

THE IMPACT OF THE LEAD TEACHER PROFESSIONAL LEARNING COMMUNITY WITHIN THE RICE UNIVERSITY MATHEMATICS LEADERSHIP INSTITUTE

J. SACK

*Rice University Mathematics Leadership Institute
Rice University School Mathematics Project
Houston, TX 77005*

N. KAMAU

*Rice University School Mathematics Project
Houston, TX 77005*

Abstract

Now in its fourth year, Rice University's Mathematics Leadership Institute (MLI) has developed over sixty high school mathematics Lead Teachers. We focus on how membership in MLI has impacted participant teachers' professional lives. The Lead Teacher community that emerged during MLI's first Summer Leadership Institute embodies the characteristics of a sustaining and coherent *knowledge* community where teachers are able to share their secret "stories of practice in safe places . . . in order to make their personal practical knowledge explicit to themselves and to others" [1]. This article includes stories of individual teachers who refused to sacrifice hours of instructional time for mandated curriculum testing, who encouraged and supported a large group of MLI teachers to participate in a grueling advanced certification program, and who challenged the local administration's expectation to compromise personal professional standards. These stories may not have emerged in their particular ways had these teachers and their supporting co-manager not been members of this coherent and sustained knowledge community. This knowledge community has enabled the achievement of MLI goals with respect to teachers' increased mathematics content knowledge, leadership development, and student achievement. We also include focus group comments and quantitative data.

Introduction

In 2004, the Mathematics Leadership Institute (MLI), a National Science Foundation-funded Mathematics and Science Partnership (MSP), was established as a partnership among Rice University and Houston Independent School District (HISD) and Aldine Independent School District (AISD). During its longstanding relationship with these two districts, Rice University advised and collaborated with district-level mathematics directors on districtwide initiatives, and in individual schools and with mathematics teachers of all grade levels. The MLI was conceptualized when the University, unable to meet the huge demand for mathematics support for many of the schools in the two districts, identified the need for on-site mathematics leadership and support in their high schools. The districts' traditional professional development workshops

and centralized support may have inspired teachers, but follow-up enactment in classrooms did not occur to any noticeable extent. This phenomenon has been documented widely [2-4].

A major goal of MLI is to develop two cohorts of high school mathematics Lead Teachers to serve as intellectual leaders and mathematics advocates on their campuses. In this capacity, Lead Teachers may act as change agents responsible for catalyzing reform in mathematics instruction at their schools. They may lead course-level planning meetings, mentor new teachers, critique and advise on programs that affect mathematics in the school, and present at teacher conferences. Each MLI cohort attends two Summer Leadership Institutes, each for a four-week period for two consecutive summers. The focus of these Institutes is to develop teachers' mathematical pedagogical content knowledge, leadership skills to interface with administrators and mentor peers, and to think about school and classroom diversity in new ways, ultimately to increase student achievement in participating schools. The MLI teachers also meet regularly during the academic years over the five-year life of the grant.

The Context

The MLI initially intended to support eighty Lead Teachers in forty high schools in two teacher cohorts (beginning June 2005 and June 2007, respectively) across HISD and AISD. Although HISD is approximately three times larger than AISD and varies with respect to some important administrative features (see Appendix A), the student and teacher demographics between the districts are comparable in terms of ethnic and socioeconomic diversity (see Appendix B and Appendix C). Currently, HISD supports thirty-five MLI teachers while AISD supports nine. Due, in part, to decentralization and conflicting philosophies about teacher leadership, Lead Teacher participation did not occur to the extent of the goal. The Institute has suffered some attrition due to retirement, transfer to non-participating districts, promotion to central office mentoring positions, departure from the profession, and death. To increase the number of Lead Teachers in the Institute, schools were invited to send more than one Lead Teacher to each cohort, resulting in more than two Lead Teachers in some schools from the start. Over time, some Lead Teachers moved to other schools that were already participating in MLI so that one school had four Lead Teachers after the second cohort joined the Institute. Appendix D shows Lead Teacher enrollment numbers and attrition from the onset of MLI in June 2005 through academic year 2007-2008. Appendix E shows MLI school participation and the number of Lead Teachers on AISD and HISD campuses.

Theoretical Foundation

Clandinin and Connelly adopted the metaphor of teachers' professional knowledge landscapes to capture the complexity of teacher knowledge expressed through the contexts in which teachers live [5]. Teachers' professional knowledge landscapes are composed of relationships among people, places, and things. In particular, the landscape comprises two "fundamentally different places, the in-classroom place and the out-of-classroom place" [5]. Generally, the out-of-classroom place is "littered with imposed prescriptions . . . filled with other people's visions of what is right for children" [6]. These impositions, designated *sacred stories*, to which teachers are obliged to respond, reach teachers through communication channels metaphorically denoted as the *conduit* [7]. Teachers' responses to these sacred stories are designated *cover stories*, but these may take on a very different appearance to teachers' actual practices within the closed confines of their classrooms [8]. In-classroom practices are designated *secret stories* which are essentially free from scrutiny [6]. Furthermore, Olson and Craig define a *knowledge community* as a safe communal place in which teachers can share their secret stories in ways that engender intellectual and professional growth [9]. Knowledge communities may evolve in formal or informal settings. They may exist between only two members or among larger groups. Knowledge communities evolve, expand, or sometimes dissolve, temporarily or permanently depending on the nature of the relationships among those who are present at any given time. For this study, the MLI community of Lead Teachers represents a knowledge community that arose from formal roots [10].

The Emergence of the MLI Knowledge Community

The MLI Lead Teachers participate in two consecutive Summer Leadership Institutes. These summer professional development Institutes run for four weeks, seven hours per day. During the first week of the first cohort's June 2005 Summer Leadership Institute, the Lead Teacher community took on particular characteristics of a knowledge community. Author and MLI Manager, Sack, in her previous position as a middle school mathematics classroom teacher, had experienced knowledge community first-hand through her school's internal structure of academic teams. Aware of the empowerment potential of membership in a knowledge community, Sack explicitly sought to create a workable learning community among the MLI Lead Teachers, hoping that small knowledge-community groups would evolve. However, she was also aware of the elusiveness of knowledge communities, but when individual participants began to share their own secret stories to the whole cohort and to its manager, Sack knew that a large knowledge community had formed [10, 11]. Throughout the ensuing academic year and the first cohort's second year, including its second Summer Leadership Institute, the knowledge-

community character persisted. A difficult situation arose that threatened to disrupt the second Summer Leadership Institute when a visiting instructor failed to recognize the group's needs. Group members openly shared their concerns directly with Sack even though they were aware of her close professional and personal relationship with this instructor. As a result, the instructor and Sack were able to work together to resolve the problem through their knowledge-community relationship. This story of the teachers' empowerment, afforded through knowledge-community membership, has been documented elsewhere [10].

The following sections of this article reflect evidence and impact of the intellectual and professional growth that resulted from the existence of this particular knowledge community. Quantitative achievement data were obtained from testing sources. Supporting data were culled from the MLI Manager's ongoing field notes and from an academic year focus group discussion using participants' written comments (November 2007). For the focus group discussion, Lead Teachers were asked to discuss and write how the MLI teacher community had impacted them personally, in their classrooms, and in their interactions with peer mathematics teachers and administrators on their campuses. The focus group comments were then organized by emergent themes. The authors and the MLI's external evaluator compared their analyses and agreed by consensus on the following themes that are presented in this article: personal confidence, collegial support, communication skills, raising the bar, risk taking, and interactions with peers and administration at their own schools. During transcription to a data file, focus group comments were dissociated from teacher identity. In the following sections, "T n " refers to any teacher, where n ($n=1,2,3,\dots,22$) is a non-identifying label used to distinguish unique teachers. The comments associated with any T n were culled from the focus group discussion. The data in this document were shared with participating Lead Teachers during their February 2008 academic year meeting, serving as the member check for the research dissemination.

Impact of MLI—Personal Confidence

Teachers' self-confidence grew through their membership in the MLI community. Of note, T1 benefits from validation of ideas through sharing; T2 expresses the personal sense of status from this community; and, T3 combines both in his/her sense of personal worth.

T1: "The leadership program has helped me to grow as a person in self confidence and have more self assurance, to share my thoughts and ideas and feel they may

be of some importance or value. (I often tell my students not to be afraid to be wrong, you just might be right.)”

T2: “My confidence as a teacher, as a teacher of teachers, as a mathematician, and even as a member of my community has grown beyond my dreams. Understanding mathematics and especially being able to teach math puts us in a sort of higher standing in our community because so many people cannot understand mathematics, thus they honor those who can. But I never really had the confidence that goes with that status. Because of MLI and the opportunities to learn more mathematics and more about teaching math, I feel very comfortable in that role now.”

T3: “I have great self doubts at times. The group has helped me to feel more confident. I am a smart person who has something to share with others.”

Impact of MLI—Collegial Support

Closely related to growth in personal confidence, several teachers specifically referred to mutual support within the MLI Lead Teacher community which has resulted in an individual and collective sense of empowerment, especially when in need of support in the face of difficult conduit directives.

T4: “I have made such good friends through MLI and have established partnerships with people I know I can call on for help.”

T5: “This program has empowered us as a group to collectively and cooperatively address both positive and negative issues. I now have cohorts on all campuses to help deal with a myriad of issues from teaching strategies to district policies.”

After completing two Summer Leadership Institutes, Lead Teachers in the first MLI cohort were offered the opportunity to obtain an advanced certification, the Texas Master Mathematics Teacher Certificate (8-12) (MMT). Unlike other states, Texas does not require teachers to obtain graduate degrees to maintain their certification credentials following their induction years as teachers. The MMT certification was introduced in 2001 “to ensure that there are teachers with

special training to work with other teachers and with students in order to improve student mathematics performance” [12]. To obtain the MMT certificate, candidates must enroll in a rigorous preparation course consisting of 120 contact hours. Candidates were expected to complete extensive mathematics assignments across the high school curriculum, as well as readings on professional development standards for teacher mentors and leaders. Finally, candidates must pass a rigorous five-hour examination that includes both mathematics content and a written response to a difficult case study dealing with pedagogical content knowledge. Daunted by the challenge of revisiting upper-level mathematics that many Lead Teachers had left behind when they completed their undergraduate studies many years before, many shied away from this opportunity for professional growth. “Jane,” fictitiously named to protect her identity, encouraged the whole cohort to register for the program, promising study group support for the entire year.

The MLI’s goal was to increase the number of MMT-certified high school teachers by 15% across the state. Jane’s unsolicited recruitment efforts and teachers’ beliefs that they would receive support from each other resulted in twenty-two out of thirty Lead Teachers registering for the course. All nine AISD teachers, including Jane, registered. The MLI co-manager also enrolled to provide additional support throughout the year. Jane lived up to her promise and arranged study group meetings throughout the MMT preparation year. During Summer 2007, of the twenty-two Lead Teachers who participated in the course, nineteen tested (86%) and fifteen (79%) were successful on the examination. This MLI achievement increased the number of grades 8-12 MMT-certified teachers in Texas by 56%. In May 2008, the number of MLI MMT-certified teachers increased to sixteen and raised the MLI impact on the initial number of MMT-certified teachers in Texas to 59% (see Appendix F).

Collegial support extended beyond personal interactions. The result of close collaboration during the Summer Leadership Institutes and the intensity of the MMT experience made a huge difference in Lead Teachers’ classrooms as noted in the following focus group comments:

T6: “I can assist my students better from having shared experiences with others.”

T7: “If I am unsure of a way to handle a situation, I have a great number of people to share with and try to find a solution.”

- T8: “Being part of MLI has helped me see that I am part of a community, a movement, a force of people who are in education not for the summer vacations, not for themselves, not for political reasons, but for a belief that they can help young people learn, achieve, and succeed. This knowledge that you are not alone is powerful, especially when you feel like a lone warrior in the classroom who battles indifference, lack of motivation, and the immaturity of ninth graders daily while pushing back the low standards of public education.”

Impact of MLI—Communication Skills

The MLI’s focus on leadership included formal communication development. A small group of Lead Teachers accompanied the MLI co-manager to a leadership institute sponsored by the Center for Leadership and Learning Communities following their second Summer Leadership Institute [13]. The group then provided the same development for the whole cohort during the academic year. Several focus group comments attested to the value of becoming better listeners and more supportive as a result of their MLI experiences.

- T9: “I know that I have grown. I am more patient and willing to understand others' plight. I am more positive in situations where others may be more negative.”
- T10: “During the summer meetings, I learned a lot about coaching in a non-threatening manner. My personality is very straightforward and to the point. I have learned how to be straightforward and to the point and also encouraging and gentle at the same time.”
- T11: “As a math teacher, I feel more confident, but also more humbled. Because I have just left the classroom, once again, after completing the Master Mathematics certification and MLI training, I remember what it is like to be a student. I am more receptive to change and to respecting individual learning styles and moods. I am more concerned about my classroom milieu than I once was. However, I am also more serious and demand more from my students. I set high standards because they are expected of me, by MLI, RUSMP [Rice University School Mathematics Project], NCTM [National Council of Teachers of Mathematics], and HCC [Houston Community College] and Rice

University. And now that I know what HCC requires, I can better prepare my students to be successful when they take math from the college.”

Impact of MLI—Interactions with Peers at Own School

Developing good communication skills through MLI enabled Lead Teachers to develop trusting relationships with teachers on their campuses.

T12: “Being the math Lead Teacher has allowed me to spend a larger amount of one-on-one time with teachers that need help. Some of our conversations have been very candid and being the Lead Teacher has opened that door.”

T13: “I want to say they now seek my advice but they kind of always did that. But now I actually know what I’m saying to them...”

T14: “I always have a good rapport with my peers, but going through the training [at MLI], I became much better as far as communicating or dealing with situations that involve the other teachers.”

Impact of MLI—Interactions with Administration at Own School

Lead Teachers are comfortable sharing stories of school with MLI management who share membership in the Lead Teacher knowledge community. Generally, in their focus group comments about interactions with campus-level administrators, Lead Teachers were very positive.

T15: “My efforts and hard work to improve the department is being appreciated. Administration is now more willing to take action on my suggestions.”

T16: “They somehow listen to some suggestions, provided that they are in a "good mood.”

T17: “We've always had a good rapport and it strengthens...and grows.”

T18: “I rely on them less unless I have problems; they relegate responsibility to me and I find other supportive systems besides administrators—they respect me for my resourcefulness!”

In some schools, the MLI opportunity was initially seen as a worthwhile professional development opportunity for interested teachers. In others, newly placed principals inherited programs, including the MLI, from past administrations. Many schools are struggling to avoid the punitive “low-performance” Annual Yearly Performance grade [14]. Consequently, many intervention programs, instituted by a variety of specialists and consultants in schools funnel down the conduit and interfere with teachers’ daily practice. Lead Teachers’ focus group comments were not all positive and reflected these situations.

T19: “We have a new set of administrators. I know, all they know is, I am the Algebra II leader.”

T20: “They [administration] are already planning who to blame if the scores drop. They are not planning for the future, they are planning for the excuse.”

T21: “The administration seemed to have a lot of hidden agendas and did not ask for or listen to [Lead] Teachers.”

T22: “No comments.”

How do Lead Teachers respond to administrative decisions and directives that negatively impact student learning and ultimately, student achievement? By sharing stories through existing trust relationships with other members of the MLI knowledge community, Lead Teachers are empowered to deal with difficult situations. For example, schools and district-level offices demand additional assessments be conducted in many schools, some on a weekly basis. The data are used to identify areas of content weakness. These directives impact more than 20% of classroom instructional time, in testing and then reviewing after the test. “Rosemary,” with MLI support, chose to allow only ten minutes to be devoted to the weekly test, especially when she knew most of her students would fail. This way, she maintained her instructional time, kept the stress levels in her classes down, and focused on instruction. Remarkably, within a few weeks, Rosemary’s students began to pass her ten-minute tests. Her students’ passing rate was about 28% on the high-stakes state-mandated test the year before and increased to about 68% after she had taught them for a year.

Another Lead Teacher, “Andrea,” stepped out of typical high school teacher boundaries in response to challenges from administration that threatened her sense of professionalism. As

leader of her school's Algebra I instructional team, she was required to meet in the same room and at the same time as other mathematics teams, devoid of resources and a place to demonstrate instructional strategies. After moving her team to an adjacent room, she was formally admonished by her administrator. In protest, after getting nowhere with requests to negotiate better meeting arrangements, she resigned from her leadership role. The MLI Manager supported Andrea's decision and marked the event up as an administration roadblock. Andrea demonstrated an ability to step beyond her comfort boundaries in other ways. The following comment was culled from a communication she e-mailed directly to the MLI Manager:

I have not only learned in an intellectual sense, but also in an emotional sense when relating to students. I grew up in a traditional Asian family, and the teacher was thought of as an authority figure, distant from her students. This paradigm seemed to work in a private school setting where students are more motivated and self-contained, but it is more challenging to teach high-risk students in inner-city schools. Listening to other Lead Teachers during the summer sessions taught me that I had to go beyond my comfortable boundaries to reach students who come from very different backgrounds than I do. As one of the youngest members of the MLI group, I feel privileged to be around a group of teachers with so much experience, wisdom, and heart. It takes heart (or stubbornness, or both!) to stay in education for twenty-something years. I learned to ask students about their lives and show them that I care about them as people. Students respond emotionally, not so much rationally, and they will work for you if they see you are working for them. I learned that from my MLI colleagues.

Conclusion

The MLI Lead Teacher knowledge community has empowered its members to stand up for themselves and for each other in particular ways. It represents a center of refuge when members feel the pressures from the conduit, a place to vent out of reach of the conduit, and a wide circle of support when teachers enter into difficult or challenging professional pathways. Members share secret stories about how they respond to sacred stories, join hands when interesting opportunities arise and celebrate their membership in this community at every gathering opportunity. Through membership in this community, teachers have raised the bar on standards for learning in their own classrooms and have shown ultimate proof of the value of the MLI MSP through their own students' achievement scores (see Appendices G-J).

References

- [1] C.J. Craig, "Knowledge Communities: A Way of Making Sense of How Beginning Teachers Come to Know in Their Professional Knowledge Contexts," *Curriculum Inquiry*, **25**(2) (1995) 151-175.
- [2] T. R. Guskey and M. Huberman (eds.), *Professional Development in Education: New Paradigms and Practices*, Teachers College Press, New York, 1995.
- [3] S. Loucks-Horsley, N. Love, K.E. Stiles, S. Mundry, and P.W. Hewson, *Designing Professional Development for Teachers of Science and Mathematics*, Corwin Press, Thousand Oaks, CA, 2003.
- [4] D. Sparks and S. Hirsch, *A New Vision for Staff Development*, National Staff Development Council, Alexandria, VA, 1997.
- [5] D.J. Clandinin and F.M. Connelly, "Stories to Live by: Narrative Understandings of School Reform," *Curriculum Inquiry*, **28**(2) (1998) 149-164.
- [6] D.J. Clandinin and F.M. Connelly, "Teachers' Professional Knowledge Landscapes: Teacher Stories—Stories of Teachers—School Stories —Stories of Schools," *Educational Researcher*, **25**(3) (1996) 24-30.
- [7] S. Crites, "The Narrative Quality of Experience," *Journal of the American Academy of Religion*, **39**(3) (1971) 291-311.
- [8] S. Crites, "The Aesthetics of Self-Deception," *Soundings*, **62** (1979) 107-129.
- [9] M.R. Olson and C.J. Craig, "Opportunities and Challenges in the Development of Teachers' Knowledge: The Development of Narrative Authority through Knowledge Communities," *Teaching and Teacher Education*, **17**(6) (2001) 667-684.
- [10] J.J. Sack, "Commonplace Intersections within a High School Mathematics Leadership Institute," *Journal of Teacher Education*, **59**(2) (2008) 189-199.
- [11] J.J. Sack, "Paths toward Mathematics Teachers' Empowerment: A Narrative of Issues Surrounding High School Reform," *Dissertation Abstracts International* (UMI No. AAT 3195965), **66**(11) (2005) 3918.
- [12] State Board for Educator Certification website, Internet:
<http://www.sbec.state.tx.us/SBECOnline/mtp/mmt/overview.asp>.
- [13] *Coaching: A Matter of Influence Mathematics Institute*, Center for Leadership and Learning Communities, Education Development Center, Newton, MA, July 10-13, 2006.
- [14] No Child Left Behind Act, Public Law No. 107-110, House of Representatives, 2001; Internet:
<http://www.NoChildLeftBehind.gov/next/faqs/teachers.html>.

Appendix A		
Administrative Characteristics of the School Districts, 2005–2006 and 2006–2007		
	<u>AISD</u>	<u>HISD</u>
TEA Accreditation	Full	Full
Comparative Size [^]	12 th largest in Texas	Largest in Texas 7 th Largest Nationally
Square Miles [^] (approximate)	111,000	301,000
Number of Schools [^]	86	295
<hr/>		
Years Teaching Experience (Average)	10.2	11.6
<hr/>		
Annual Salaries*		
Beginning teachers	\$36,343	\$36,114
6–10 years	\$42,694	\$41,308
Over 20 years	\$60,910	\$58,441
<hr/>		
Teacher Turnover Rate	16.8%	14.9%
<hr/>		
Secondary Mathematics Class Size	22	24
Student Teacher Ratio	15 to 1	17 to 1
Attendance Rate*	95.8%	94.7%
Drop-out Rate (Gr. 7–12)*	3.3%	4.7%
<hr/>		
Expenditures*		
Per-pupil	\$8,378	\$9,691
Instruction and Instructional- Related Services	\$4,755	\$4,671
<hr/>		
Sources: Texas Education Agency, Academic Excellence Indicator System, 2005–2006* and 2006–2007 and District websites [^] Expenditures represent all funds, per-pupil.		

- HISD is geographically about three times the size of AISD, with over 200 more schools.
- Districtwide, AISD teachers have an average of 1.4 fewer years of teaching experience than HISD teachers, are paid at a higher rate, and have a higher turnover rate.
- On average, AISD teachers had two fewer secondary mathematics students in their classes and an overall student-teacher ratio that was lower by two than HISD teachers.
- Attendance and dropout rates differed by 1.1 and 1.4 percentage points, respectively, in favor of AISD.
- Per-pupil expenditures were \$1,313 higher in HISD, while instruction/instructional-related services expenditures were \$84 higher in AISD.

Appendix B
District Student Demographics, 2006–2007

	<u>AISD</u>	<u>HISD</u>
Total Enrollment	58,596	202,449
<u>Ethnicity</u>		
African-American	31%	29%
Asian	2%	3%
Hispanic	62%	59%
Native American	<1%	<1%
White	4%	8%
Total	100%	100%
Economically Disadvantaged	81%	78%
At-Risk	68%	66%
English Language Learners (ELL/LEP)	28%	27%
Bilingual	26%	26%
Special Education	9%	10%
Gifted/Talented	5%	12%
Recommended HS Program Graduates, 2006	73%	85%
Disciplinary Placement, 2005–06	2%	2%

Source: Texas Education Agency, Academic Excellence Indicator System, 2006–2007

- Reflecting their relative geographic sizes, HISD student enrollment was more than three times AISD student enrollment.
- The districts serve ethnically and socio-economically diverse, urban populations.
- Across districts, Hispanic and African-American students represent the largest groups, with twice as many Hispanic than African-American students.
- Overall, AISD and HISD student populations reflect more similarities than differences.
- With the exceptions of Gifted and Talented students and Recommended High School Graduates, the districts varied by no more than 4 percentage points within student groups.

Appendix C
MLI Lead Teacher Demographics, 2006–2007

	<u>AISD</u>	<u>HISD</u>	<u>Total</u>
Current Participation	13	38	51
Male	7.7%	26.3%	11
Female	95.3	73.3%	40
Age	36–48	31–73	—
Teaching Experience	8–19	2–51	—
<u>Race/Ethnicity</u>			
African-American	69.2%	36.8%	23 (45%)
Asian	15.4%	23.7%	11 (22%)
Hispanic	0%	5.3%	2 (4%)
Native American	0%	0%	0
White	15.4%	31.6%	14 (27%)
Other	0%	2.6%	1 (2%)

Source: MLI Databases, 2005–2008

- MLI Lead Teachers mirrored the relative sizes of the districts, with a one-to-three ratio of AISD to HISD participants.
- Excluding one to three outliers, in both districts the vast majority were in their 30's and 40's and possessed 8–20 years of teaching experience.
- They were typically African-American, White, or Asian.
- MLI teachers in HISD represented a more diverse group based on age, teaching experience, and race/ethnicity.

Appendix D
MLI Cohort I and Cohort II Teachers, 2005–2008

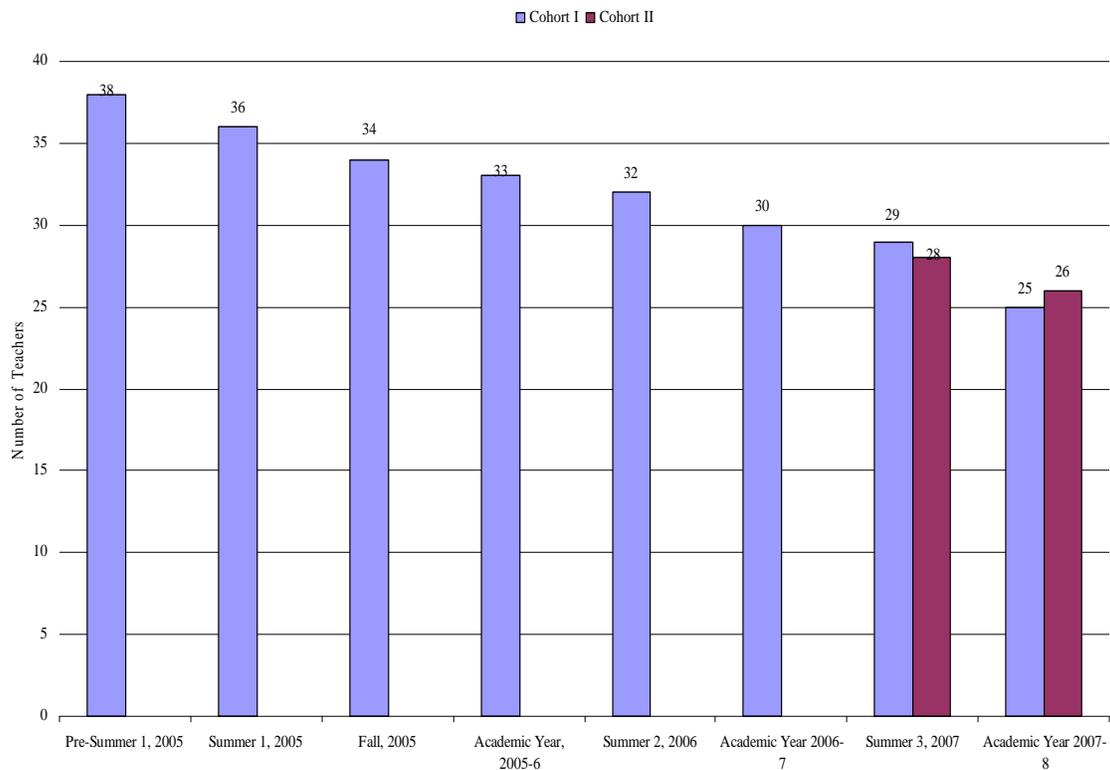


Figure 1. MLI Lead Teacher participation by year, 2005–2008.

- A combined total of 33 AISD and HISD Cohort I MLI Lead Teachers participated in the first Academic Year in 2005–06.
- The number of Cohort I MLI Lead Teachers decreased to 30 by the second Academic Year, 2006–07.
- With the addition of Cohort II, the number of MLI Lead Teachers grew to 51 by the third academic year, 2007–08.

Appendix E
MLI School Participation, 2006–2007

	<u>AISD</u>	<u>HISD</u>
<u>MLI Schools</u>	9	25
<u>MLI Teachers</u>		
1 MLI Teacher	5	16
2 MLI Schools	4	6
3 MLI Schools	-	2
4 MLI Schools	-	1
Total Teachers	13	38

Source: RUSMP databases and pre-program surveys, May 2005 through January 2008.

- There were 34 campuses across the districts with MLI Lead Teachers.
- HISD was represented by nearly three times the number of AISD schools (nine and twenty-five schools, respectively).
- There was one MLI teacher on twenty-one (62%) of the participating campuses and two MLI teachers on ten (29%) of the campuses.
- None of the AISD campuses housed more than two MLI participants, while two HISD campuses (6%) housed three MLI teachers and one campus (3%) housed four.

Appendix F
Number of Master Mathematics Teacher (MMT) Certifications in Texas

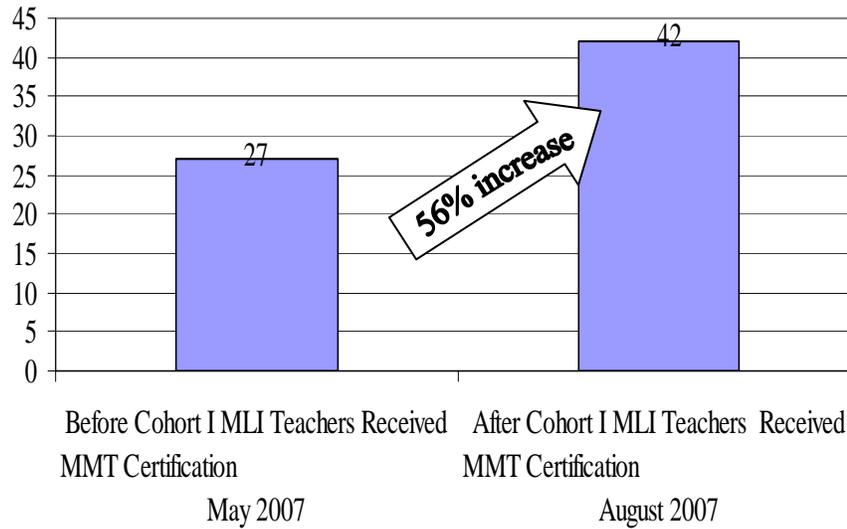


Figure 2. The impact of MLI Lead Teacher MMT certification in Texas, 2007.

Source: TEA, State Board for Educator Certification communication with MLI Manager, September 11, 2007.

- The number of MMT Grades 8–12 certifications across the state was twenty-seven in May 2007.
- The number increased by 56% when fifteen MLI teachers received certification in August 2007.
- Additional information indicated this increase far exceeded the MLI strategic plan for a 15% increase with the first cohort and the 20% goal projected for both cohorts.
- In May 2008, the number of Cohort I MMT-certified teachers increased to sixteen resulting in a 59% increase in the number of MMT-certified teachers in Texas relative to the number of MMT-certified teachers prior to MLI's participation.

Appendix G									
TAKS Scale Scores for Students of MLI Teachers, 2005–2007									
	Year 1				Year 2				
	Spring 2005		Spring 2006		Spring 2006		Spring 2007		
% Met Standard => 2100	55.3		62.7		61.1		65.5		
% Commended => 2400	11.5		10.9		12.8		15.5		
Lowest 10% Range	<u>Low</u>	<u>High</u>	<u>Low</u>	<u>High</u>	<u>Low</u>	<u>High</u>	<u>Low</u>	<u>High</u>	
	1276	1909	1654	1936	1034	1924	1597	1945	

Source: School Districts' TAKS Databases, Spring 2005 through Spring 2007.

Data Analysis: Students' scale scores on the state-mandated, criterion-referenced Texas Assessment of Knowledge and Skills (TAKS) were assessed. Baseline 2004–05 student performance preceded the first MLI program in summer 2005. Year 1 (2005–06) and Year 2 (2006–07) test scores of students in Cohort I MLI teachers' mathematics classrooms were analyzed. Year 1 student achievement results for thirty-one of the thirty-three Cohort I MLI teachers (94%) were analyzed in Spring 2006. Omitted teachers were not in instructional positions during the 2005–06 academic year. Year 2 results were available for all thirty Cohort I MLI teachers in Spring 2007.

- The percentage of students of MLI teachers meeting or exceeding the 2100 TAKS passing score increased in Year 1 from baseline (Spring 2005) by 13.4% and again in Year 2 by 7.2% from Spring 2006 to Spring 2007. Overall, 18.4% more students of MLI teachers passed the TAKS from baseline to Year 2.
- In Year 2, the percentage of MLI teachers' students achieving commended status increased 21.1%. Overall, 34.8% more students of MLI teachers achieved commended status on the TAKS from baseline to Year 2.
- Students' lowest scores increased 29.6% in Year 1 and 54.5% in Year 2.
- Students' scores on the upper end of the lowest 10% increased 27 points in Year 1 and 21 points in Year 2.

Appendix H
Gains on Lowest TAKS Scale Scores for Students of MLI Teachers, 2005–2007

	<u>Lowest Scale Score</u>	<u>% TAKS Knowledge Possessed</u>	<u>% Knowledge Needed to Pass TAKS</u>	<u>% Annual Gain</u>
<u>Year 1</u>				
Spring 2005	1276	60.8%	39.2%	
Spring 2006	1654	78.8%	21.2%	29.6%
<u>Year 2</u>				
Spring 2006	1034	49.0%	51.0%	
Spring 2007	1597	76.0%	24.0%	55.1%

Source: School District TAKS Databases, Spring 2005 through 2007.

- Based on the 2100 TAKS passing score, gain in the lowest score from Spring 2005 to Spring 2006 (Year 1), improved the knowledge needed to pass the TAKS by 29.6% (from 60.8% to 21.2%).
- Gain in the lowest scores from Spring 2006 to Spring 2007 (Year 2), improved the knowledge needed to pass the TAKS by 55.1% (from 51.0% to 24.0%).

Appendix I
MLI Cohort I Teachers' Student Achievement

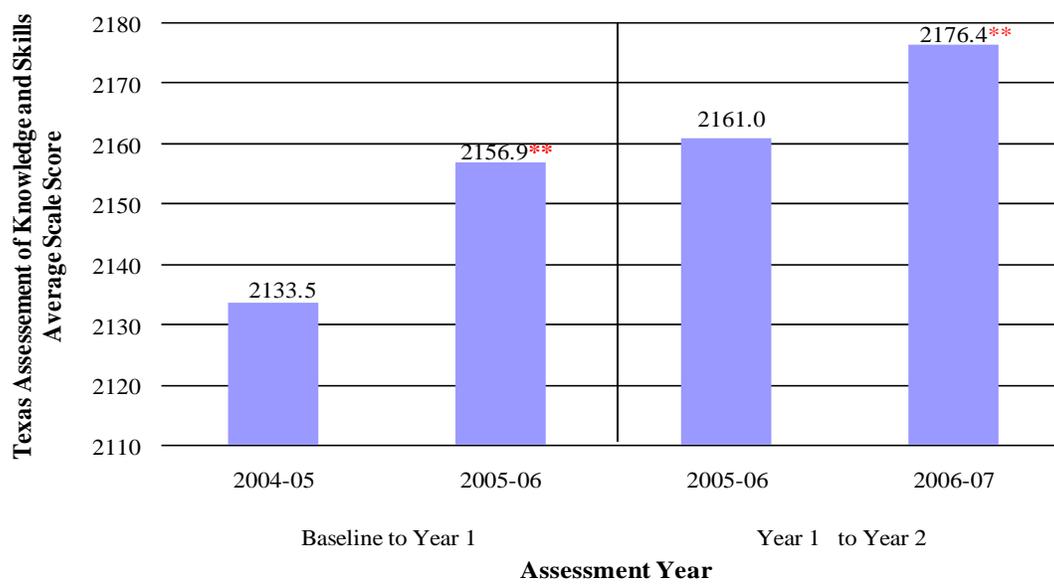


Figure 3. Year 1 and Year 2 TAKS achievement gains of the students of MLI teachers.

Source: AISD and HISD TAKS databases, Spring 2005 through Spring 2007.

Data Analysis: Student achievement results for Cohort I MLI teachers were analyzed in 2005–06 (N=31) and 2006–07 (N=30). Omitted teachers were not in instructional positions during the 2005–06 academic year. Aggregated scale scores on the state-mandated, criterion-referenced Texas Assessment of Knowledge and Skills (TAKS) were assessed. Baseline 2004–05 student performance preceded the first MLI program in Summer 2005. In Year 1, 2005–06, an independent *t*-test analysis was conducted to compare the mean scores of students in MLI teachers' mathematics classrooms to the scores of students in MLI teachers' 2004–05 mathematics classrooms. This strategy was repeated in Year 2 (2006–07) by comparing MLI teachers' 2006–07 student scores with their 2005–06 students' scores.

- The mean scores of students of MLI teachers exceeded the 2100 TAKS passing score in Year 1 and Year 2.
- MLI teachers' students achieved statistically significant gains each year.
- A 23.4-point gain in student achievement was achieved in Year 1 [$t(6,237)=4.9$, $p<.000^{**}$].
- A 15.4-point gain was achieved in Year 2 [$t(7,453)=3.3$, $p<.001^{**}$].

Appendix J MLI Teachers' Student Achievement

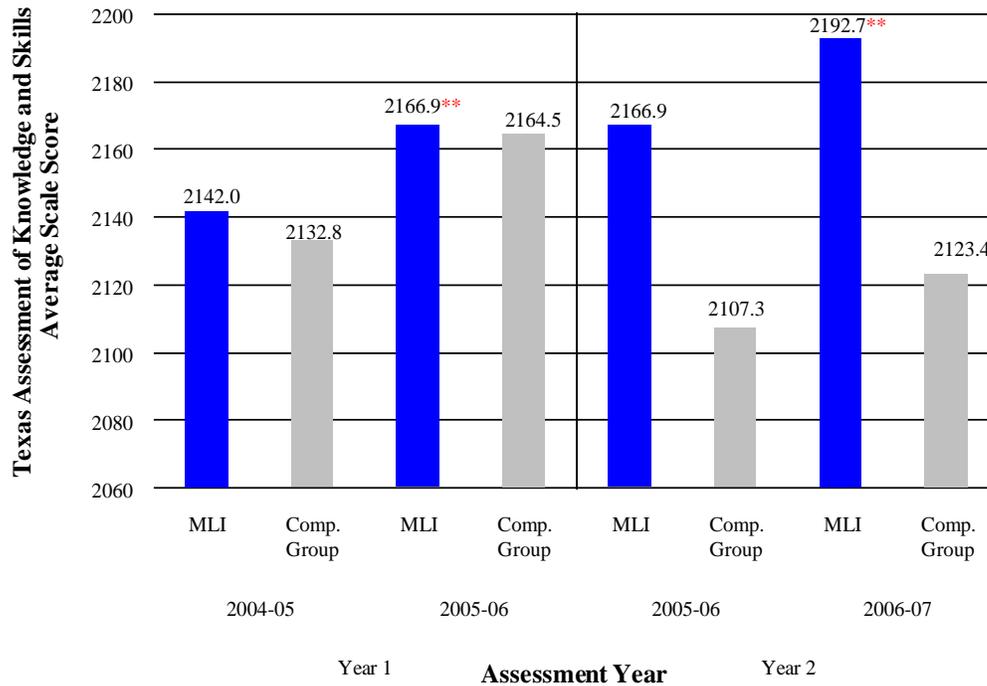


Figure 4. Year 1-Year 2 TAKS achievement gains of MLI and comparison teachers' students.

Source: AISD and HISD TAKS databases, Spring 2005 through Spring 2007.

Data Analysis: Student achievement results were analyzed for Cohort I MLI teachers for whom a comparable group of teachers was available. In Year 1, 2005–06, MLI (N=23) and comparison teachers (N=19) were matched on school district, geographic location of the school, subject taught, and years of teaching experience. This strategy was repeated with MLI (N=22) and comparison teachers (N=25) in Year 2, 2006–07.

Aggregated scale scores on the state-mandated, criterion-referenced TAKS were assessed. The passing scale score on the TAKS was 2100 points. Baseline 2004–05 student performance preceded the first MLI program in Summer 2005. In Year 1, 2005–06, an independent *t*-test analysis was conducted to compare the mean scores of students in MLI teachers' mathematics classrooms to the scores of students in MLI teachers' 2004–05 mathematics classrooms. This strategy was repeated in Year 2 (2006–07) by comparing MLI teachers' 2006–07 student scores with their 2005–06 students' scores. The performance of MLI students is highlighted in this analysis.

- The mean scores of students of MLI teachers exceeded the 2100 TAKS passing score in Year 1 and Year 2.
- MLI teachers' students achieved statistically significant gains each year: 24.9 points in Year 1 [$t(4356)=4.12$, $p.<.000^{**}$] and a higher gain of 25.8 points in Year 2 [$t(5596)=4.6$, $p.<.000^{**}$] compared to Year 1.
- The students of MLI teachers consistently outperformed the students of comparison teachers. In Year 2, this performance gap increased to 69.3 points, which was statistically significant [$t(5341)=12.5$, $p.<.000^{**}$].
- Additional findings indicated that in Year 2, MLI teachers showed higher percentages of students achieving commended status (2400 points or greater) on TAKS than comparison teachers (17.9% versus 11.1%). Students of MLI teachers also showed more of an increase in students reaching commended status (3.0 % pts. versus 1.7% pts) from 2005–06 to 2006–07.