topic of my Master's Thesis is: What is the impact when our students keep journals in an inclusive Algebra I class? I am requesting your permission to conduct one interview with your child regarding his or her opinions of the journal writing experience as well as to use your child's work as part of my study. I will neither grade the journal entries nor will they count in any way towards the students' grades for this initial study. In order to create a comfortable environment for writing, spelling and grammar will not be corrected.

Please be assured that students' work and answers cited in my thesis will be strictly confidential. I will not use your child's name, the name of his or her school, or school district in my writing. All of our twenty-four students will participate in journal writing, the last five to ten minutes of class, three times a week for eight weeks. However in my thesis, I will only use the work of students whose permission and parental permission has been attained. Additionally, please be assured that journal writing will not take away from instructional time in class but instead will be used as a way for each student to summarize his or her thoughts on our lesson that day.

The purpose of this study is to inform me as to how our students learn mathematics so that I can better serve them. I will be looking at how our students solve problems as well as how they explain their solutions.

If you would like to discuss this further, please call me at school any morning/afternoon (908 218-8858) between 10:00 and 11:00 AM or after 2:30.

Please sign page 2 and return it to school with your child by Thursday January 30th, 2007.

I sincerely thank you for your attention to this matter,

Ms. T.

Ms. T. - Master's Thesis Parental Permission Form

I grant permission for my child's work to be used, anonymously, in the study described above. _____

I grant permission for my child to be interviewed, anonymously, once at the end of the study. _____

I do not give permission for my child to participate in this study.

I do not give permission for my child to be interviewed.

Child's name: _____

Date: _____

APPENDIX H

Ms. T. T.
 In-Class Support Teacher
 [REDACTED]
 Algebra I
 January 28, 2008

Dear Student:

I am in the process of writing a thesis to earn a Master of Education in Instruction. I am requesting your permission to use your work and interview answers in my thesis.

Your real name, school district, and high school will neither be used in my writing nor will the content of your journals be shared during the study period with any teacher but Mr. Eaton.

This study will take place from January 2008 through early April 2008. These journals will not be graded therefore incorrect spelling and grammar will not be corrected. Instead, I will be using your journals to help me understand how you learn mathematics.

You will be asked to write in your journals to a journal prompt, at the end of class, three times a week, for 5-10 minutes, about your understanding of mathematical concepts and attitudes towards our math class. Please be assured that the writing will not take away from instructional time in class but instead will be used as a way for you to summarize your thoughts on our lesson that day. You will be given a rubric and writing samples before our first journal entry as well as a journal book.

Everyone in our class will be expected to participate in our journal writing but only those of you who have given permission, as well as receiving your parent's/ guardian's permission, will be used in my study. Please sign below if you will grant permission or not. I am looking forward to sharing this journal experience with you.

Thank you,

Ms. T.

Ms T. – Master's Thesis Student Permission Form

Student's name: _____

Date: _____

I grant permission to use my work, anonymously, in the study described above.

I grant permission to be interviewed, anonymously, once at the end of the study.

I do not give my permission to use my work in your study. _____

I do not give permission to be interviewed. _____

APPENDIX I

CO-TEACHER PERMISSION FORM

Research Plan for T. T.

I give my permission for my in-class-support teacher, T. T., to conduct research in our Algebra I class. I have read over the research plan and understand the timeline and the quantity of class time that will be used for this purpose and agree to participate.

_____, Mathematics Instructor
S. High School