RESEARCH

Report on an Educational Program

Department of Research and Accountability

HISD/Rice Model Science Lab
2005–2006

Houston Independent School District

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Executive Summary

HISD/Rice Model Science Lab 2005–06

The establishment of teacher professional development models to improve student achievement have had wide-spread implementation in school districts across the United States. Many of these programs are designed to ensure that students are exposed to highly qualified teachers, the best teaching strategies, and the latest information and technological advances. Specific research-related science professional development models maintain that when teachers are provided the necessary intellectual infrastructure–including a complex balance of increased science knowledge, a safe environment for professional experimentation, and a long-term interaction with colleagues, then students' understanding of science is improved (Harcombe, 2001). Moreover, Harcombe (2001) maintains that when professional teacher development is based on constructivist learning theory and framed in the knowledge domain of the sciences, it empowers teachers to dramatically change what they know, how they teach, and what their students learn.

The HISD/Rice Model Science Lab (RML) project, located at Lanier Middle School in the Houston Independent School District (HISD), has been a joint Rice University and HISD program established in 1991 to train middle school science teachers in new ways of teaching based in a laboratory environment. Released from their normal teaching duties for one year, six to eight Resident Teachers study current scientific advances, examine new education technology, evaluate classroom and laboratory teaching strategies, and develop new curricula appropriate for their diverse students. The Resident Teachers return to their home schools to apply their new skills and knowledge following participation in the lab. Resident Teachers trained over the past few years became leading science teachers and established a communication network among teachers who care about students and education reform.

The ultimate goal of the HISD/Rice Model Science Labs is to stimulate active student thinking in science, which in turn requires drastic paradigm changes in the participants' teaching styles and strategies. Through a variety of experiences in this program, teachers are stimulated to redefine their ideas about the basic nature of instruction, learning, and science. Teachers collaborate to explore instructional paths to improve student understanding and achievement in science.

Key Components

- Lab Facility Design: The lab is designed to meet Texas Education Agency guidelines and recommendations for middle level science lab based on state safety requirements and recommendations and from teachers.
- Professional Activities: A commitment toward collaborative professionalism is promoted with interactions with the scientific educational community through lectures, conferences, workshops, and presentations.
- Science Knowledge Standards: Content knowledge is taught with a focus on the National Science Education Standard in accordance with the Texas Essential Knowledge and Skills. Scientific literacy is the goal as scientific concepts and theories are studied as well as the nature of scientific inquiry and the processes of science.
- Pedagogy: Effective instructional and assessment practices are researched, modeled, and implemented in the classroom based on current educational research. The constructivist approach focuses on success for all students that incorporates alternative assessments, multiple intelligence theory, science technology and society, and brain dominance models.
- Leadership: Teachers are encouraged to actively participate in science education leadership oppor-

tunities and events at local, state, and national levels. Workshops are presented to elementary and middle level colleagues within HISD.

- Field Activities: Scientific investigation begins with observations of the natural world. Experiences outside the classroom promote inquiry and bring scientific principles to life with relevant hands-on interactions in various field environments.
- Action Research: Effective methods of science instruction are personalized as teachers seek answers to instructional issues that will improve instructional practices and procedures. Scientific inquiry is brought to life as teachers investigate authentic investigations of science instruction.
- Publications: Teachers within the program have written curriculum, articles, research proposals, created websites, instructional models, and materials incorporating effective instructional practices. The impact of the innovation HISD/Rice Model Lab program has been documented within several science education research journals, books, magazines, and text.

Findings

- By 2005–06, the HISD/Rice Model Science Lab expanded into all five regions, incorporated elementary schools in the program design, and established elementary and middle school feeder patterns of Catalyst Teachers for selected regions.

- From 1991–92 through 2005–06, 111 teachers directly participated as Resident Teachers, and approximately 1,726 teachers received training through the HISD/Model Science Lab workshops.

- A higher level of teacher professionalism was evident as teachers used more effective teaching strategies, attended and presented at conferences, provided leadership in the science community and the district, published articles, and earned travel grants to study abroad.

- The most effective science teaching strategies used in the HISD/Rice Model Science Lab included: addressing misconceptions about science, assuring alignment to the National Science Standards, assuring alignment to the Texas Essential Knowledge and Skills (TEKS), assuring alignment to HISD CLEAR, developing lesson plans that addressed the same objectives as Model Lessons or incorporating Model Lessons as an instructional tool, participating in professional development in science content, using alternative assessment techniques, promoting group problem solving, using the 5-E instructional model, using teacher research/action research in the science classroom, integrating technology in the classroom, and using concept maps or other organizational tools within instruction.

- On the Teacher/Administrator Survey, respondents reported the following changes in student attitudes or behaviors: students are more motivated about the hands-on activities presented in class; more students like science classes; student learning is focused on skill-building rather than fact memorization; and, students are more aware of concept application.

- After a fifteen year period, 87% of the HISD/Rice Model Science Lab Teachers stayed in education with 74% still actively participating. In HISD, 63% of the Resident Teachers were still active, 47% were in classrooms, and 16% assumed administrative positions.

- The mean NCEs for students in all cohorts fell within the average range. The highest performance among cohorts was evident on Stanford 10 for Cohort VI students, having attained a mean of 53.1 NCEs. Cohort VI students were instructed by HISD/Rice Science Model Lab teachers during the 2004-05 academic year. In contrast, Cohort IV attained the lowest mean NCE on Stanford 9, which was 40.6. Cohort IV students were taught by Model Lab teachers during the 2002-03 academic year.

- Cohort III (2001-02) outperformed Cohorts I, II, and IV on the Stanford 9 as indicated by the highest proportion of students scoring above average in most of the content areas. The specific content areas measured knowledge in *Life Science*, *Earth Science*, *Science Processing Skills*, *Form and Function,* and *Constancy*.

- On Stanford 10, Cohort VI (2004-05) outperformed Cohort V (2003-04) in content areas measuring *Earth Science*, *Physical Science*, *Nature*, *Constancy*, *Models*, *Basic Understanding*, and *Thinking Skills.* This finding was evidenced by the fact that the highest proportion of students who scored above average in the majority of content areas was found in Cohort VI.

Recommendations

1. Continue funding and supporting the HISD/Rice Model Science Lab as an effective professional development model.

2. Consider supporting a financial collaborative that offers HISD/Rice Model Lab workshops through HISD's Professional Development Department.

3. Develop a more supportive framework for the former Resident Teachers once they return to their home campus. This would include providing the necessary materials, incorporating a mentor, and providing release time to attend professional development as well as plan workshops.

4. School administrators should consider using former Resident Teachers as mentors or lead science teachers at their home campus/feeder pattern and provide release time for them to fulfill this role.

5. To build capacity, school administrators should consider allowing former Resident Teachers to continue attending quality professional development activities to stay abreast of new science developments.

6. Require Resident Teachers to visit their home school at more frequent intervals (i.e. once per month) to ensure a smoother transition once they return to their home campus, where they will serve as a school-based resource for science.

7. Develop an HISD website to serve as an interactive forum to enhance communication among all science professionals. This website would incorporate community and district activities, post HISD/Rice Model Lab developed presentations, workshops, and curricular resources, provide links to other quality educational sites and resources, and provide a venue for feedback.

HISD/Rice Model Science Lab
2005–06

Purpose: *The purpose of this report is to assess the effectiveness of the HISD/Rice Model Science Lab Program in improving the science teaching methods of Resident Teachers, and in improving science achievement, as well as the attitudes toward science of their students.*

Design: *Quasi-experimental, Descriptive. A retrospective study encompassing the 1991–92 to the 2005-06 academic year.*

Population: *Six cohorts of HISD/Rice Model Lab science teachers for grades six through eight and their students following the one year teacher Residency from 1999–2000 to 2004–05.*

Methods: *The science performance on the Stanford Achievement Test of students whose teachers benefited from the project was tracked. A Teacher/Administrator Survey was administered to 104 HISD/Rice Model Science Lab teachers/administrators to assess the implementation process for the training program. A Stakeholder Survey was given to 15 HISD and Rice staff to gain additional insight into implementation and effectiveness.*

Findings: *Resident Teachers reported that the program was effective in improving science teaching skills and positively impacting student attitudes and behaviors. Further, several Resident Teachers have assumed leadership positions in the district and the science community. The mean Normal Curve Equivalents (NCEs) on Stanford for all student cohorts from 1999 to 2005 fell within the average range. The highest performance was evident among the 2005–06 student cohort on Stanford 10 having attained an average of 53.1 NCEs.*

Conclusions: *Findings indicate program benefits in targeted areas, including enhanced professional development opportunities and science achievement, particularly in classrooms that were directly impacted by Model Lab participants.*

Educational Implications: *The HISD/Rice Model Science Lab program is an effective method for training teachers who can train other teachers and also assume leadership roles to produce a positive impact on student achievement, student behaviors, and teaching methods.*

Introduction

Program Description

The establishment of teacher professional development models to improve student achievement have had wide-spread implementation in school districts across the United States. Many of these programs are designed to ensure that students are exposed to highly qualified teachers, the best teaching strategies, and the latest information and technological advances. Specific research-related science professional development models maintain that when teachers are provided the necessary intellectual infrastructure–including a complex balance of increased science knowledge, a safe environment for professional experimentation, and a long-term interaction with colleagues, then students' understanding of science is improved (Harcombe, 2001). Moreover, Harcombe (2001) maintains that when professional teacher development is based on constructivist learning theory and framed in the knowledge domain of the sciences, it empowers teachers to dramatically change what they know, how they teach, and what their students learn.

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The ultimate goal of the HISD/Rice Model Science Lab (RML) is to stimulate active student thinking in science, which in turn requires drastic paradigm changes in the participants' teaching styles and strategies. Through a variety of experiences in this program, teachers are stimulated to redefine their ideas about the basic nature of instruction, learning, and science. Teachers collaborate to explore instructional paths to improve student understanding and achievement in science.

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- Leadership: Teachers are encouraged to actively participate in science education leadership opportunities and events at local, state, and national levels. Workshops are presented to elementary and middle level colleagues within HISD.
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Program Costs and Funding Source

The 2005–06 budget allocation for the HISD/Rice Model Lab program was $571,681. Program personnel, including support personnel along with extra duty pay, accounted for $507,381, or 89%, of the budget allocation. Consultants accounted for $11,600. Supplies, rental expenses, contracted maintenance and repair, and related technology equipment accounted for $30,780. Travel expenses and food combined with conference /workshop registration fees totaled $21,920. The total number of Full Time Equivalents (FTEs) was eleven.

Evaluation Questions:

1. What were the professional activities for the 2005–06 Resident Teachers that were designed to enhance science instruction?
2. What significant changes were made in the HISD/Rice Model Science Lab from program inception?
3. How many teachers have directly and indirectly

benefited from the HISD/Rice Model Science Lab?

4. What was the effect on the quality of science instruction and teacher professionalism after participation in the HISD/Rice Model Science?
5. What modifications in the program at the HISD/Rice Model Science Lab program were recommended?
6. What was the retention rate for the Resident Teachers who participated in the HISD/Rice Model Science Lab program and what were the factors that had an impact on retention?
7. What was the science performance, as measured by the Stanford Achievement Test, of students whose teachers participated in the HISD/Rice Model Science Lab from 1999–2005?
8. What strategies have been most effective for training teachers in science instruction? What best practices have been identified by stakeholders?

There are four major components of this report: (1) a descriptive presentation of the Model Lab program; (2) in-depth interviews with content specialists, science curriculum specialists, and administrators who spearheaded the program, (2) quantitative analysis of science performance, and (4) qualitative analysis using surveys of teachers, retired or former teachers, and administrators to collect information related to the quality of teacher professionalism and effective teaching strategies.

Methodology

Data Collection

The data for this report were obtained from several sources, including the School Administrative Student Information (SASI) System, the Public Education Information Management System (PEIMS), and the Stanford Achievement Test, Ninth and Tenth editions data files. Information regarding the program was obtained from HISD/Rice Model Lab program personnel and Central Office personnel through interviews, surveys, and observations. Program documentation, survey data, and interviews were used to assess changes in the program since its inception. Published articles and books, *HISD/Rice Model Science Lab Summative Review, 1991–2006*, portfolios, evaluation forms from a selected RML workshop, and interviews with program staff were used to identify teachers who participated in the program, determine the number of teachers who directly benefited from the program, teacher demographic and retention information, workshop presentation summaries, workshop evaluation data, and the number of leadership positions assumed by RML personnel.

The Stanford is a norm-referenced test administered in grades 1 – 11. The achievement data were used as science performance indicators, while the student demographic data were used to describe student characteristics. The selected measures of student performance used in this analysis were the Science NCE and Scale scores and the Science Content Cluster scores on the Stanford Achievement Test. Stanford data used in the first three years of this study (1999–00 to 2002–03) were based on Stanford, Ninth edition; whereas, the data used for the final two years of the study were based on Stanford, Tenth edition. A conversion was made in 2002–03 of Stanford 10 to Stanford 9, since this was the first year that HISD students were administered Stanford 10 test.

Survey Data

Stakeholder Questionnaire

A survey was administered to 15 stakeholder including science teachers, program coordinators, field researchers, catalyst members, science specialists, and the project director of the HISD/Rice Model Science Lab. Survey participants were selected by the HISD Model Lab program manager. The survey was designed to determine activities that were perceived to be most effective in helping the program achieve its goals, activities that were critical in sustaining the program, the obstacles encountered that hindered progress toward program goals, strategies used to overcome obstacles, and suggestions for changes in the structure of the Model Lab. A copy of the 2005–06 Stakeholder Questionnaire is included in **Appendix A**.

The survey was administered through electronic mail (e-mail). Initially, respondents were allowed approximately one week to complete the survey. An additional week was allowed for respondents who were unable to meet the initial deadline.

Administrator/Teacher Survey

A teacher survey instrument was designed to collect information related to the quality of teacher professionalism and effective teaching strategies for the 1996–97 program evaluation. This instrument was subsequently modified using input from selected stakeholders. The survey consisted of eight sections (background, teaching strategies, professional activities, activities to learn more about science and/or pedagogy, impact on students, leadership roles, use of technology in the classroom, and strengths of the program). (See **Appendix B** for rating scales). A series of open-ended questions regarding further commentary on activities, technology, areas for modification, and describing changes in perceptions were also included. Survey forms were mailed on January 20, 2006 and were sent by e-mail using an Adobe 7.0 form on January 23, 2006. Of the survey forms delivered to 104 teachers, retired or former teachers, or administrators, 55 forms were returned for analysis, reflecting a 53% return rate. The results of the teacher survey are presented in **Appendix B**.

Survey data were aggregated into one EXCEL database and SPSS was used to calculate descriptive statistics. Items marked "N/A" and missing data were not included in calculating the percentages. Percentages were based upon the total number of responses. Open-ended questions were grouped into emergent categories and the frequencies of each category tallied.

Sample

Teacher Cohort

The study sample was HISD middle school teachers whose sabbatical year of participation in the HISD/Rice Model Science Lab was between the 1999–2000 and 2004–05 school years. A total of 53 teachers were identified as meeting this criteria during this period. Students taught by targeted teachers, the year following teacher exit from the program, were used to establish student/teacher Cohorts I-VI. The profile of the students in the Cohorts I-VI can be found in **Table 1.**

Table 1 reveals that students in Cohorts I, III, and V were more likely to be female than male. Students in Cohort VI were, overwhelmingly, African American (79.1%) compared to other cohorts. Cohort I had the highest percentage of students in the Gifted/Talented program (32%), and the lowest percentage of students on free or reduced lunch. At the same time, Cohort VI had the highest percentage of students on free or reduced lunch. Further, only 3.4% of the students in Cohort IV were limited English proficient (LEP) compared to 21.4% of students in Cohort I. None of the students in either cohort were in the Bilingual program.

Teacher/Administrator Survey

Table 2 compares the demographic characteristics of the Rice Model Lab participants to the Rice Model Lab Survey respondents. From 1991–92 through 2005–06, there were 111 teachers that participated in the HISD/Rice Model Science Lab Program . The majority of participants were female (78.4%) and either White (49.5%) or African American (39.6%). When comparing the demographic characteristics of Rice

Table 1: Demographic Profile of Students whose Teachers Participated in the HISD/Rice Science Model Lab Teachers by Cohort

	Cohort I 1999–2000		Cohort I 2000–2001		Cohort III 2001–2002		Cohort IV 2002–2003		Cohort V 2003–2004		Cohort VI 2004–2005	
	N	%	N	%	N	%	N	%	N	%	N	%
Gender												
Female	268	52.7	439	50.1	399	56.0	377	47.0	416	53.1	341	44.3
Male	241	47.3	428	49.9	313	44.0	425	53.0	367	46.9	429	55.7
Ethnicity												
African American	264	51.9	397	45.8	341	47.9	375	46.8	425	54.3	609	79.1
Asian	10	2.0	11	1.3	25	3.5	6	0.7	29	3.7	11	1.4
Hispanic	173	34.0	410	47.3	292	41.0	360	44.9	234	29.9	100	13.0
Native American	2	0.4	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
White	60	11.8	49	5.7	54	7.6	61	7.6	95	12.1	50	6.5
Students by Program												
Bilingual	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Gifted/Talented	163	32.0	28	3.2	96	13.5	13	1.6	148	18.9	155	20.1
Free/Reduced Lunch	367	72.1	760	87.7	563	79.1	679	84.7	623	79.6	661	85.9
At-Risk	268	52.7	513	59.2	287	40.3	406	50.6	377	48.1	458	59.5
Limited English Proficient (LEP)	109	21.4	99	11.4	43	6.0	27	3.4	67	8.6	95	12.3

Table 2: Demographic Comparison of RML Participants to RML Survey Respondents

	RML Teachers		RML Respondents	
	N	%	N	%
Gender				
Female	87	78.4	43	78.2
Male	23	20.7	12	21.8
Missing	1	0.9		
Racial/Ethnic Group				
Native American	0	0.0	0	0.0
Asian	2	1.8	0	0.0
African American	44	39.6	40	40.0
Hispanic	9	8.1	2	3.6
White	55	49.5	31	56.4
Missing	1	0.9		
Total	**111**	**100.0**	**55**	**100.0**

Model Lab Teachers to the Rice Model Lab Survey respondents, the percentages of males, females, and African American respondents were comparable to the RML Teacher participants. Alternatively, the percentage of White respondents was overrepresented, while the percentage of Asians and Hispanics were underrepresented.

Data Analysis

Survey data were aggregated into one EXCEL database and SPSS was used to calculate descriptive statistics. Items marked "N/A" and missing data were not included in calculating the percentages. Percentages were based upon the total number of responses. Open-ended questions were grouped into emergent categories and the frequencies of each category tallied. The PEIMS staff database was used to identify students who were taught by Model Lab teachers following their Resident year. Achievement data were collected for the students of the teachers who participated in the program from 1998–2004. In addition, the PEIMS staff database was used to supplement information regarding demographics for the Rice Model Lab participants when data were not available.

Analysis of science performance of students whose teachers participated in the HISD/Rice Model Science Lab was reported by Normal Curve Equivalents (NCEs) and Content Clusters. The NCE scores ranged from 1 to 99, with a mean NCE of 50. The NCE scores allowed for the comparison of student performance from different test administrators, while having the same meaning across tests, subtests, and grade levels.

The Science Clusters supported the hands-on, minds-on approach by including many graphic illustrations of the types of activities students were involved in or observations made in an inquiry-based science classroom. Each item was classified first by the science content that it measured and, then, according to the science process it assessed. Science Cluster analysis emphasized the major concepts of science described in the *National Science Education Standards* and the *Benchmark for Science Literacy*. A description of the Content Clusters measured as well as the processes assessed on Stanford are as follows:

Science Clusters

<u>Content Measured</u>

- *Life* - understanding of characteristics of organisms, life cycles of organisms and their environment, health, resources, and technological challenges.
- *Physical* - understanding of properties of objects and materials, position and motion of objects, light, heat, electricity, magnetism, and uses of physical concepts in technological designs.
- *Earth* - understanding of properties and sources of Earth materials, objects in the sky, changes in Earth and sky, resources, and impacts of technology.
- *Nature of Science* - understanding of the processes used in scientific investigations, including the use of basic measurement tools, making observations, analyzing data, evaluating scientific experiments, and recognizing the limits and advantages of science in society.

<u>Processes Assessed</u>

- *Science Processing Skills* - understanding of the processes used in scientific investigations, including the use of basic measurement tools, making observations, using simple graphs, and recognizing the inherent fairness of a scientific test.
- *Using Evidence and Models* - ability to use and analyze evidence, science experiments, and models of the processes in the natural and technological worlds, including historical evidence and historically significant models.
- *Constancy* - ability to use observations, data, and basic understanding to recognize and analyze patterns in the natural and technological worlds.

- *Form and Function* - ability to use observations, data, and basic understanding to compare form and function of objects and organisms in the natural and technological worlds.

In addition, a separate *Thinking Skills* score was provided from a compilation of designated items in Science. These items measured the students' ability to analyze and synthesize information; to evaluate information in order to determine cause and effect, fact and opinion, and relevance vs. irrelevance; and to extrapolate beyond information in order to draw conclusions, make predictions, and hypothesize.

Results

What were the professional activities for the 2005–06 Resident Teachers that were designed to enhance science instruction?

The 2005–06 Model Science Lab involved Resident Teachers in activities that were designed to change the instructional techniques and professional attitudes of the teachers, to make them more student-centered, motivated to life-long learning, and committed to participating in professional activities. The activites are as follows:

Resident Teacher Activities

- Journal - Teachers reflected on new ideas, approaches that worked and did not work, new insights about students, and their role as science teachers. Teachers were expected to make at least three journal entries per week. Entries included reactions to lectures, field trips, observations, and site visits. They included comments about journal articles or books, and any personal growth experiences.

- Student Case Study - Teachers focused on students and monitored student development throughout the entire school year. Specifically, teachers followed and developed a profile of their most challenging student and designed an educational program tailored to meet the student's needs or take an action that is designed to impact the student's view of himself/herself as a learner.

- Field Observations - Resident Teachers were assigned to the careful and analytical observation of a variety of other teachers in order to broaden their understanding of the teaching process. They produced monthly reports on a teacher not participating in the Model Lab and observed and provided feedback about RML teachers. They observed different teaching styles and strategies, and noted their impact on students. They also observed the teachers in their group and provided daily feedback about students, instruction and assessment.

- Science Innovations Update - To broaden science knowledge, each Resident selected a field of science (astronomy, botany, geology, medicine, paleontology, biology, genetics, engineering, physics, chemistry, environmental science, or oceanography) to explore and research for six of the latest discoveries or innovations in that field.

- Science Night - Residents celebrated and showcased their students' successes by holding a Science Night for students and parents. Residents showcased student work and offered educational experiences for the whole family. Activities were documented through photographs, interviews, and other methods selected by the Resident.

- Teacher as Researcher (Action Research) - Residents refined their teaching skills by testing and evaluating new concepts and teaching techniques in a classroom setting. Residents were responsible for designing instruction units to address each of the TEKS content and skills while exploring new teaching approaches to better meet the needs of the students. As part of the analysis, residents were videotaped three times each semester. Data from the tapes were used to evaluate effectiveness. Selected topics that were investigated included Teacher Talk/Student Talk Ratio, Wait Time, and Use of Feedback Techniques. Since each Resident was a part of a teaching team, team members assisted each other in collecting data and in videotaping.

- Professional Development Workshops - Resident Teachers worked together to develop and present two different workshops for HISD teachers during the spring semester. These workshops were designed to address key science concepts and/or processes. Materials were correlated with CLEAR and integrated teaching techniques along with a rich science background. The following fall, after returning to their home schools, the Residents work in pairs to design and present one additional workshop, which may include workshops on HISD Model Lessons.

- Portfolio - Resident Teachers collected materials throughout the year, including their journals, student work, and a section addressing the teacher as a researcher. Additional sections that may be included were classroom strategies, field observations, science innovations, student case study, teacher partnerships, professional readings, field trips, professional conferences, professional development workshops, science night, technology and contacts with the science community.

- Rice Credit Program Completion. Residents successfully completing and submitting the requisite work earned seven hours of graduate credit from Rice University. Additionally, Resident teachers received a computer for classroom use and access to $2,000 for materials and equipment contributed by HISD.

A description of a typical two-week training schedule at the HISD/Rice Model Science Lab is presented in **Figure 1**. Resident teachers worked in teams of 3 or 4 to foster more collaborative planning. Using this design, all group members were responsible for planning, feedback, and classes, collectively, with one key instructor per lesson. Each team member was responsible for at least 4 periods of instruction during a four week period (20 class periods total).

Application and Selection Process

As part of the process, teachers submit a completed application form for review and recommendations from an administrator, peer teacher, and student. Additionally, classroom observations were conducted for every applicant. Teachers were chosen on the basis of their rapport with students, enthusiasm for teaching, and potential for professional growth. RML is a professional development program designed to move teachers toward their potential as master teachers and education leaders; it is not a remedial program. Decisions are made in May. For the past thirteen years, the residency cohorts have consisted of no more than two elementary science lead teachers and no more than six middle school teachers.

<table>
<tr><th colspan="6">Week 1</th></tr>
<tr><th>Time of Day</th><th>Monday</th><th>Tuesday</th><th>Wednesday</th><th>Thursday</th><th>Friday</th></tr>
<tr><td rowspan="2">a.m.</td><td>Team teach (3 teachers) Periods 1 & 2</td><td rowspan="2">Science Content Class</td><td>Team teach (3 teachers) Periods 1 & 2</td><td rowspan="2">Interview student for case study; or Writing class</td><td>Team teach (3 teachers) Periods 1 & 2</td></tr>
<tr><td>Team teach (4 teachers) Periods 3 & 4</td><td>Team teach (4 teachers) Periods 3 & 4</td><td>Team teach (4 teachers) Periods 3 & 4</td></tr>
<tr><td rowspan="2">p.m.</td><td>Team teach (3 teachers) Periods 5 & 6</td><td rowspan="2">Observe Expert HISD Teacher</td><td>Team teach (3 teachers) Periods 5 & 6</td><td rowspan="2">Guest Scientist</td><td>Team teach (3 teachers) Periods 5 & 6</td></tr>
<tr><td>Team teach (4 teachers) Periods 7 & 8</td><td>Team teach (4 teachers) Periods 7 & 8</td><td>Team teach (4 teachers) Periods 7 & 8</td></tr>
<tr><th colspan="6">Week 2</th></tr>
<tr><th>Time of Day</th><th>Monday</th><th>Tuesday</th><th>Wednesday</th><th>Thursday</th><th>Friday</th></tr>
<tr><td rowspan="2">a.m.</td><td rowspan="2">Science Content Class</td><td>Team teach (3 teachers) Periods 1 & 2</td><td rowspan="2">Pedagogy Class</td><td>Team teach (3 teachers) Periods 1 & 2</td><td rowspan="4">Teachers attend training in national programs, such as SEPUP, Fast Plants, FOSS, WET; or Take a field trip; or Present a workshop; or Go to a conference</td></tr>
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<tr><td rowspan="2">p.m.</td><td rowspan="2">Interview student for case study; or Writing class</td><td>Team teach (3 teachers) Periods 5 & 6</td><td rowspan="2">Technology Class or Interact with home school</td><td>Team teach (3 teachers) Periods 5 & 6</td></tr>
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</table>

Figure1: HISD/Rice Model Science Lab Schedule, 2005–06

What significant changes were made in the HISD/Rice Model Science Lab since the inception of the program?

The HISD/Rice Model Science Lab experience continued to expand into more schools, including elementary schools, and Resident Teachers were present in every HISD Region including Aternative/Charter Schools as indicated in **Table 3**. Out of a total of 35 HISD schools, there were eight elementary schools with Resident Teachers. This proactive approach of incorporating teachers at the elementary level began approximately 13 years ago. As a result, feeder patterns with Resident Teachers were established between elementary and middle schools in the Central, North, South, and West Regions. Furthermore, in the South Region, Resident Teachers were placed in all three levels (Almeda Elementary School, Dowling Middle School, and Madison High School). The highest representation of Resident Teachers occurred in the Central and West Regions, and the lowest representation occurred in the East.

Although the program itself remained consistent throughout the 15-year period, the mentorship component was integrated into other stand-alone components such as the Science Innovation Update, Science Night, or field trips. Other modifications for the 2005–06 school year centered on grouping the Resident Teachers rather than pairing them. Resident teachers worked in teams of three or four to foster more collaborative planning. Using this design, all group members were responsible for planning, feedback, and classes, collectively, with one key instructor per lesson. Each team member was responsible for at least four periods of instruction during a four week period (20 class periods total). In addition to the previous changes, as the program unfolded, Resident Teachers were actively recruited, especially in schools with teachers who had not participated.

Table 3: Number of HISD/Rice Model Science Lab Participants, 1991–92 through 2005–06

Region	Number of Participants
Alt./Charter	1
Central	25
East	4
North	9
South	8
West	18
HISD Central Office	4
Other	42
Total	**111**

Since the inception of the program in 1991–92, many of the Resident Teachers assumed leadership and administrative positions throughout the district, including all five Regional Offices. More specifically, during the 2005–06 academic year, 18 Resident Teachers served in an administrative capacity.

How many teachers have directly and indirectly benefited from the HISD/Rice Model Science Lab?

As presented in **Appendix C**, 111 teachers directly participated in the HISD/Rice Model Science Lab from 1991–92 through 2005–06. The home schools of the participating teachers were distributed throughout the district and served a diverse group of students. Appendix C depicts both the distribution of home schools along with the present distribution of Resident Teachers across the district.

Each Resident Teacher was committed to returning to the home school for one year following the residency year in the Model Science Lab. The teachers signed a contract agreeing to return to their home school, and the principals signed a contract agreeing to take the teacher back after the RML year of residence. Over the past fifteen years, teachers transferred to other schools or districts, assumed administrative positions in the district or outside of the district, left the teaching profession, or retired/died.

Resident Teachers presented workshops which provided other teachers or participants the opportunity to benefit from the program. The number of workshops and participants are reported in **Table 4**. From 1995–96 through 2005–06, Resident Teachers conducted a total of 102 workshops. Resident Teachers for the 2005–06 school year were preparing workshops to be presented in the spring. In addition to the workshops, Resident Teachers presented at local, regional/state, and national conferences from 1995–96 through 2005–06 (see**Table 5)**. The Metropolitan Association for Teachers of Science (MATS), Conference for the Advancement of Science Technology (CAST), and the National Science Teachers Association (NSTA) exemplified the venues for which RML teachers consistently presented.

Other teachers in the district have benefited from the HISD/Rice Model Science Lab through teacher workshops. From 1991–92 through 2005–06, approximately 1,726 teachers attended the 102 workshops.

Table 4: Number of Workshops Conducted by Resident Teachers and Participants, HISD/Rice Model Science Lab

Year	Workshops	Participants
1995–96	11	155
1996–97	11	183
1997–98	9	194
1998–99	19	286
1999–2000	21	431
2000–01	11	199
2001–02	12	134
2002–03	2	31
2003–04	3	71
2004–05	3	42
2005–06*	2	
Total	**102**	**1,726**

Note: There will be 2 Workshops offered in March 2006.
Source: HISD/Rice Model Science Lab Summative Review, 1991–2006

For the 2004–05 school year, two workshops entitled, "Matter and Energy: A Gem of a Unit" and "Cellular Research and You," were presented by RML instructors. To assess the quality of the workshops provided by RML teachers, 32 *Customer Exit Survey/Professional Development Evaluation Forms* were analyzed. On a four-point scale, with 4.0 being the highest and 1.0 being the lowest, the mean rating provided by the participants in the first session for the *Overall Quality of the Session* was a 3.89. From a content perspective, the mean rating of participants regarding their knowledge of "Stimulus responses/homeostasis relationships" increased from 3.55 before the workshop to 3.90 after the workshop. Participants in the second session rated *Connection to CLEAR*, *Relevance of content/objectives*, *Usefulness of materials/handouts*, and *Variety and value of activities/strategies* with the highest mean score (3.92).

Table 5: Number of HISD/Rice Model Science Lab Participants Presenting at Local, State, and/or National Conferences

Year	Local	State	National
1995–96	11	6	10†
1996–97	1	11	11
1997–98	-	11	11
1998–99	-	11	11
1999–2000	-	9	8
2000–01	-	18	15
2001–02	-	8	10
2002–03	-	9	13
2003–04	-	10	11
2004–05	7	14	14
2005–06*	2	16	13
Total	**21**	**123**	**127**

† Includes one International Presentation
* Local and National presentations are scheduled for Spring, 2006
Source: HISD/Rice Model Science Lab Summative Review, 1991–2006

What was the effect on the quality of science instruction and teacher professionalism after participation in the HISD/Rice Model Science Lab?

An increase in the quality of science instruction and teacher professionalism was documented through observations of the current Resident Teachers, documentation provided by the HISD/Rice Model Science Lab program staff, and results of a Teacher/Administrator Survey. After participation in the program, teachers more effectively addressed the following:

- Misconceptions about science,
- Assured alignment to the National Science Standards,
- Assured alignment to the Texas Essential Knowledge and Skills (TEKS),
- Assured alignment to HISD CLEAR,
- Developed lesson plans that addressed the same objectives as Model Lessons or incorporated Model Lessons as an instructional tool,
- Participated in professional development in science content,
- Used alternative assessment techniques,
- Promoted group problem solving,
- Used the 5-E instructional model,
- Used teacher research/action research in the science classroom,
- Integrated technology use in the classroom, and
- Used concept maps or other organizational tools within instruction.

Current HISD/Rice Model Lab Resident Teachers were observed as their students were engaged in finishing their World Energy Research Projects. The teaching strategies observed coupled with lesson plans and other documentation supported effective practices previously described in addition to the following:

- Assuring that units address all of the multiple intelligences;

- Using inquiry instruction; and,
- Applying a Constructivist approach.

Other evidence also indicated improvements in the quality of teacher performance. According to responses on the 2005–06 Teacher/Administrator Survey (see **Appendix B**), teachers used a number of techniques more consistently after participation in the HISD/Rice Model Science Lab. Although many of the teachers reported using these techniques before participation in the HISD/Rice Model Science Lab, a majority of the respondents indicated that they always used the following teaching strategies after participation in the program:

- Addressing misconceptions about science;
- Assuring alignment to the National Science Standards;
- Assuring alignment to the Texas Essential Knowledge and Skills (TEKS);
- Assuring alignment to HISD CLEAR;
- Developing lesson plans that addressed the same objectives as Model Lessons or incorporating Model Lessons as an instructional tool; and,
- Participating in professional development in science content.

In addition, although they occasionally used these techniques before, more than half of the respondents reported more frequent use of the following techniques after participation in the HISD/Rice Model Science Lab:

- Using alternative assessment techniques;
- Promoting group problem solving;
- Using the 5-E Instructional Model;
- Using Teacher Research/Action Research in the Science Classroom;
- Use of technology integration in the classroom; and,
- Using Concept Maps or other organizational tools within instruction.

The quality of professionalism also improved as indicated by attendance at professional conferences. Specifically, 36 of the 47 Resident Teachers reported attending a greater number of conferences after their Resident Year in the lab. Additionally, after their Resident Year, all respondents reported attending at least one conference per year, and more than half reported attending three or more conferences during the year.

There were other indications of improved professionalism in Resident Teachers. Of the respondents, 94.0% attended workshops at the national, state, and/or local levels, 89.8% developed innovative projects in the classroom that involved students and the community, 88.0% made presentations at conferences at the national, state, and/or local levels, 84.0% provided support to schools within HISD, 77.6% participated in Rice Model Lab professional development, 76.0% promoted peer coaching to help and encourage other staff members, and 76% provided leadership within their school's feeder pattern.

Ninety-eight percent of the respondents reported that they conducted research on the Internet; more than 94% of the respondents reported learning more about science and science teaching using technology; over 92% of the respondents reported reading professional journals or books, and 90.4% indicated that they networked with other professionals.

Seventy-five percent of the respondents assumed leadership positions in developing or reviewing science/curriculum in HISD or other educational venues as officers or members of professional organizations, and/or in affiliation with University programs. **Appendix B** provides a comprehensive summary of the leadership positions assumed by HISD/Rice Model Science Lab participants. Resident Teachers were involved as HULINC master science teachers or lead teachers, assisted in developing or reviewing the science curriculum, served as department chairs, and/or served as science specialists/science lead teachers on their respective campuses. Involvement in professional organizations at the local, state, and national levels and moving into leadership positions within those organizations attests to the increased level of professionalism exhibited. Affiliation in professional organizations is crucial for networking.

Resident Teachers were required to complete an Action Research report. According to program personnel, "Action Research encourages teachers to be more analytical about their instruction by gathering classroom data and personal research about their own instructional practices." Selected topics included Teacher/Talk, Student Talk ratio, Wait Time, and Use of Feedback Techniques. Resident Teachers worked with one another to assist in collecting data about teaching practices, providing oral feedback, and videotaping instructional sessions. This process enhanced the level of professionalism among all of the Resident Teachers.

Other areas indicative of increased professionalism by Resident Teachers included earning travel grants to study abroad for a summer in locales such as Ghana, Bangkok, Tanzania, and Greece and publishing journal articles (25%). Additionally, one Resident Teacher served as the Project Director responsible for facilitating the publication of an environmental journal that was created, edited, and written by students.

Measurable Changes: Students

Teachers responding to the Teacher/Administrator Survey reported changes in student attitudes or behaviors that they attributed directly to participation in the HISD/Rice Model Science Lab. At least 95% of the respondents reported the following positive responses from their students:

- The students are more motivated about the hands-on activities presented in class.
- More students like science classes.
- Student learning is focused on skill-building rather than fact memorization.
- Students are more aware of concept application.

What modifications in the program at the HISD/Rice Model Science Lab program were recommended?

Teachers responding to the Teacher/Administrator Survey recommended modifications in the program for the new resident teachers and the catalyst or other district teachers. Modifications suggested by respondents for the new resident teachers, at times, were conflicting. For example, one respondent wanted to continue the team model used during the 2005–06 year instead of using partners; however, another respondent indicated that the program design should change back to having two teachers in the classroom. Alternatively, several of the respondents indicated that no changes were necessary. **Appendix B** provides a comprehensive list of the modifications that were suggested.

Modifications for New Resident Teachers

Strengthen Existing Components

- Provide more dialogue between [Teacher] Resident's principal and Department Chair, especially to have a smooth transition when returning to the home campus.
- Provide more opportunities to have directors in the classroom with residents to ensure strategies are being implemented.
- Allocate more time to address classroom management techniques, basic skills, and motivate reluctant students.
- Increase the number of field investigations/observations and reflective time on non-teaching days.
- Offer [an increased number of] RML Teacher workshops as in the past.

New Strategies /Modifications

- Develop a master science teacher program. While in the program, residents earn graduate credit, and after the program they would have the option of continuing to work toward [a] master of science teacher certification.
- Develop mentorships and internships with the professional community.
- Develop a plan for continued support of the Resident Teacher, especially in obtaining materials or technology for classes.
- Require Resident Teachers to go back to their home school at least once a month to maintain the relationship with the school.
- Provide information about graduate programs, support Resident Teachers in taking additional EXCET tests, and develop a master teacher program where the residents earned graduate credit.
- Develop a set of expectations for the new Resident Teachers that include committing to provide a set number of hours of professional development for the home school, feeder pattern, and region; completing an internship of at least six weeks within the science community; developing model lessons for the district; attending curriculum update meetings; and encouraging RML teachers to work with outside agencies.
- Send the Resident Teachers into different classrooms towards the end of the year to apply what they have learned in different environments. Not all schools are as equipped as [HISD/Rice Model Science Lab], nor are the students as cooperative.
- Consider modifying the schedule so that Resident Teachers have more flexibility and fewer structured activities so that they can seek outside training, reflect more on experiences, and network
- Provide compensation to Resident Model Lab teachers.
- Emphasize the importance of working closely with teachers and schools in the feeder school pattern, especially with elementary schools.

Modifications suggested by respondents for the catalyst teachers or other district teachers centered on the catalyst meetings. Respondents indicated an interest in continuing to have catalyst meetings, to meet more frequently, to change the meeting time to later in the evening or on Saturday mornings so that teachers working out of the district or on campuses with late dismissal times would be able to attend. Respondents recommended that during the meetings, catalyst teachers could share lessons, discuss best practices, increase networking opportunities, incorporate book studies and invite area scientists to provide lectures. One respondent suggested that catalyst teachers function as mentors to the resident teachers for one year as they transition back into the classroom. Although several respondents indicated no changes were needed, a few recommended better communication, sharing, and opportunities to provide workshops.

What was the retention rate for the Resident Teachers who participated in the HISD/Rice Model Science Lab program and what were the factors that had an impact on retention?

Table 5 summarizes the teacher retention data for the HISD/Rice Model Lab Resident Teachers over a fifteen year period (1991–92 through 2005–06). Eighty-seven percent of the Rice Model Lab Resident Teachers stayed in education with 74% still actively participating. In HISD, 63% of the RML Resident Teachers were still active, 47% were in classrooms, and 16% assumed administrative positions. According to the *Texas Teacher Retention, Mobility, and Attrition, Policy Research Report*, almost half of the entering Texas teachers left the classroom after **five** years. Harcombe, Knight, and Bellamy (2003, p.137), identified seven factors significantly impacting teacher retention based upon the HISD/Rice Model Science Laboratory Project. These included "professionalism, networking, developing conceptual understanding, understanding students, having a safe place to learn, lifelong learning opportunities, and time."

Table 5: Retention Rate of Resident Teachers, HISD/Rice Model Science Lab, 1991–2006

	#	%
Total Retention in education	97	87
Still active in education	82	74
Still active in HISD	70	63
Still in HISD classrooms	52	47
In HISD administration	18	16

Note: Data reflect a total of 111 RML Resident Teachers from 1991–02 through 2005–06.

Were there gains in science performance as measured by the Stanford achievement test for students whose teachers participated in the HISD/Rice Model Science Lab from 1998–2005?

The Stanford science results by cohort provide an assessment of how students performed the first year following teacher exit from Residency. The findings are presented by (1) overall performance and (2) content cluster performance.

Overall Performance

The overall performance of the HISD/Rice Model Science Lab student/teacher cohorts is presented in **Figure 2**. Findings for 1999 through 2003 were based on the Stanford 9; while 2003–2005 results were based on Stanford 10.

It is evident in Figure 2 that students in all cohorts attained mean NCEs that were in the average range or within one standard deviation above or below the mean (34.4–64.9 NCEs). More specifically, the performance for half of the cohorts fell within the mid- average range (between 44.7 and 54.8 NCEs) and half fell in the low-average range (34.4-44.7 NCEs). The highest performance was evident on Stanford 10 among Cohort VI students, having attained a mean of 53.1 NCEs. In contrast, Cohort IV attained the lowest mean NCE of 40.6. The students in Cohort VI, which was the highest performing cohort, were predominately African American (79%) and on free or reduced lunch (85.9%). The students in Cohort IV, the lowest performing cohort, had fairly comparable percentages of African American and Hispanic students and the lunch status of those students were similar to Cohort VI (Refer to **Table 1**).

Content Cluster Performance

Figure 3 depicts the cluster performance on items that measured student's knowledge of *Life Science*. Mastery required an understanding of characteristics of organisms, life cycles of organisms and their environment, health, resources, and technological challenges. The findings revealed a fairly steady increase in the percentage of students who scored average on Stanford 10; but a moderate fluctuation in the percentages of students who scored average on Stanford 9. At the same time, above average and below average scores among the cohorts fluctuated on Stanford 9 and 10. Additionally, although the majority of students in all cohorts, except Cohort I, attained scores in *Life Science* that fell within the average range, Cohort VI had

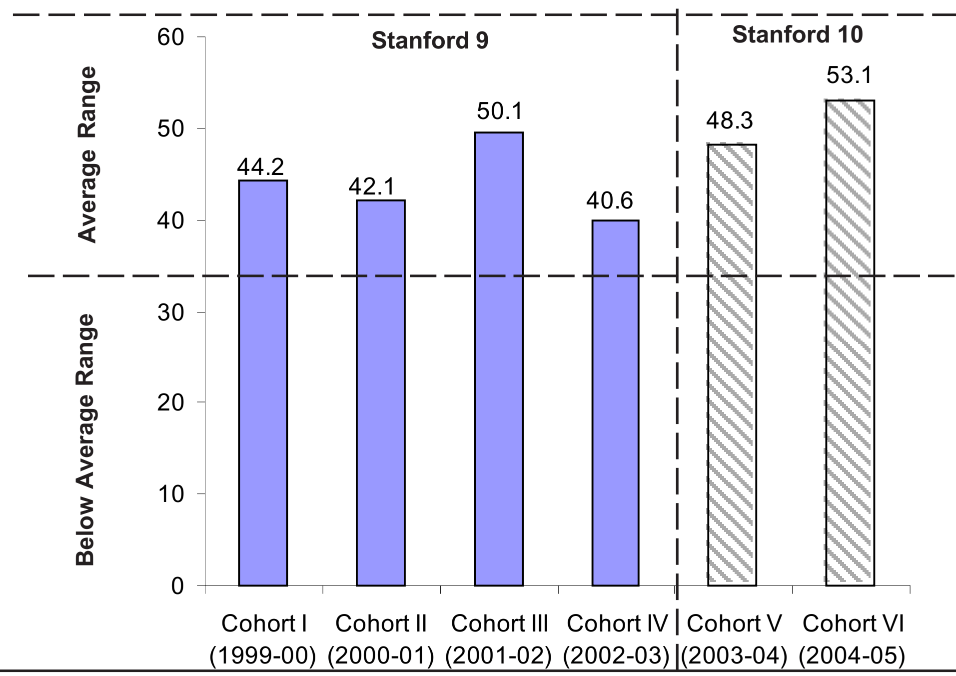

Figure 2: Stanford Science Mean Normal Curve Equivalents by Cohort, 1999–00 to 2004–05

the highest percentage of students who scored average (70%). It is also apparent that Cohort III had the highest percentage of students who scored above average (33%); while Cohort II had the highest percentage of students who scored below average.

Content cluster performance on items measuring knowledge in *Earth Science* is depicted in **Figure 3**. Students were required to demonstrate an understanding of properties and sources of Earth materials, objects in the sky, changes in Earth and sky, resources, and impacts of technology. The findings revealed fluctuations in the performance of students administered Stanford 9 (Cohort I to Cohort IV). However, an overall increase in average performance was evident among these groups from 52% to 57%. Cohort III had the highest percentage of students on Stanford 9 and Cohort VI had the highest percentage of students on Stanford 10 who scored above average on *Earth Science* (36% and 23%, respectively). On the other hand, Cohorts II and V had the highest percentage of students who scored below average on the tests (32% and 29%, respectively).

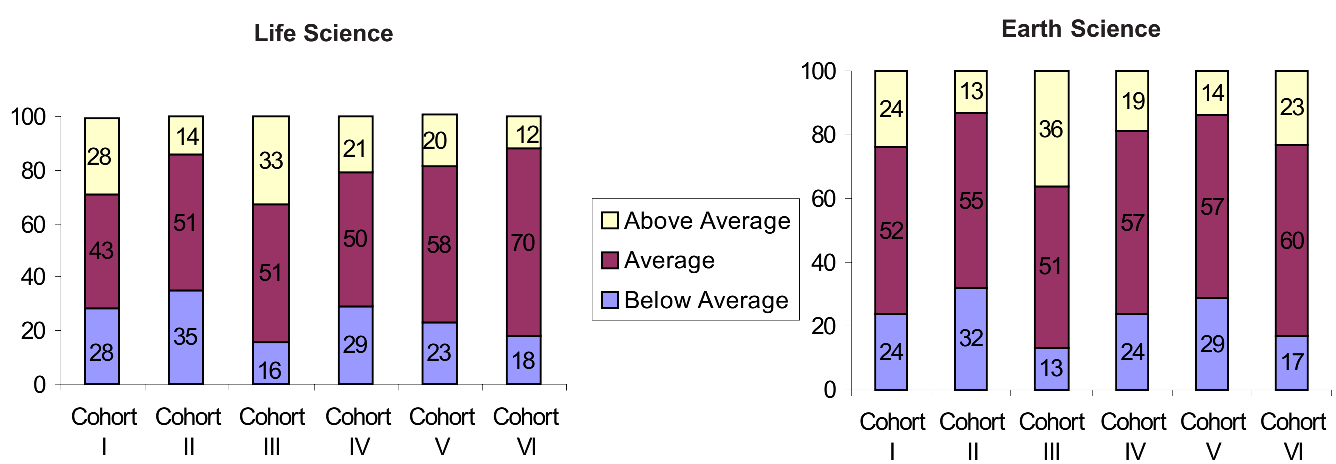

Figure 3: Life Science and Earth Science Cluster Performance by Cohort

Performance in *Physical Science* is presented in **Figure 4**. Students were required to demonstrate an understanding of properties of objects and materials, position and motion of objects, light, heat, electricity, magnetism, and uses of physical concepts in technological designs. A steady decline was observed in the percentage of students who scored above average from Cohort I to Cohort IV (26% vs. 15%). This level of performance was regained to 26% by Cohort VI students on Stanford 10. At the same time, the highest percentage of students who scored in the average range was attained on Stanford 9 by Cohort III students (70%). Cohorts V and VI had comparable percentages of students who scored average on Stanford 10 (58%).

Cluster content results of students on items that measured *Nature of Science* is shown in Figure 4. Successful students showed and understanding of the processes used in scientific investigation, including the use of basic measurement tools, making observations, analyzing data, evaluating scientific experiments, and recognizing the limits and advantages of science in society. *Nature of Science* was only assessed on Stanford 10 in Cohorts V and VI. A substantial increase was evident among students in Cohort V compared to Cohort VI scored above average (from 17% to 32%). In addition, 56% of Cohort V students scored average compared to 55% of Cohort VI students who scored average.

Demonstration of *Science Processing Skills* was reflected through understanding of the processes used in scientific investigations, including the use of basic measurement tools, making observations, using simple graphs, and recognizing the inherent fairness of a scientific test. *Science Processing Skills* were only measured on Stanford 9. Student cohort results are presented in **Figure 5**. Fluctuation in performance was apparent, with Cohort III showing the highest percentage of students scoring in the above average range (33%) and the lowest percentage of students who scored below average (23%). In addition, the majority of students in Cohorts II and IV attained average scores (54% in both groups).

Although a decline in the percentage of students who scored above average was observed from 26% by Cohort I to 15% by Cohort IV, the level of performance was regained to 26% by Cohort VI. Cohort III had the highest percentage of students who scored in the average range (70%). At the same time Cohorts I and VI had the highest percentage of students who scored in the above average range (26%).

Figure 5 also provides content cluster analysis on items that measured the *Form and Function* of objects and organisms in the natural and technological worlds. Cohort VI had the highest percentage of students who scored average on Stanford 10 (70%); whereas, Cohort IV closely followed, reflecting the highest percentage of students who scored average on Stanford 9 (62%).

Items that measured *Constancy*, the ability to recognize and analyze patterns in the natural and technological worlds, can be found in **Figure 6**. Nearly half of the students in Cohort III had scores that were above average (47%). However, the majority of students in Cohorts II and IV on Stanford 9 as well as the majority of students in Cohorts V and VI on Stanford 10 scored within the average range.

Figure 7 revealed performance on items that assessed knowledge of processes, historical evidence, and *Models* used in science experiments. Fairly comparable percentages of students in Cohorts II and IV scored within the average range (57% and 58%, respectively). Simultaneously, Cohort I students were the largest group to attain above average scores (26%), and Cohort I was had the largest percentage of students who fell below average (31%). On Stanford 10, there was a decline in the percentage of students who scored average from Cohort V (53%) to Cohort VI (50%). In addition, there was a decrease in the percentage of students who scored above average (from 18% to 26% in the respective groups).

What strategies have been most effective for training teachers in science instruction? What best practices have been identified by stakeholders?

Key stakeholders comprised of science teachers, program coordinators, field researchers, catalyst members, science specialists, and the project director of the HISD/Rice Model Science Lab were surveyed to determine their opinions regarding the program's best practices. Fifteen stakeholders were submitted the survey via electronic mail. Ten completed surveys were returned, yielding a response rate of 67%.

Respondents were probed on specific activities that helped the program achieve its goals, activities that were critical in sustaining the program, obstacles that have hindered progress toward program goals, and strategies used to overcome obstacles. In addition, stakeholders were asked what changes they would make, if any, to the HISD/Rice Model Science Lab.

In general, survey respondents were in consen-

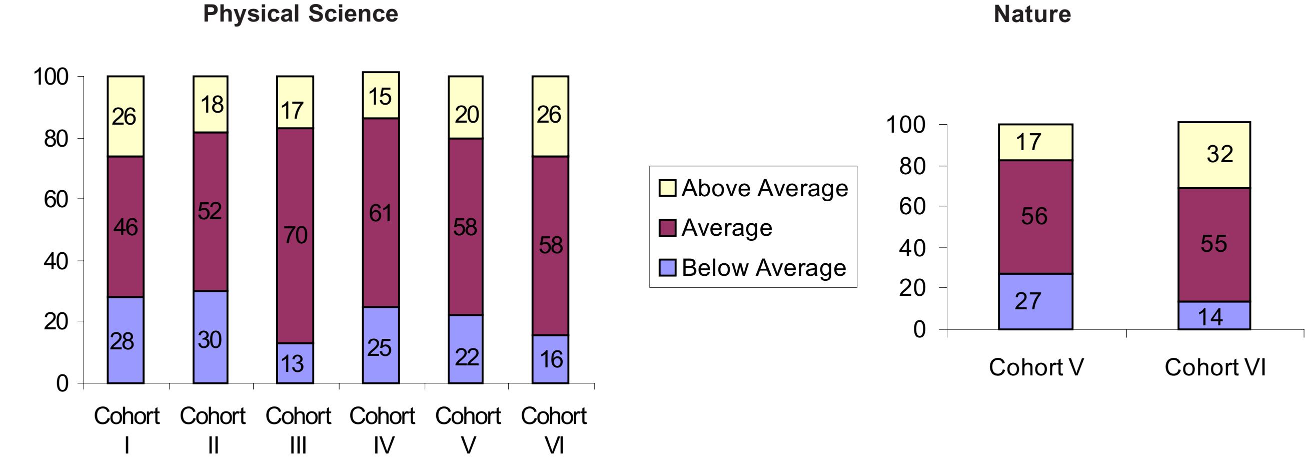

Figure 4: Physical Science and Nature Cluster Performance by Cohort, 1999-00 to 2004-05

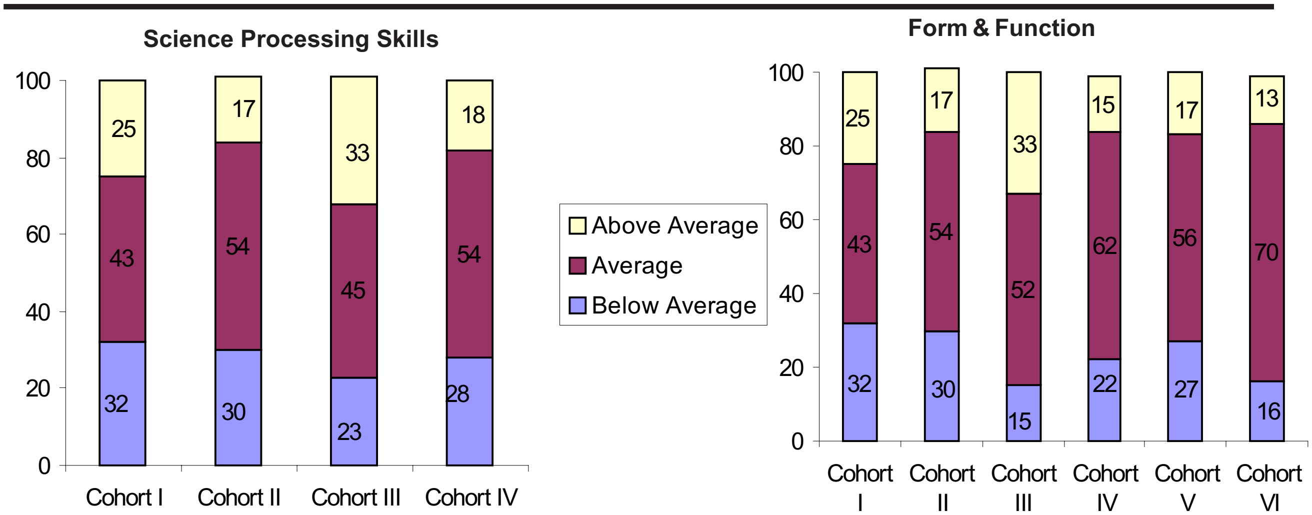

Figure 5: Science and Form & Function Cluster Performance by Cohort, 1999-00 to 2004-05

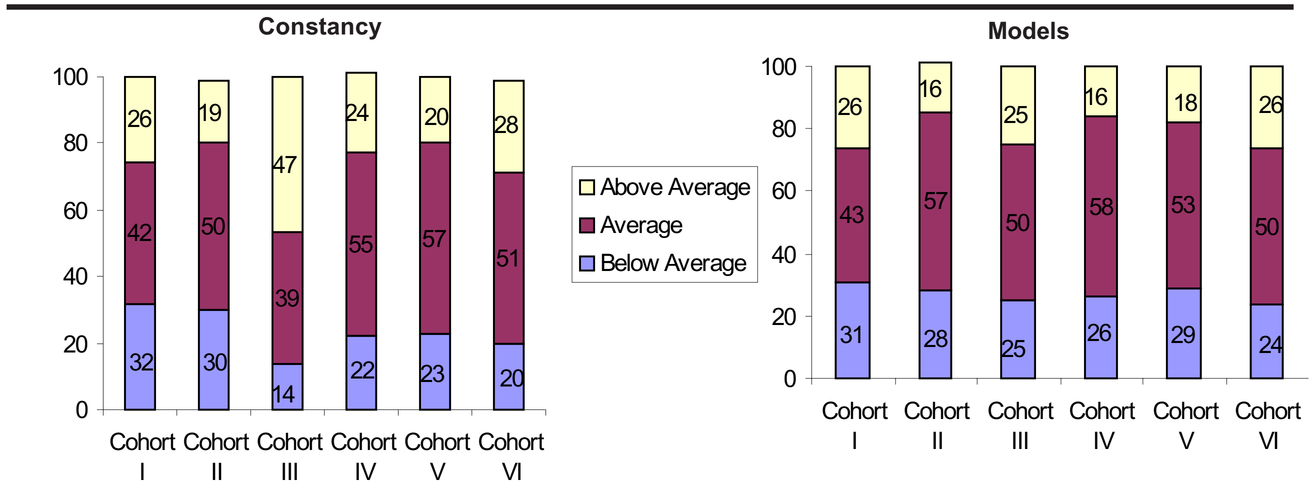

Figure 6: Constancy and Models Cluster Performance by Cohort, 1999-00 to 2004-05

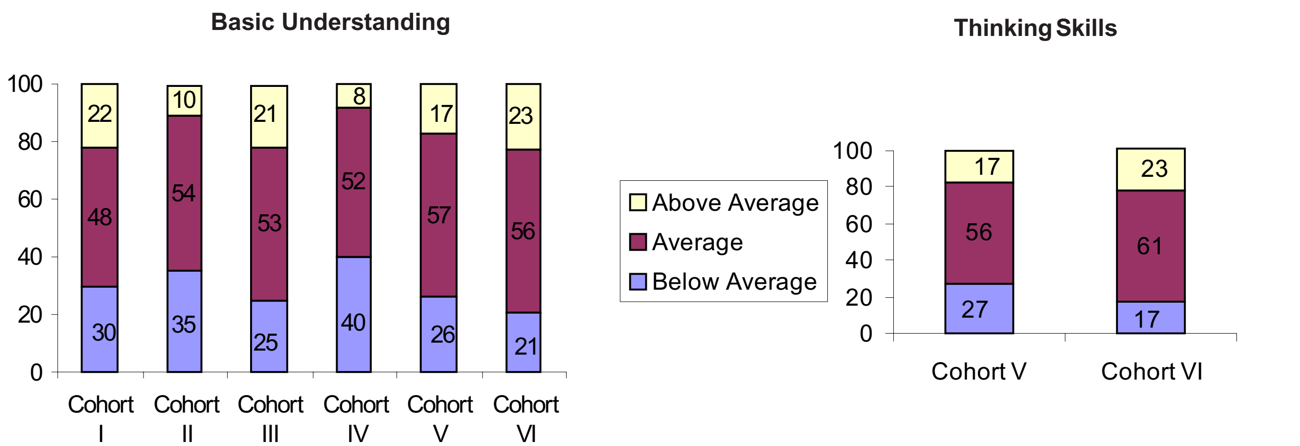

Figure 8: Basic Understanding and Thinking Skills Cluster Per Performance by Cohort, 1999-00 to 2004-05

sus on the fundamental purpose of the program, which is to improve science achievement among HISD middle school students. More specifically, respondents indicated that the program "encourages teachers to develop their abilities, knowledge, skills, and insights to become more effective in stimulating urban students to learn science concepts with a deep understanding." Moreover, the Model Lab has successfully provided teachers with a "well-rounded background in science and pedagogy," fostered a leadership role by facilitating how to teach science to other campus teachers. Respondents indicated that the lab had the ability to "influence how teachers met these goals by providing research based experiences." In addition, respondents felt that the training provided teachers with a "new way of looking at science teaching by providing them with training on pedagogy, methodology, mentors."

Specific comments related to (1) obstacles encountered, (2) strategies to overcome obstacles, and (3) suggested changes to the Model Lab are as follows (Refer to **Table 8** for best practices results).

Obstacles Encountered

- Administrators reluctance to allow teachers to participate.
- Discord in the program leadership.
- Reduced opportunities to provide professional development for other science teachers within the district.
- Teacher reluctance to give up misconceptions about science content and to change thoughts on teaching and learning.
- [Not enough] data on how program has affected student achievement.
- Texas' move to integrated science in middle school expanded the need for instructional support.

Strategies to Overcome Obstacles

- Support from members.
- Support from program administrators to determine source of problems through illustrations and teacher input.
- Quantitative database for teachers that have cycled through the lab that would reflect student success.
- Professional development workshops (although the number of workshops has declined from 15–20 to 2–3 yearly).
- Provided introduction to Model Lab at Instructional Leadership meetings for new principals to review program objectives and goals prior to teacher participation.
- Encouraged opportunities for training within local and community science organizations, within district curriculum department, and within sub-districts.
- Team teaching to allow teachers to share content load and collectively create lesson[s] and instructional strategies for specified content...Study groups also outline texts...

Suggested Changes to the Model Lab

- More teachers to have a relationship with the lab in that they could come and learn about best practices and collaborate with the teachers of the lab on effective science teaching.
- Make sure the combination of HISD's CLEAR curriculum and the Rice Model Lab's lessons were aligned....the disconnect for the participants when they return to their campuses is noticeable.

Table 8. Best Practices Identified by Key Stakeholders of the HISD/Rice Model Lab, 2005–2006

Direct instruction in science concepts and pedagogy and time with an actual class of students in order to put the direct instruction to use.
Re-teaching science to address misconceptions.
Instructional sequences that blend readings about science and pedagogy with activities that encourage the Resident teachers to reflect on teaching practices and refine teaching techniques.
Teachers observe other science teachers' classrooms.
Teachers allowed sufficient time to thoroughly develop expertise in the modern theory-based methods of teaching science.
Time away from the normal hectic schedule of teaching to be able to reflect and learn.
Every teacher who has participated in the program becomes an ongoing member of the complete cadre of participants.
The Residency allows each teacher to instruct at least one class of students throughout the year, but to eliminate other school responsibilities to make time for professional, scientific, and personal growth and learning.
The program extends each teacher's fundamental philosophy of education.
Before school starts, the entire team of teachers and directors spend two days and a night at a retreat camp. Participants are led through the challenges of a low-ropes course and other activities designed to build team spirit and skills in communication and conflict resolution; builds awareness of each other's strengths, skills, and personality types. It also sets the foundation of trust and cooperation that are essential for peer discussion of the deeply personal aspects of teaching.
The integration of effective instructional strategies and science content knowledge with an emphasis on meeting the diverse needs of the students based on current research. Specific practices that promote program goals include: instructional planning activities (addressing misconceptions, 5-E lesson cycle, team planning, multiple intelligences, question strategies, concept mapping) action research, student case studies, and professional development.

- Website for more accessible outreach opportunities.
- HISD feeder pattern directed workshop topics.
- Provide highly effective workshops for new teachers.

Respondents continued to emphasize that the Model Lab program has provided "insight and direction for many science teachers" within HISD. In addition, the program has offered "content knowledge, assessment strategies, and content integration leadership" to several elementary and middle schools in the district.

Discussion

The purpose of this evaluation was to assess the effectiveness of the HISD/Rice Model Science Lab program in improving the science teaching methods of Resident Teachers, and improving science achievement, as well as the attitudes toward science of their students. Through the use of both quantitative and qualitative data, the HISD/Rice Model Science Lab continues to be an effective professional development model based upon short-term and long-term indicators.

Teacher retention, especially in an urban setting, represents a major obstacle. Harcombe, Knight, and Bellamy (2003) documented a 95% retention rate over an 11 year period. Furthermore, 74.4% remained in HISD and remained in the classroom. After fifteen years, 74% remained in education, 47% were in HISD classrooms, and 16% assumed administrative positions. Since half of the entering Texas teachers left the classroom after only five years based upon the Texas Teacher Retention, Mobility, and Attrition, Policy Research Report, the HISD/Rice Model clearly demonstrates long-term, cost-effective benefits.

Recommendations

1. Continue funding and supporting the HISD/Rice Model Science Lab as an effective professional development model.

2. Consider supporting a financial collaborative that offers HISD/Rice Model Lab workshops through HISD's Professional Development Department.

3. Develop a more supportive framework for the former Resident Teachers once they return to their home campus. This would include providing the necessary materials, incorporating a mentor, and providing release time to attend professional development as well as plan workshops.

4. School administrators should consider using former Resident Teachers as mentors or lead science teachers at their home campus/feeder pattern and provide release time for them to fulfill this role.

5. To build capacity, school administrators should consider allowing former Resident Teachers to continue attending quality professional development activities to stay abreast of new science developments.

6. Require Resident Teachers to visit their home school at more frequent intervals (i.e. once per month) to ensure a smoother transition once they return to their home campus, where they will serve as a school-based resource for science.

7. Develop an HISD website to serve as an interactive forum to enhance communication among all science professionals. This website would incorporate community and district activities, post HISD/ Rice Model Lab developed presentations, workshops, and curricular resources, provide links to other quality educational sites and resources, and provide a venue for feedback.

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Appendix A

HISD/Rice Model Science Lab
Stakeholder Survey
December 2005

Name_________________

Please respond to the following **8** questions:

1. What is (was) your role in the HISD/Rice Model Science Lab program?

2. How long have you been (were you) involved in this capacity?

3. From your perspective, what are the goals of the HISD/Rice Model Science Lab?

4. Over the past year, what activities do you think have helped the program achieve its goals? (Best Practices)

5. What activities do you believe have been critical in sustaining the program?

6. What obstacles have you encountered that may have hindered progress toward program goals?

7. What strategies did the program use to overcome these obstacles?

8. What changes, if any, would you make to the HISD/Rice Model Science Lab?

Additional comments are appreciated (optional).

Appendix B
HISD/Rice Model Science Lab
Teacher/Administrator Survey
2005–06

Instructions: The purpose of this survey is to assess the effectiveness of the HISD/Rice Model Science Lab in meeting its program goals. This survey is designed to be completed by teachers/administrators who have participated in the HISD/Rice Model Science Lab staff development program at Lanier Middle School or who are in the process of completing the program. Please complete the survey and use the envelope provided to return it to the HISD Department of Research and Accountability, Route #10 by **Monday**, **February 6, 2006**.

1. Name:____

2. During which year did you participate in the HISD/Rice Model Science Lab?

	# of Respondents	% of Respondents
1991–92	3	5.5
1992–93	6	10.9
1993–94	1	1.8
1994–95	2	3.6
1995–96	3	5.5
1996–97	3	5.5
1997–98	7	12.7
1998–99	3	5.5
1999–2000	3	5.5
2000–01	5	9.1
2001–02	1	1.8
2002–03	1	1.8
2003–04	6	10.9
2004–05	4	7.3
2005–06	7	12.7
Total	55	100.0

3. How many years of teaching experience had you attained prior to participating in the program? 10.3 years (Mean for all Respondents, N=55)
4. Including the current year, how many years of teaching experience do you have in HISD? 13.1 years (Mean for all Respondents, N=55)
5. What was your major in college? ______________________
6. In what areas do you hold a teaching certification? ________
7. What science courses are you currently teaching? ________
8. What is your current position/job title?___________________
9. For the 2005–06 school year, indicate the grade level (s) you are teaching. Please check (☐) all that applies.

N	%	Grade	N	%	Grade
54	1.9	Kindergarten	54	22.2	Eighth
54	1.9	First	54	7.4	Ninth
54	1.9	Second	54	3.7	Tenth
54	1.9	Third	54	1.9	Eleventh
54	3.7	Fourth	54	1.9	Twelfth
54	7.4	Fifth	54	22.2	Adm. Role
54	35.2	Sixth	54	9.3	Other/Retired
54	27.8	Seventh			

10. Enter the school campus number to which you are currently assigned: Appendix C (Example, Austin HS is 001, so enter code 001)

Appendix B (continued)

Scale: A=Always; B=Frequently; C=Occasionally; D=Never;

	BEFORE RML		# of Responses				% of Responses			
		n	A	B	C	D	A	B	C	D
11.	Addressing misconceptions about science	51	1	7	37	6	2.0	13.7	72.5	11.8
12.	Tailoring instruction to meet individual needs	55	6	21	23	5	10.9	38.2	41.8	9.1
13.	Assuring that units address all of the multiple intelligences	55	3	14	25	13	5.5	25.5	45.5	23.6
14.	Utilizing the constructivist approach	52	1	10	24	17	1.9	19.2	46.2	32.7
15.	Assuring alignment to the national science standards (starting in 1995–96)	44	1	8	16	19	2.3	18.2	36.4	43.2
16.	Assuring alignment to the Texas Essential Knowledge and Skills (TEKS) (starting in 1998–99)	34	11	11	11	1	32.4	32.4	32.4	2.9
17.	Assuring alignment to HISD CLEAR (starting in 1999–2000)	30	10	7	8	5	33.3	23.3	26.7	16.7
18.	Developing lesson plans that address the same objectives as Model Lessons or incorporating Model Lessons as an instructional tool(starting in 2002–2003)	22	8	5	7	2	36.4	22.7	31.8	9.1
19.	Assessing student progress with Curriculum snapshots, if available (starting in 2002–2003)	22	5	5	5	7	22.7	22.7	22.7	31.8
20.	Encouraging student initiated investigations	55	6	12	29	8	10.9	21.8	52.7	14.5
21.	Employing thematic instruction	54	5	12	28	9	9.3	22.2	51.9	16.7
22.	Using alternative assessment techniques	55	4	19	23	9	7.3	34.5	41.8	16.4
23.	Promoting group problem solving	55	8	14	27	6	14.5	25.5	49.1	10.9
24.	Allowing open-ended investigations	54	2	8	27	17	3.7	14.8	50.0	31.5
25.	Lecturing	51	3	27	19	2	5.9	52.9	37.3	3.9
26.	Using discrepant events	50	1	14	19	16	3.0	28.0	38.0	32.0
27.	Assigning end-of-chapter questions	54	6	17	26	5	11.1	31.5	48.1	9.3
28.	Requiring students to define terms	53	7	22	22	2	13.2	41.5	41.5	3.8
29.	Performing demonstrations	55	6	24	22	3	10.9	43.6	40.0	5.5
30.	Using verification labs	45	3	16	16	10	6.7	35.6	35.6	22.2
31.	Using the 5-E Instructional Model	51	2	9	14	26	3.9	17.6	27.5	51.0
32.	Using Teacher Research/Action Research in the Science Classroom	48	3	5	10	30	6.3	10.4	20.8	62.5
33.	Participating in Professional Development in Science Content	54	15	19	13	7	27.8	35.2	24.1	13.0
34.	Using Inquiry Instruction	55	4	13	27	11	7.3	23.6	49.1	20.0
35.	Use of technology integration in the classroom	53	8	5	25	15	15.1	9.4	47.2	28.3
36.	Using Concept Maps or other organizational tools within instruction	55	3	8	24	20	5.5	14.5	43.6	36.4
37.	Using Rice Model Lab developed materials	43	1	3	21	18	2.3	7.0	48.8	41.9

Appendix B (continued)

Scale: A=Always; B=Frequently; C=Occasionally; D=Never;

	During RML		# of Responses				% of Responses			
		n	A	B	C	D	A	B	C	D
11.	Addressing misconceptions about science	50	22	25	2	1	44.0	50.0	4.0	2.0
12.	Tailoring instruction to meet individual needs	53	51	25	7	0	39.6	47.2	13.2	0.0
13.	Assuring that units address all of the multiple intelligences	52	23	22	7	0	44.2	42.3	13.5	0.0
14.	Utilizing the constructivist approach	51	21	26	3	1	41.2	51.0	5.9	2.0
15.	Assuring alignment to the national science standards (starting in 1995–96)	42	22	12	7	1	52.4	28.6	16.7	2.4
16.	Assuring alignment to the Texas Essential Knowledge and Skills (TEKS) (starting in 1998–99)	34	25	4	4	1	73.5	11.8	11.8	2.9
17.	Assuring alignment to HISD CLEAR (starting in 1999–2000)	29	17	9	2	1	58.6	31.0	6.9	3.4
18.	Developing lesson plans that address the same objectives as Model Lessons or incorporating Model Lessons as an instructional tool(starting in 2002–2003)	22	13	3	3	3	59.1	13.6	13.6	13.6
19.	Assessing student progress with Curriculum snapshots, if available (starting in 2002–2003)	16	6	2	3	5	37.5	12.5	18.8	31.3
20.	Encouraging student initiated investigations	53	18	25	10	0	34.0	47.2	18.9	0.0
21.	Employing thematic instruction	50	15	23	11	1	30.0	46.0	22.0	2.0
22.	Using alternative assessment techniques	53	17	33	3	0	32.1	62.3	5.7	0.0
23.	Promoting group problem solving	53	23	25	5	0	43.4	47.2	9.4	0.0
24.	Allowing open-ended investigations	52	17	20	14	1	32.7	38.5	26.9	1.9
25.	Lecturing	51	0	11	32	8	0.0	21.6	62.7	15.7
26.	Using discrepant events	48	6	26	15	1	12.5	54.2	31.3	2.1
27.	Assigning end-of-chapter questions	51	2	2	14	33	3.9	3.9	27.5	64.7
28.	Requiring students to define terms	52	3	10	27	12	5.8	19.2	51.9	23.1
29.	Performing demonstrations	53	8	25	19	1	15.1	47.2	35.8	1.9
30.	Using verification labs	43	9	15	15	4	20.9	34.9	34.9	9.3
31.	Using the 5-E Instructional Model	51	22	22	5	2	43.1	43.1	9.8	3.9
32.	Using Teacher Research/Action Research in the Science Classroom	49	10	29	9	1	20.4	59.2	18.4	2.0
33.	Participating in Professional Development in Science Content	52	35	16	1	0	67.3	30.8	1.9	0.0
34.	Using Inquiry Instruction	54	29	23	5	0	53.7	42.6	3.7	0.0
35.	Use of technology integration in the classroom	53	22	22	9	0	41.5	41.5	17.0	0.0
36.	Using Concept Maps or other organizational tools within instruction	53	13	25	15	0	24.5	47.2	28.3	0.0
37.	Using Rice Model Lab developed materials	53	25	17	11	0	47.2	32.1	20.8	0.0

Appendix B (continued)

Scale: A=Always; B=Frequently; C=Occasionally; D=Never;

	After RML		# of Responses				% of Responses			
		n	A	B	C	D	A	B	C	D
11.	Addressing misconceptions about science	39	24	12	3	0	61.5	30.8	7.7	0.0
12.	Tailoring instruction to meet individual needs	43	19	19	5		44.2	44.2	11.6	
13.	Assuring that units address all of the multiple intelligences	43	18	20	4	1	41.9	46.5	9.3	2.3
14.	Utilizing the constructivist approach	43	19	18	4	2	44.2	41.9	9.3	4.7
15.	Assuring alignment to the national science standards (starting in 1995–96)	41	27	13	1	0	65.9	31.7	2.4	0.0
16.	Assuring alignment to the Texas Essential Knowledge and Skills (TEKS) (starting in 1998–99)	38	32	3	3	0	84.2	7.9	7.9	0.0
17.	Assuring alignment to HISD CLEAR (starting in 1999–2000)	36	27	7	1	1	75.0	19.4	2.8	2.8
18.	Developing lesson plans that address the same objectives as Model Lessons or incorporating Model Lessons as an instructional tool(starting in 2002–2003)	34	20	12	1	1	58.8	35.3	2.9	2.9
19.	Assessing student progress with Curriculum snapshots, if available (starting in 2002–2003)	34	13	14	6	1	38.2	41.2	17.6	2.9
20.	Encouraging student initiated investigations	45	19	20	5	1	42.2	44.4	11.1	2.2
21.	Employing thematic instruction	45	11	21	12	1	24.4	46.7	26.7	2.2
22.	Using alternative assessment techniques	44	16	26	1	1	36.4	59.1	2.3	2.3
23.	Promoting group problem solving	46	20	25	1	0	43.5	54.3	2.2	0.0
24.	Allowing open-ended investigations	44	14	19	10	1	31.8	43.2	22.7	2.3
25.	Lecturing	44	0	10	26	8	0.0	22.7	59.1	18.2
26.	Using discrepant events	42	5	20	15	2	11.9	47.6	35.7	4.8
27.	Assigning end-of-chapter questions	42	2	8	16	16	4.8	19.0	38.1	38.1
28.	Requiring students to define terms	42	2	12	22	6	4.8	28.6	52.4	14.3
29.	Performing demonstrations	43	9	18	15	1	20.9	41.9	34.9	2.3
30.	Using verification labs	35	6	10	16	3	17.1	28.6	45.7	8.6
31.	Using the 5-E Instructional Model	41	12	25	3	1	29.3	61.0	7.3	2.4
32.	Using Teacher Research/Action Research in the Science Classroom	39	6	20	10	3	15.4	51.3	25.6	7.7
33.	Participating in Professional Development in Science Content	45	25	16	4	0	55.6	35.6	8.9	0.0
34.	Using Inquiry Instruction	43	21	19	3	0	48.8	44.2	7.0	0.0
35.	Use of technology integration in the classroom	43	19	22	2	0	44.2	51.2	4.7	0.0
36.	Using Concept Maps or other organizational tools within instruction	44	10	24	10	0	22.7	54.5	22.7	0.0
37.	Using Rice Model Lab developed materials	45	7	19	17	2	15.6	42.2	37.8	4.4

Appendix B (continued)

			# of Responses					% of Responses				
		n	0	1	2	3	4+	0	1	2	3	4+
38.	Number of conferences you attended (district, state, regional, or national) on the average each year before your resident year.	47	13	17	10	3	4	27.7	36.2	21.3	6.4	8.5
39.	Number of conferences (district, state, regional, or national) you attended on the average each year before your resident year.	47	0	9	13	14	11	0.0	19.1	27.7	29.8	23.4

		n	# of Responses		Percent of Responses	
			Yes	No	Yes	No
40.	Published journal articles	49	12	37	24.5	75.5
41.	Produced curricula for use by others	50	36	14	72.0	28.0
42.	Piloted curriculum materials/science programs for commercial or district use	50	28	22	56.0	44.0
43.	Reviewed textbooks or curriculum materials	49	36	13	73.5	26.5
44.	Served as officers in professional organizations	48	15	33	31.3	68.8
45.	Served on committees or boards at national, state, and/ or local levels	49	19	30	38.8	61.2
46.	Made presentations at conferences at national, state, and/or local levels	50	44	6	88.0	12.0
47.	Attended Workshops at national, state, and/or local levels	50	47	3	94.0	6.0
48.	Provided leadership within your school's feeder pattern	50	38	12	76.0	24.0
49.	Developed innovative projects in the classroom	49	44	5	89.8	10.2
50.	Developed projects in the classroom that involved the student and the community	50	29	21	58.0	42.0
51.	Promoted peer coaching to help and encourage other staff members	50	38	12	76.0	24.0
52.	Received one or more grants or awards for yourself or others	49	26	23	53.1	46.9
53.	Assisted the district with curriculum development	47	28	19	59.6	40.4
54.	Promoted a program at the elementary level (Science Night, TAKS professional development)	50	34	16	68.0	32.0
55.	Graduate programs (additional coursework, degrees, certification)	48	30	18	62.5	37.5
56.	HU-LINC involvement (mentor, lead teachers, specialist)	48	32	16	66.7	33.3
57.	Involved in district initiatives (writing and revising model lessons, Project CLEAR writing, Snapshot assessment development)	50	20	30	40.0	60.0
58.	Participated in the Elementary Science Initiative	49	23	26	46.9	53.1
59.	Participated in Rice Model Lab professional development	49	38	11	77.6	22.4
60.	Instructed district workshops	49	30	19	61.2	38.8
61.	Provided support to schools within HISD (Science Night, Science Fair, Special Lectures/Presentations, Field Trip Assistance, etc.)	50	42	8	84.0	16.0
62.	Received special recognition for instructional expertise	49	23	26	46.9	53.1
63.	Read professional journals or books	52	48	4	92.3	7.7
64.	Analyze new curricula and resources	52	46	6	88.5	11.5
65.	Research the internet	50	49	1	98.0	2.0
66.	Network with other professionals	52	47	5	90.4	9.6
67.	Contact experts in the various fields of science	51	34	17	66.7	33.3
68.	Technology	52	49	3	94.2	5.8

Appendix B (continued)

			# of Responses		% of Responses	
		n	Yes	No	Yes	No
70.	The students are more motivated about the hands-on activities presented in class.	48	47	1	97.9	2.1
71.	Student learning is focused on skill-building rather than fact memorization.	49	47	2	95.9	4.1
72.	More students are aware of the educational path needed to pursue a career in science.	48	35	13	72.9	27.1
73.	More of my students express an interest in science careers.	44	32	12	72.7	27.3
74.	Students are more aware of concept application.	48	46	2	95.8	4.2
75.	More students like science classes.	47	46	1	97.9	2.1
76.	More students have been successful in science due to alternative evaluation ideas.	47	43	4	91.5	8.5
77.	Students have taken more responsibility for finding out what they want to know.	45	39	6	86.7	13.3
78.	Students understand how to integrate math concepts within science class such as using formulas to make calculations and graphing skills.	44	38	6	86.4	13.6

79. Other ways students have been affected:

Students are learning skills to aid them in comprehending science text.

Alternative Assessments that stress project building help the special ed. population.

While I do not have a classroom or set group of students that I work with, I integrate the ideology and learning experiences from the Rice Model Science Lab into my duties at Region 4. From developing curriculum products to working as an instructional coordinator at a school, the RMSL experience has prepared me to be an effective support person and teacher to both students and in-service teachers.

Participation in science related activities at district level, universities, museums and college majors.

I would say that before my retirement my students were totally affected. My whole way of teaching changed after the Model lab experience! Such as pinpointing a new group to review the lab experiment in front of the class. This method reinforced the concepts of learning in doing the lab as well as improvement of presentation skills. My students presently cannot do labs (adjudicated facility).

Participating more in school writing clubs.

I feel I have available more strategies to reach out to more students.

Creating Power Points; Being the instructor to lower grade level students at Family Science Nights; Participated in Science camp over spring break.

More focus and use of technology resources for research.

I do not know of any study or tracking of students after their middle school science experience

Due to having 4 different preparations every day has challenged me for excellence in each class.

Also, my classes have at least 1/3 special education students and as many behavioral problems.

Discipline has truly affected my classroom. I have a few students that have excelled but I feel most of my students are not interested in learning even when I have hands-on experiments. The majority of my students have 5-7 F's on their report cards. I am experiencing the worst year of any of my teaching experiences.

My lesson plans are better developed. I frequently use the 5E plan and I think this has better allowed me to use instructional time to the full. Questioning techniques are also better implemented.

Students are better at working in groups.

Applying Technological skills to real-life situations; Applying science concepts learned in class to real-life situations.

Increased vocabulary learning the language. Designing their own experiments and learning to collect, analyze, and interpret data, and draw conclusions.

I can tell you that my students walked into class asking,” What are we going to do today?”[Teacher name omitted]?

Students "enjoy" learning science from an active, hands-on instructor. I see a lot of smiling faces, interest, etc.

I feel that my work with an all girls class and subsequent girls science club promoted the young ladies interest in science and their self-esteem in their ability to do "science."

Appendix B (continued)

80. What leadership Roles have you assumed since participation in the RML?

Job Title	Number of Responses
Leadership Positions in Science or Curriculum	
Department Chair	13
HULINC	12
Curriculum Specialist/Science Curriculum Specialist	2
Elementary Model Lesson Writer	1
Practitioner Research, Project CLEAR	1
Instructional Technology and Science	1
Writer, Scope and Sequence Environmental Science, HISD	1
Curriculum Developer, Alief ISD	1
Science Specialist/Lead/Lab/Coach	14
Science Fair Chair/Coordinator	3
Professional Organizations	
JASON Project	1
Program Chair Conference for the Advancement of Science	1
President, Science Teachers Association of Texas (STAT)	1
Secretary, STAT	1
STAT Committee Member	2
President, Texas Earth Science Teachers Association (TESTA)	1
Vice President, TESTA	1
Secretary, TESTA	1
Metropolitan Association for Teachers of Science (MATS)	1
President, MATS	1
Vice President, MATS	2
Treasurer, MATS	1
Membership Committee, MATS	1
National Science Teachers Association (NSTA)	1
Science Scope Advisor Board NSTA	1
Science Scope Reviewer	1
President, National Earth Science Teachers Association	1
Vice President, Association of Multicultural Science Education	1
Manager, Water Education Programs	1
National Assessment of Educational Progress (NAEP), Texas	1
Asst. Director for Education, Houston Museum of Natural Science	1
Texas Representative for Southwest Consortium for the Improvement of Mathematics and Science Teaching (SCIMAST)	1
Key Leader, Building a Presence for Science	1
Representative, Building a Presence for Science	1
Coordinator, Gulf Coast Alliance for Minorities in Engineering (GCAME)	1
National Program Director, Clean Air Challenge	1
Advisor, Texas Earth Science Development Committee	1
Coordinator, PUMA	1
Co-Principle Investigator of Earth System Science in the Community (EarthComm)	1

Appendix B (continued)

Job Title	Number of Responses
University Affiliations/Programs	
Rice University Mentor and Teacher	1
Texas A&M Mentor	1
University of Houston Mentor	1
Baylor College of Medicine Science Education Leadership Fellows (SELF)	1
Advisory Board, HISD/Rice Model Lab	1
Co-Director, HISD/Rice Model Science Lab	1
Resource Teacher/Assistant, HISD/Rice Model Science Lab	4
Other Leadership Positions or Professional Affiliations	
Consultant	3
Delta Kappa Gamma	1
Manager, RITE	1
Title VII Teacher Trainer	1
Title I Instructional Coordinator	1
Magnet Coordinator	1
Lead Teacher/Cluster Leader	8
HISD [MS Name] Instructional Council Member	1
Reading Teacher Trainer	1
Team Leader, Vanguard	1
Mentor/Mentor Coordinator	4
Technology Trainer/Technologist	2
SDM Committee	2
Treasurer	1
English as a Second Language, Sheltered Instruction Observation Protocol (SIOP)	1
Graduate Assistant	1
Upward Bound Instructor	1
Testing Coordinator/TAKS Coordinator	2
Faculty Advisor Committee	1
Presenting Workshops	4
Total Responses	**128**

Appendix B (continued)

Scale: A=Frequently; B=Occasionally; C=Rarely; D=Never; E=No access, or don't know how to use

			Number of Responses					Percent of Responses				
		n	A	B	C	D	E	A	B	C	D	E
81.	Student use of computer to write reports	40	18	14	6	0	2	45.0	35.0	15.0	0.0	5.0
82.	Computer programs as an integral part of instruction	39	22	13	1	0	3	56.4	33.3	2.6	0.0	7.7
83.	Computer programs as ancillary activities or enrichments	38	15	17	3	1	2	39.5	44.7	7.9	2.6	5.3
84.	Probeware with graphing calculators	38	5	11	7	6	9	13.2	28.9	18.4	15.8	23.7
85.	Probeware with computers	37	4	8	10	7	8	10.8	21.6	27.0	18.9	21.6
86.	Laser discs	39	7	4	9	11	8	17.9	10.3	23.1	28.2	20.5
87.	Presentation software used by students for classroom work	39	14	10	9	4	2	35.9	25.6	23.1	10.3	5.1
88.	Digital Cameras	39	16	15	6	0	2	41.0	38.5	15.4	0.0	5.1
89.	WWW for student research	40	29	8	2	1	0	72.5	20.0	5.0	2.5	0.0
90.	Video camera work with students	38	11	8	9	4	6	28.9	21.1	23.7	10.5	15.8

91. Other (describe briefly): digital scoping and digital microscope; ELMO display, Student Power Point; Calculators; Visualize/Program; Flex cam, microscopes, stereoscope; InFocus Projector; Whiteboard Interactive Display; Polaroid and Disposable cameras; Microprojector, liquid screen with overhead.

Scale: A=Very important to me; B=Moderately important to me; C=Slightly important; D=Not important

			Number of Responses				Percent of Responses			
		n	A	B	C	D	A	B	C	D
92.	Enhances scientific knowledge and understanding	53	44	9	0	0	83.0	17.0	0.0	0.0
93.	Uses activities and strategies that make me more adept at teaching students	53	45	8	0	0	84.9	15.1	0.0	0.0
94.	Encourages interaction among science teachers as well as peer networking	52	36	15	1	0	69.2	28.8	1.9	0.0
95.	Involves teachers with the scientific community	52	28	16	7	1	53.8	30.8	13.5	1.9
96.	Upgrades skills with computer technology	51	37	14	0	0	72.5	27.5	0.0	0.0
97.	Provides additional time for reflection, study, and scientific interaction	51	39	9	1	2	76.5	17.6	2.0	3.9
98.	Prepares teachers to train others	52	34	15	3	0	65.4	28.8	5.8	0.0
99.	Provides professional growth opportunities like publishing, grant writing, and involvement with professional teacher organizations	52	35	13	4	0	67.3	25.0	7.7	0.0

			Number of Responses		% of Responses	
		N	Yes	No	Yes	No
102.	Did you change your perception of what you think is important in your role as a teacher?	52	38	14	73.1	26.9

Appendix B (continued)

100. What modifications in the program at the HISD/Rice Model Science Lab would you recommend for the 2006-07 school year for **new resident teachers**?

- Less structure to the program to increase the amount of time for networking and seeking individual training outside.
- More opportunity to provide professional development to district teachers using concepts developed by RML.
- Continue to support teachers in obtaining materials or technology for their classes once they return to their home school.
- Assign mentors from the Medical Center and NASA, and provide more opportunities to visit sites and labs.
- Emphasize the importance of working closely with teachers and schools in the feeder school pattern, especially the elementary schools.
- Commitment to provide a set number of hours of professional development for the home school, feeder pattern, and region.
- Complete an internship within the science community of Houston with a minimum of 6 weeks.
- Develop model lesson unit (s) to be provided to all teachers in the district.
- More interaction with the home school during the program that is actually required. Resident Teachers should visit at least once per month.
- I would recommend that the lab go into different classrooms towards the end of the year to apply what they have learned in different environments. Not all schools are as equipped as [the Rice Model Lab], nor are the students as cooperative.
- More work on motivating the extremely reluctant student.
- More field investigation for the teachers would be beneficial and more reflective time on non-teaching days.
- Provide information about graduate work programs available in the area.
- Encourage taking additional EXCET tests, and provide support for those preparing to take tests like the composite science.
- Return portfolios to the person who made it.
- More time management techniques in place.
- Continue using the team model for teaching instead of partners, and require teachers to teach two classes like the Teacher Residents did in 2005–06.
- Conduct more teacher observations.
- Increase the time spent on Hands-on activities
- Increase the salary of Resident Teachers upon their return to their home school.
- I would have directors in the classroom with residents to ensure strategies are being implemented.
- Back to team teaching. That was one of the most powerful parts of the lab for me, being able to have two teachers in the classroom working with the students.
- Shorten time to one semester to enable more to participate; More dialog between [the] Resident's principal and department chair, especially to have a smooth transition when returning back to campus.
- At this time, I do not know of any modifications that I would make other than to continue support of teachers once they return to their home school. By this I mean especially support in obtaining materials or technology for classes.
- More training in basic concepts.
- Offering teacher workshops (RML) as in the past would enhance the program. 2) The RML residents would benefit from attending curriculum update meeting.
- I would like to see more" real" activities that will promote a wanting in the teacher to go out and get involved with other agencies outside of the HISD school district. Grants and workshops with meaningful experience other than going from one booth to [missing].
- The only recommendation for new resident teachers would be the development of a master science teacher program. While in the program residents earn graduate credit, and after the program they would have the option of continuing to work toward master science teacher certification.

Appendix B (continued)

101. What modifications in the program at the HISD/Rice Model Science Lab would you recommend for the 2006–07 school year for catalyst teachers or other district teachers?

Modifications with Selected Quotations	# of Responses
Meeting Agenda/Frequency "For catalyst teachers I would like to see more frequent meetings, say once every 2 months. Catalyst teachers could bring to the table what they have used from the Model Lab, how and what modifications they may have had to make to use of these lessons or teaching strategies." "More Catalyst Meetings-time to get together and share teaching strategies. Maybe some plan time; More lectures by area scientists that we can come and listen to speak." "Book studies or monthly lectures on research in education."	9
No Changes	6
Change the Meeting Time "… I am unable to attend catalyst meetings @ RML. My campus dismisses at 4 p.m. and I am unable to reach RML to attend the meetings. I would like to see catalyst meetings held later in the evening or on Saturday mornings."	4
Networking "Better networking opportunities. Maintain the network. More workshops (as there were years ago) and professional development opportunities by people who know what it is like to be in the classroom."	4
Improve Communication and Sharing "…Better communication and collaboration with catalysts." "We are clearly not utilized. Only contact is via e-mail regarding an occasional event which we are invited to attend."	4
Catalyst Teachers as Mentor Teachers "Catalyst teachers should function as mentors to resident teachers one year during the program and one immediately after completion of their resident year. Catalyst Teacher should organize one Saturday Conference per school year for other district teachers."	2
RML Workshops "To come together and present workshops…"	2
Support "More support/continued networking for the first year in the "real world"-definitely a stressful transition."	2
Compensation "Catalysts skills as mentors need to be increased with the lab's residence. HISD should use Catalyst more to promote science Education/Leadership by using/paying excellent Residents."	2

Appendix B (continued)

103. Please explain your response to the previous question (Question 102).

The ultimate goal of any teacher is to change lives through education. I don't think my perception changed but was enhanced by the bevy of knowledge gained and used through this program.
I was a coverage teacher. My RML experience taught me the value of delving deeply into core ideas. While the number of concepts might be less, the thinking process developed by focused study will the student figure out the rest.
I deepened my commitment to students and belief of how their time with me effects their lives, possible earning potential, etc.
I did not feel valued as a teacher and had suppressed my ability to teach science....subsequently after completing the program of the Rice/Model Science Lab, I took the EXCET and became certified in the science fields
The value of the educator as a professional to promote effective instruction and learning for all students.
Having the time to work on planning lessons, develop my knowledge of both science content and appropriate pedagogy opened my eyes to what it takes to be a more effective teacher. There is no way to have this type of reflection and growth while you are submerged in the daily requirements of being a classroom teacher. By becoming more knowledgeable and skilled (and by increasing my network of resources) I was able to see how important each minute is in the classroom and how every action I take is monumental in the education of students.
I listen to what students are talking about during activities a great deal more than I did before the RML experience. I am also aware of the boredom that can set in during a 90 minute class, so I try to keep my lessons exciting and students moving around.
The teacher as a facilitator, not just an instructor.
My perception of my role as a teacher has not changed but I have learned ways to extend my role as a teacher in small ways with both students and colleagues.
During my year at RML, I realized how important it was to have "the whole package" of organizational and management skills and focus, as well as sound scientific knowledge. I was grateful to observe so many gifted teachers.
I knew what I wanted and to do as an elementary teacher of a self-contained class. The residency at the RML did enhance my knowledge as a teacher in my science class. It gave me a better perspective as how to integrate science and the other subjects I taught.
After the lab, I saw my role in the classroom as more of a guide to student inquiry and my role as a professional more a part of a greater science community.
I became more of a coach/facilitator. I came to understand how superficial much of what I taught was and that I needed to teach to a deeper level. I became much more reflective of my teaching. Many items were marked N/A since I did not return to a classroom after I left the lab. However, many of my experiences were beneficial in new roles.
My basic philosophy didn't really change just my awareness and ability to apply it to the classroom.
It wasn't changed, rather it was enhanced.
This year has opened my eyes about my job. Misconceptions run rampant in the science community; I learned how important it is to become an expert in everything you teach. Also I need to be extra cautious about my lesson plans. I do not want my activities to teach misconceptions or "??bid science."
Content knowledge is important, but knowing how to impart that knowledge is the key. Assessment is not only a teacher role, but a student one as well. Students can discuss their learning!
No, because I've always felt as though my job as a teacher is very important to the students that I serve as well as the community that I'm preparing students to live and work in.
I was there to change my wrong perception in science and to improve my lab set-up with 35 students to each class period. That is the hardest thing to do. So many set-up so little time.
Be more interactive with the students; be a facilitator and less a teacher
More of a facilitator
I see myself as a facilitator more than a giver of information.
I always assumed teaching was teacher initiated. I learned it is not.
I always thought teachers and students should learn together. I continue to do that. What changes was that I had permission to make errors and 1. You didn't ask, but before teachers are selected, a personality profile should be administered/addressed. There have been too many problems for the lab than involve people with negative or self-serving agendas. Also, this should not be a place admin. send people to reprogram the teacher. The teacher needs to want the professional development.
I am making a personal connection with more of my students to try to help them academically.
In some ways bet the experience taught me better ways o do the things I wanted to do by providing me with ideas and resources.
Better idea of assessment and group work done by students.
I always believe collaboration and scientific update was important-no invaluable. Love to bust misconceptions as well!
Upon entering the Rice Model Lab, I entered the classroom thinking I was just a teacher who lectures, gives notes, and assigns "busy work" After leaving he program ,my eyes were opened to be more than just a teacher. I learned how to incorporate the multiple intelligences in to lesson planning. I understand that instruction must be diagnostic, filled with patience and multiple opportunities to grasp different concepts. The RML experience afforded me the opportunity to learn how to effectively convey science content to my students.

Appendix B (continued)

102. Continued

The lab enriched my experience but I was always focused on my role as a teacher even before I was a catalyst.

I have always felt that I should be actively involved in all phases of improving skills and qualities that would help students to be productive, involved, understand science concepts by being actively involved and keep current with technology. The model provided many opportunities for this to happen. However, I feel that I was unable to always allow my student technology opportunities because it was not available at my school.

I think that as an experienced teacher who had previously written curriculum, presented at workshops and given my students a lot of hands on experiments, that I actually not changed my way of thinking. The RML really let me hone my technology skills, which then has added to my already broad base. However, I am extremely unhappy with not being able to use my professional evaluation of what the students need. I am being forced to be driven by the districts' need to be on a certain page every day.

My perception of a teacher has always been that of presenting academic excellence. The Rice Model Lab gave me new opportunities to expand on my perceptions.

I have a greater understanding of the importance of teaching skills-lab/process skills, research skills, etc. Than just imparting science content. I think this is one of the advantages of inquiry based learning.

more attention to correlation of strategies and learning outcomes, more emphasis on teaching the child as opposed to teaching the subject

During my experience in the RML, I was able to the need to clarify misconceptions and the exposure of the book revisions. The experience of shadowing a student was one of my favorite activities.

I came to realize that a teacher is not only a facilitator of learning but also a learner. To be an effective teacher one has to become a life long learner.

I knew that a teacher's job was as a facilitator and I learned how to define and refine delivery of the subject.

I am now more focused on inquiry learning, resolving science based educational misconceptions and reflection as it relates to my teaching practices and experiences.

I always thought science should be interesting and fun. I recall being bored as a student in HISD in the '40s and '50s and that was a terrible injustice for students. Until RML, I thought I had to sneak the fun of science into the classroom. The Lab experience completely reversed how I taught and my personal enjoyment of the teaching experience.

My experience enhanced what I thought is important. A science teacher must have command of the subject and a passion to share learning.

After my experience in the model lab I viewed myself as more of a facilitator of instruction. I am there to assist students in their learning, not become the sole proprietor of knowledge.

The RML reinforced my belief about "good teaching" and provided me with the tools and pedagogy to enable my students to become life long learners. The RML is an invaluable setting to allow science teachers to be truly highly qualified.

The role of a science teacher is to allow students to learn and discover how their world "works". This needs to be done by observing, experimenting, and questioning. RML allows you to work with others who feel this way.

In the lab, you had time to try new ideas and colleagues to help develop these ideas. I worked with some amazing people and we came up with great ideas that lead to some awesome units. I truly cherished my year at the lab and feel it gives teachers some wonderful tools.

I see myself as more of a "provider" than "lecturer". I think I present activities and subject matter more from the fun, exciting, and interesting standpoint than from the "you have to learn this" point of view.

I did not know how broad certain misconceptions can be with students. It is a point when I plan a lesson to begin by thinking about what I want the student to grasp and redirect students to that point of understanding.

I feel that it was much more important to facilitate in student learning through offering them many opportunities to engage in hands-on experiences. Before, the Rice Model Lab, I did more lecturing and book work. In addition, as a teacher, I felt much more like a professional with a lot to offer the students and the scientific community. I was much more comfortable with making presentations and taking a leadership role.

Appendix B (continued)

5. What was your major in college?

College Major	# of Responses
Chemistry	5
Biology	18
Natural Science	1
Elementary Education	7
Secondary Education	2
General Science	2
Health, Community Health, or Health & Physical Education	5
French	1
English	1
Fine Arts	1
Plan II (Liberal Arts)	1
Geology	3
Education/Agricultural Ed.,/Home Economics Ed.	5
Accounting	1
Psychology	2
Elementary Education/Earth Science	2
Geography/Environmental Science	1
Criminal Justice	1
Hotel Restaurant Management	1
Resource Recreation Management	1
Science	2
Physics	1
Forestry	1
Curriculum & Instruction, Science	1
Physical Therapy	1
Total	**67**

Appendix C

Home Schools of Resident Teachers Who Participated in the HISD/Rice Model Science Lab from 1991–92 Through 2005–06

Region	School	Orig. Schl.	Current Loc.
Alternative	CLC-MS	1	0
Alternative	CEP-SW	0	1
Central	Central Regional Office	0	1
Central	Black MS	2	2
Central	Browning ES	0	1
Central	Clifton MS	2	3
Central	Cullen MS	3	1
Central	Gregory Lincoln	2	0
Central	Hamilton MS	3	0
Central	Harvard ES	0	1
Central	HISD Rice Model Lab	0	3
Central	HISD RML Residents	0	7
Central	Hogg MS	3	2
Central	Lanier MS	4	3
Central	River Oaks ES	1	0
Central	Ryan MS	3	0
Central	TSU Lab School	1	0
Central	Yates	0	1
East	East Regional Office	0	1
East	Crespo ES	1	0
East	Deady MS	4	0
East	Edison MS	1	0
East	Holland MS	2	0
East	Jackson MS	5	0
East	Ortiz MS	1	0
East	Southmayd ES	0	1
East	Stevenson MS	3	2
North	North Regional Office	0	1
North	Bowie ES	1	0
North	Burbank ES	1	0
North	Burbank MS	2	1
North	E.O. Smith Ed. Ctr.	1	0
North	Fleming MS	2	1
North	Fonville MS	2	1
North	Isaacs ES	1	1
North	Key MS	1	1
North	M.C. Williams	1	0
North	Marshall MS	2	1
North	McDade ES	1	1
North	McReynolds MS	3	1
North	Patrick Henry MS	3	0
North	Wesley ES	1	0
North	Williams MS	1	0

Appendix C (con'td)

Home Schools of Resident Teachers Who Participated in the HISD/Rice Model Science Lab from 1991–92 Through 2005–06

Region	School	Orig. Schl.	Current Loc.
South	South Regional Office	0	1
South	Almeda ES	2	1
South	Attucks MS	3	0
South	Dowling MS	3	1
South	Hartman MS	3	1
South	Madison HS	0	2
South	Montgomery ES	1	0
South	Seguin ES	0	1
South	Thomas MS	2	1
West	West Regional Office	0	2
West	Bonham ES	1	0
West	Braeburn ES	1	0
West	Briarmeadow M.S.	0	1
West	Fondren MS	3	1
West	Grady MS	1	0
West	Johnston MS	0	1
West	Long MS	5	3
West	McNamara ES	1	0
West	Parker ES	2	0
West	Pershing MS	4	3
West	Revere MS	2	1
West	Rodriguez ES	0	1
West	Shadowbriar	2	0
West	Sharpstown MS	3	1
West	T.H. Rogers MS	1	1
West	Welch MS	3	0
West	West Briar MS	0	3
	HISD Central Office	0	4
	Eight Ave. ES	1	0
	Other	2	29
	Retired	0	13
Total		**111**	**111**