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A PROTOTYPE LEARNING LABORATORY SCHOOL CASE STUDY

THE EVOLUTION OF THE LEARNING THROUGH MUSIC CONSULTING GROUP-RAMSEY IFAC SCHOOL LEARNING LABORATORY SCHOOL PARTNERSHIP

A Series of Case Study Portraits and Portfolios

LARRY SCRIPP, KENNETH FREED, DEE LUNDELL, COREY SEVETT, AND JENNIFER VAILLANCOURT

With contributions from Steve Norlin-Weaver (Principal, Ramsey IFAC), Beth Hulteng (violin teacher, Ramsey IFAC), Jane Mason (general music teacher, Ramsey IFAC), Maureen Koelsch (Arts Coordinator and LTMCG program coordinator), Nick Raposo (curriculum writer for the LTMCG), Terry Wolkowicz (LTM consultant from the NEC Research Center), Fred Sienkiewicz and Ashima Scripp (NEC Research Center assistants).

The final stages of the Boston based CLCS-NEC Research Center partnership (1998-2003) described in the previous case study connects directly to the formative stages of the Minneapolis based Learning Through Music Consulting Group[1] (LTMCG) and its partnership with the K-8 Ramsey International Fine Arts Center (IFAC) Public School in Minneapolis (2003-2007).

Like the CLCS-NEC laboratory school report, this study portrays the complex challenges of research-based program development in a primary school environment dedicated to exploring the impact of music and music-integrated learning in conjunction with the NEC Research Center. Unlike the previous report, however, the Ramsey-LTMCG case study shows how a K-8 school with a long history of arts learning in a large urban school district embraced Learning Through Music as a strategic priority for school professional development and improvement in partnership with local arts organization and university partners. These efforts resulted in significant contributions to research and leadership in a growing national network of music-in-education laboratory school partnerships.

This case study report proceeds as a series of Ramsey case study 'portraits' illustrated by portfolio exhibits and data displays that stem from action research initiatives facilitated by LTMCG's professional development services, curriculum design consulting, co-teaching, data collection and analysis methods in collaboration with the Ramsey school LTM leadership and teacher action research projects.

The series of case study portraits begins with the story of the partnership illustrated by the LTM practices that began with the Kenwood Symphony Orchestra Pen Pal program.

KENNETH FREED, THE FORMER CONDUCTOR AND EDUCATION DIRECTOR OF THE KENWOOD SYMPHONY ORCHESTRA, IS VIOLIST AND ASSISTANT CONDUCTOR OF THE MINNESOTA ORCHESTRA ('05-'06 SEASON), CONDUCTOR OF THE MANKATO SYMPHONY ORCHESTRA, AND THE FOUNDING PRESIDENT OF THE LEARNING THROUGH MUSIC CONSULTING GROUP.

Larry Scripp *is the Founding Director of the Research Center for Learning through Music at New England Conservatory and the Principal Investigator for the Music-in-Education National Consortium and its Learning Laboratory School Network.*

Dr. Dee Lundell *was a Grade 4 special education teacher at the Ramsey School and is now the academic consultant for the LTMCG.*

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Jennifer Vaillancourt *is a Ramsey IFAC Grade 3 teacher and Learning Through Music collaborating teacher.*

CREATING A PARTNERSHIP

The Learning Through Music Consulting Group and the Ramsey School

Kenneth Freed and Larry Scripp

This section describes how the formation of the Learning Through Music Consulting Group facilitated Ramsey School partnerships that led eventually to both organizations being invited to join the Music-in-Education National Consortium as founding members of its "Learning Laboratory School Network." This narrative provides the case study with a detailed look at partnership building as a continuous process of differentiation and synthesis. As partnerships take shape, consensus evolves out of understanding how diverse perspectives are melded together through dialogue and action.

The Ramsey School Partnership with the Learning Through Music Consulting Group evolved at first out of conversations between two musicians with distinctly different backgrounds who were nonetheless able to find common perspectives on music's essential and formative role in education: Ken Freed—a former Suzuki School director and currently a member of the Minnesota Orchestra and a conductor of civic orchestras—and Larry Scripp—a former co-director and founder of the Conservatory Lab Charter School, and currently the Founding Director of the Research Center at New England Conservatory and the Director and Principal Investigator for a national consortium of music-in-education laboratory school partnerships.

TWO PERSPECTIVES ON REFRAMING MUSIC'S ROLE IN EDUCATION

When pressed to describe how they became interested in the challenge of bringing music into the core curriculum as a strategy for change in public schools, both Larry Scripp and Ken Freed report that the synthesis of their thinking was forged through listening to each other's concerns for music's future role in public education. Growing dissatisfaction with the status quo of exclusively performance based or talent-driven music education programs of the past eventually challenged them to co-create learning through music programs that were designed to be inclusive, comprehensive, and interdisciplinary in nature.

From the perspective of conservatory training, teaching, and research in musical development, Scripp notes that his commitment to music education stems from the desire to see something more than a restoration of past practices[2]:

> "The past decade of school reform has challenged musicians, music educators and general educators to reconsider music's role in public schools. Yet, for many musicians, the challenge is not about restoring music to its former presence in schools. It is instead about re-envisioning music's position at the core of the public school curriculum and culture."

Like many music educators, his early experience with music defined much of his philosophy for music's essential role in schools and the need for diverse musical experiences in order to optimize learning through music:

> "As an adolescent, I came to the conclusion that music education can arise from far more comprehensive and diverse musical experiences than were offered in the school. I wanted to compose, to improvise, and recreate the music I was listening to. I wanted to play more than one kind of instrument and sing despite the uncertainties of vocal production that every teenage boy faced. Yet I noticed that the school programs had no such curriculum in mind. I was told I should stick to one instrument. If you are in the band, you can't be in the chorus. And if you want to play keyboards, your family will have to provide them.
>
> "In addition, music that did not fit into the standard band literature or orchestral classics was not condoned. The many hours I spent improvising in my parent's big band and my friends' garage bands were entirely under the radar of public education. And no time was spent speculating on music's connection to learning in other areas of the curriculum. This point of view was never articulated in school, although I knew from visiting my grandfather—an esteemed inventor, electrical engineer, and an organist-composer-choral director—that he considered music as a medium for problem solving skills in mathematics and physics that depended on practical considerations and abstract reasoning in music composition, performance, and the making of recordings."

WHAT KEN FREED DESCRIBED TO SCRIPP AS "AN AMAZING OPPORTUNITY FOR A MUSIC AND ARTS-FOCUSED ORCHESTRA RESIDENCY" AT THE RAMSEY SCHOOL WAS BORN OUT OF HIS MOUNTING FRUSTRATION AS A PROFESSIONAL MUSICIAN AND CONDUCTOR OBSERVING OR PARTICIPATING IN ORCHESTRA 'OUTREACH CONCERTS' THAT DID NOT SATISFY HIS DESIRE FOR GENUINE EDUCATION IMPACT IN SCHOOLS.

TWO PATHS OF DEVELOPMENT AS ARTIST-TEACHER-SCHOLARS

For Scripp, spending years performing chamber music, conducting orchestras, directing new music concerts, composing music (for film, dance, animation, theater, television), and teaching music students of all ages in community schools, private schools, and conservatories afforded little opportunity to change the staid conventions of music education. The career of a musician-teacher seemed to be enough to keep busy.

However, deciding to divide his teaching time with research seemed to change everything. After years participating in and leading research in arts learning and human development at Harvard Project Zero, Scripp finds himself advocating now for the expansion of the boundaries of music learning in public schools through action research and rigorous documentation and assessment practices. Scripp's experience as an arts learning researcher and a cognitive psychologist of music led to his creation of a small charter school partnership with the NEC Research Center in Boston. Conceived as a laboratory for learning through music, the Conservatory Lab School became a strategic point of departure for the eventual investigation of the impact of learning through music practices and policy on a national level. What was needed to jump-start a new consortium of national laboratory school partnerships was to find the prototype urban public school.

Ken Freed conducting the Kenwood Symphony Orchestra as part of the Ramsey School's "Sorcerer's Apprentice" Orchestra Project (see page 235).

According to Ken Freed, the Ramsey IFAC School and its partnership with the Kenwood Orchestra was exactly that opportunity. What Ken Freed described to Scripp as "an amazing opportunity for a music and arts-focused orchestra residency" at the Ramsey School was born out of his mounting frustration as a professional musician and conductor observing or participating in orchestra 'outreach concerts' that did not satisfy his desire for genuine education impact in schools[3].

> "Orchestras labor mightily to reach children. Most school curricula painstakingly constructed by orchestra education departments end up on the shelf, and teachers' participation is limited to introducing artists in schools, administering paper and pencil tasks, and behavior management during concerts. Professional development for educational endeavors is often perfunctory or non-existent, treating teachers as apostles who sing the praises of symphonic repertoire, and not as co-learners with children yearning to discover more about the nature of music and its deep connection to other subject areas. For many orchestras, the Youth Concerts serve as 'infotainment,' meant to expose children to music, but not really instilling anything of educational value."

Ken's inspiration for getting involved with change in orchestral educational outreach has only increased by becoming involved directly in school program development and research, and by understanding he was not alone in his passion for change in schools and orchestra education policies. Furthermore, through his conversations with Scripp and the orchestra colleagues and mentor-conductors, he realized that members of a civic orchestra can become 'change agents' in schools by helping to break down cultural and learning barriers between musicians, teachers and children through music:

> "At an American Symphony Orchestra League conference, acclaimed opera director Peter Sellars threw down the gauntlet to all of us in the symphonic music business when he noted that we need to be in schools with the same fervor and commitment that inspired the message of Beethoven's Ninth Symphony…he proposed that orchestras begin seeing their walls not as exclusionary, but as models of

THEIR CHALLENGE WAS FRAMED IN TERMS OF A NEW INQUIRY: HOW COULD A CONSULTING GROUP BUILD AN EFFECTIVE TEAM OF MUSIC AND ACADEMIC CONSULTANTS WHO FACILITATE RESEARCH-BASED PARTNERSHIPS BETWEEN SCHOOLS AND OTHER ARTS ORGANIZATIONS, PROVIDE PROFESSIONAL DEVELOPMENT TO TEACHERS, AND COORDINATE RESEARCH FOCUSED ON 'LEARNING THROUGH MUSIC' LABORATORY SCHOOL PRACTICES IN PUBLIC SCHOOLS DEDICATED TO MUSIC AS A STRATEGIC PRIORITY FOR ARTS AND ARTS-INTEGRATED LEARNING?

shared space. What he envisioned was music without borders, music with the power to heal, and music as social action."

Through extended conversation and joint inquiry, Scripp and Freed began to fashion a shared point of view about music's evolving role in education. They concluded that the opportunity to reshape the future of music in education rested on the premise of building collaborative partnerships between arts organizations, higher education, and schools dedicated to music education for all children. Furthermore, they decided that since music was removed from the school curriculum in the 1980s and 1990s, many school communities now support arts learning based schools like Ramsey and networking efforts like Arts for Academic Achievement in Minneapolis *because* there is renewed appreciation for what was missing in arts-deprived school policies of the past. Because there is now far more extensive evidence of the impact of music on various forms of learning critical to the success of schools, research-quality documentation and assessment practices would have to be incorporated into all aspects of these partnerships so that all stakeholders in the success of the partnerships would understand the value music and music integration in education as a strategy for ongoing reform and excellence in the areas of teaching, learning and professional development of artists, teachers, community artists, and pre-professional interns.

THE CREATION OF THE LEARNING THROUGH MUSIC CONSULTING GROUP

To Freed and Scripp, each step of the process of incorporating a music and music-integrated learning program into the Ramsey School would require guidance and coordination. Thus, the Learning Through Music Consulting Group (LTMCG) was brought into existence because they felt that, with guidance, music programs could be designed to promote learning in music for its own sake and, at the same time, provide important connections to learning in other disciplines in the arts and academics, as well as personal and social development. And as they began to discuss these challenges of forming the consulting group, they realized that they needed to align their efforts with those who were willing to push the boundaries of past educational practices and policies of schools and orchestras. Accordingly, the board of the LTMCG is now comprised of representatives from university-conservatory music education departments, arts philanthropists, music industry leadership, music presenting and learning organizations, a former head of the Arts for Academic Achievement, and a well-known corporate governance lawyer who believes in the need for 'music as an alternative language of learning' for schools.

Thus, their challenge was framed in terms of a new inquiry: How could a consulting group build an effective team of music and academic consultants who facilitate research-based partnerships between schools and other arts organizations, provide professional development to teachers, and coordinate research focused on 'learning through music' laboratory school practices in public schools dedicated to music as a strategic priority for arts and arts-integrated learning?

TAKING ACTION

Their aspirations for music and education becoming increasingly entwined, Scripp and Freed and their colleagues used the newly formed and locally funded Learning Through Music Consulting Group to take action in the Ramsey School in Minneapolis.

Judy Hornbacher, former Executive Director of the Arts for Academic Achievement project in Minneapolis and founding board member of the LTMCG, responded with great enthusiasm to the opportunity to create a music-centered arts learning organization starting with the Ramsey School:

> "My response to the formation of the LTMCG was enormously positive; it seemed to be the perfect extension of work that we were doing through Arts for Academic Achievement by going much deeper into the curriculum itself, by analyzing the components of music and other subjects, studying the intersections and making extrapolations for improved instruction. Further, I felt that having more adults, more adult musicians working with students and teachers, would build the capacity of all participants in the project."

As she saw it, the chief goals of the LTMCG were to:

- operationalize, in a complex, urban school, the theory that music inherently contains skills and knowledge that overlap with other subjects;
- develop an ever growing cadre of teacher and teaching musicians who are implementing, learning from, and creating new ways of integrating music and other subjects to the improvement of both;
- demonstrate, through sound evidence, that integration of music into other curriculum areas improves achievement both in music and in the parallel subject; and
- integrate music teachers into the dense teaching life of the school beyond the music classroom.

Ken Freed and Larry Scripp agreed that the chief challenges facing the LTMCG articulated by Judy Hornbacher became a blueprint for LTMCG practices productive for the Ramsey laboratory school program. Thus, the tactical success of the LTMCG relied on:

- developing coherent and effective strategies for building the understanding and practice of LTM;
- growing the circle of participants ever larger;
- working in a real, complex, and dynamic urban school environment where staff, funding and district focus are subject to constant, sometimes capricious, change;
- creating structures that make time available for full-time staff members to work thoughtfully through the requirements of lesson design and evidence gathering; and
- developing a coherent approach to fund raising and distribution of tasks.

For Scripp, the success of the LTMCG depended on changes in attitudes from music specialists. As the Chair of the Music-in-Education Guided Internship program at New England Conservatory and the convener of professional development institutes for professional music educators nationally, Scripp notes

> "The idea of learning in and through music used to be a tough sell to seasoned music educators and their students who came to NEC. Ten years ago, music teachers told me they were upset that musicians would be responsible in any way for learning in other subject areas. Today, things have changed. Young music teachers are now upset by the implication that the way they teach music today does not already reinforce or enhance learning in other subject areas."

For Freed, it was a matter of breaking down barriers and building new visions of community service from the perspective of his orchestra colleagues:

> "To some extent, most professional and civic orchestras share a heightened sense of idealism, coupled with an entrenched and static self-image. I would argue that these musicians—whose musical aspirations connect to their professional lives in telling ways—are searching for new meaning in their work, a reframing of personal and organizational goals integrated by music and education.
>
> "I felt that my frustration was getting the better of me, and I awoke from a dream where in a flash of light I saw the connection between a school, my orchestra, and a research institution that might begin to push the envelope of what an orchestra could accomplish, other than entertain. In 1999, I became music director of the Kenwood Symphony, a civic orchestra, and decided that I could use that organization to channel my frustration and reach the vision from my dream into positive change at a grass roots level."

CREATING SHARED SPACE

The LTMCG would not have started in Minneapolis were it not for the impulse to create a shared space between an orchestra and a school. Opportunity knocked in the form of a challenge when the Kenwood Orchestra lost its Monday evening rehearsal space. After canvassing the usual religious institutions for a suitable replacement venue, one of the KSO cellists suggested they try the recently refurbished auditorium of her child's K-8 school, the Ramsey International Fine Arts Center.

Students perform with the Kenwood Orchestra as part of the Learning Through Music Pen-Pal Program.

Ramsey music specialist and KSO orchestra member Stacy Aldrich coaching a student during the Pen Pal concert rehearsal.

A professional development session activity that involved classroom teachers, music specialists, and the LTMCG coordinator.

Meetings were arranged, and Ken Freed and the school's Principal, Steve Norlin-Weaver, quickly came to terms: concerts in exchange for rent.

For Ken Freed, this new shared space quickly led to the realization that the Ramsey School could be a laboratory for shaping the revitalization of music and music integration practices in schools through the collaboration of trained community musicians, music specialists, and classroom teachers:

> "While visiting the Ramsey school one day, I was struck by the nonchalance of the kids as they twirled their violins in the hallway—it reminded me of the students of the New England Conservatory's Charter Lab School program founded by Dr. Scripp. There, music integration is practiced as well as preached, and I imagined that Ramsey and the KSO might begin to explore a new kind of relationship, working off the blueprint of New England Conservatory's Charter Lab School curriculum and assessment frameworks."

For Freed the vision of shared space necessitated a change in the mission of the orchestra.

> "In order to prevent these ambitious plans from getting ahead of themselves, I had to reconcile the KSO players not only to a new rehearsal and performance venue, but also to a new paradigm of success, predicated on some new and challenging relationships with a school. Inspired by our move, the board, executive committee, and I decided that the time was right to reexamine our mission, making children and education central to our core commitment. We revised our mission statement by adding the phrase "bring learning to life." I imagined a powerful and galvanizing pairing between an orchestra and a school, observed and regulated by a research institution, namely, the New England Conservatory Research Center for Learning Through Music (RCLTM). The intermediary organization was the emergent Learning Through Music Consulting Group, which contained representatives from each of the other organizations."

The KSO was interesting to the school as a performing group, but the idea of music integration guided by LTM consultants and a research institution became equally enticing to Freed and Scripp. The school's principal, Steve Norlin-Weaver, demonstrated his commitment to the partnership by inserting the music integration program, LTM, into the school's five-year improvement plan as part of its differentiated instruction strategy. The orchestra would be trained to deliver music integration curricula, while data and assessment would be handled by the New England Conservatory Research Center in Boston. Potentially this would provide Principal Norlin-Weaver with the data he needed to validate the connection between music and learning to his staff and community and to counter the budget cuts he faced on an annual basis.

THE LEARNING THROUGH MUSIC PROGRAM UNFOLDS

After the institutional lines had been drawn, it became a matter of KSO musicians and Ramsey teachers learning to go outside their comfort zones; they had to develop trust and to learn each other's languages and cultures. Professional development for the orchestra was first. Some of their players had not been inside a classroom for 60 years. Then the classroom teachers had to find the shared fundamental concepts and processes [see Scripp, 2007, CLCS case study report in this *Journal*], i.e., proportion and tone, between music and their curriculum. Both orchestra members and teachers worked on meeting the standards set in the curriculum.

AT THE RAMSEY SCHOOL, THE ORCHESTRA MEMBERS VOLUNTEERED FOR PROFESSIONAL TRAINING MUCH LIKE THE GUIDED INTERN PROGRAM AT NEW ENGLAND CONSERVATORY. COMMUNITY ORCHESTRA MEMBERS LEARNED TO GIVE LESSONS, MASTER CLASSES, AND MUSIC OUTREACH CONCERTS IN SCHOOLS IN WAYS THAT MATTERED MOST TO THE SCHOOL.

The orchestra began with a simple mentoring program that offered private lessons for students who couldn't afford them. From there they developed their own version of the Pen Pal Program piloted at New England Conservatory; players paired with teachers and classrooms to bring the lessons of *La Boheme*, *Four Seasons*, and *Sorcerer's Apprentice* to the children. A CD and a letter were sent by the players to the classrooms, visits were arranged, and relationships slowly began to form. Suddenly, the players had new reasons to practice their parts. The players would appear in-person, introduce themselves by reading a story, and in some cases, team-teach the sketched-out lessons of the music.

An original aspect of the program included weekend concerts, but they were ill attended in the first year. As a possible solution, the next year the principal suggested that they perform more frequently throughout the year—for the entire school on Friday mornings, then two concerts on Friday, then three concerts in one morning, twice a year, with the kindergartners having shorter concerts. Suddenly, teachers sensed the orchestra's commitment to the children was sincere, as players were sacrificing their paid work for them and the kids. All of a sudden, the orchestra was getting requests for repertoire by Mexican and African-American composers, for composers who tied their work to poetry, drama, and history. The school was "getting it."

THE ORCHESTRA PARTNERSHIP AS ACTION RESEARCH

What Ken Freed made clear to the LTMCG was that the process of implementing an LTM program begins best with an orchestra residency. At the Ramsey School, the orchestra members volunteered for professional training much like the guided intern program at New England Conservatory. Community orchestra members learned to give lessons, master classes, and music outreach concerts in schools in ways that mattered most to the school. Carefully designed curricular units and documentation and rigorously assessed evidence of learning began with musical experiences provided by the orchestra and extended to interdisciplinary units that engaged all teachers at the Ramsey School. As students at the school became pen-pals with orchestra members, cross generational learning experiences became anchored in school orchestra performances.

Now that the LTM program has taken root in Minneapolis, the school performing groups regularly perform with the resident community orchestra, the teachers support music as curriculum in their classrooms, and the music teachers are now busy assessing music learning for evidence of learning transfer between music and academic, personal, and social development. The LTM Consultants are busy creating digital portfolio systems to capture evidence of music and music-integrated learning achievement aligned with the school community's standards of excellence and achievement—evidence that will be a part of the Music-in-Education National Consortium's Laboratory School Network and publications in the coming year.

Steve Norlin-Weaver's goals with the Music-in-Education Laboratory School Project are aligned with the school's overarching inquiry questions:

- How can data be used to demonstrate the impact of the arts programs on student success?
- How can thoughtful, specific arts integration linking our discrete arts programs with our core curriculum areas be created and established?
- How will all units focus on arts integration to provide diverse and equal access to learning for all students?

The consulting group's first workshops for faculty and orchestra members started with inquiry questions like "How can music and music integration enhance teaching and learning at a school whose mission is to build a learning community that incorporates the arts across the curriculum?"

The investigation of the Ramsey partnership question became the basis for an action plan for bringing the Kenwood Orchestra into the school, providing professional training for orchestra members to introduce musical works and to work with

Breaking down barriers between the audience and the orchestra members was an important first step in the KSO-Ramsey partnership.

The Prototype Learning Laboratory Digital Portfolio System features a Menu Bar that organizes digital artifacts according to music-in-education program outcomes. This structure was forecasted by the RUBRICS CUBE system and adapted from earlier powerpoint formats developed by Chicago Arts Partnerships in Education (CAPE), a founding member of the MIENC.

teachers and students in the lower elementary grades on interdisciplinary connections with the music. Learning Through Music Consultants were hired to work with the principal, Steve Norlin-Weaver, to establish benchmarks for the LTM program in the School Improvement Plan, and over three year's time Pachelbel's *Canon*, Dukas' *The Sorcerer's Apprentice*, excerpts from Puccini's *La Boheme*, excerpts from the Vivaldi *Seasons*, Beethoven's *Ode to Joy*, and Copland's *Lincoln Portrait* all became part of the school's music and music-integrated academic curriculum. Results were measured by the quality of curriculum music integration design, collaborative teaching in classrooms, and documentation of student work in response to musical works followed by the development of assessments of music reading skills for voice and violin. And in every case, the new action based on a piece of music was connected to action research inquiry questions.

After considerable redesign, the program expanded into other areas of inquiry and investigation, some of which will be explored later in this study: A drum circle program was created to help students deal with social and emotional issues that interfered with the learning process in their classrooms. A 'creating opera program' has been expanded to address curriculum standards in social studies, language literacy, and musical literacy. A drum stick program has been assessed in relation to word fluency skills of third graders. Seventh grade math instruction has been enhanced by musical analysis, and literature classes are studying poetry and odes through music. Music teachers now use expanded mathematical representations of musical patterns in general music classes, and students have participated in concerts with their pen-pals.

DEVELOPING INSTITUTIONAL CAPACITY THROUGH DOCUMENTATION AND EVALUATION OF PROGRAM OUTCOMES

After joining the Music-in-Education National Consortium's Learning Laboratory School Network, all institutions involved in the LTM project at Ramsey were challenged to develop the capacity to manage complexity. The first step was to formulate a researchable line of inquiry. The inquiry questions are not just a general indication of curiosity, but rather of focused investigation into areas of concern for what is not known. A question about music's impact on students' cognitive skills, aesthetic judgment, or social development must be generally stated, and must allow for specific lines of inquiry that are of interest to each participant in the process. The capacity for formulating these questions, designing methods of investigation, and finding ways for constructive interpretation of outcomes thus becomes an indication of developing institutional capacity. Higher education and arts partnership provide guidance and resources. New information becomes the currency of an inquiry-based learning environment.

The Ramsey-LTMCG partnership resulted in the creation and ongoing development of its Learning Laboratory School Network digital portfolio, as featured in the next section of this report.

THE RAMSEY LEARNING LABORATORY SCHOOL ACTION RESEARCH PROJECTS

The Ramsey Digital Portfolio System

Corey Sevett and Dee Lundell

The Ramsey International Fine Arts Center is committed to delivering a program that embraces the arts learning for its own sake and for the sake of learning in other subject areas. At Ramsey IFAC the arts are integrated into our program through discrete programming of strings, band and visual art, as well as through an integrated approach in core classrooms, including residencies, LTM and purposeful planning. For staff there is an expectation that if you choose to teach at Ramsey IFAC it's because you value teaching in the context of an arts-infused program.

— Ramsey Principal Steven Norlin-Weaver

THE RAMSEY DIGITAL PORTFOLIO SYSTEM AS AN ACTION RESEARCH TOOL

The Ramsey-Learning Through Music Consulting Group (LTMCG) case draws on the materials organized by the MIENC's prototype Learning Laboratory School System Digital Portfolio System. Unlike the previous case study of the CLCS, the principles of documentation and assessment for the purpose of multivariate analysis of school learning outcomes is now formalized through a portfolio system. As forecasted by the

PROTOTYPE LEARNING LABORATORY SCHOOL DIGITAL PORTFOLIO SYSTEM PROGRAM OVERVIEW

The six-slide collage presented here draws on the opening slides from the Ramsey "Learning Laboratory School" digital portfolio. These 'front page' slides provide crucial demographic information and program overview for understanding the context for the prototype music-in-education laboratory school: its commitment to (a) authentic, comprehensive, interdisciplinary forms of music learning for every student; (b) research-based professional development and consulting services for every teacher, intern, or community artist who works with the Learning Through Music program; and (c) whole school commitment to partnerships that support the essential role of music in education and its contribution to whole school improvement as part of ongoing school reform processes.

The first step of the Digital Portfolio sequence is to provide the overall context for the music-in-education school projects.

RUBRICS CUBE system described earlier in this *Journal*, the portfolio system is designed to present a comprehensive set of music-in-education school outcomes from an action research perspective.

The LLSN documentation digital format is modeled on the Chicago Arts Partnerships in Education (CAPE) documentation template developed by Arnold Aprill and Britton Bertran and revised by Amy Rasmussen. These formats build on the insight that the portfolio models developed by Arts PROPEL in the 1980's—which were highly effective, but were perceived as too unmanageable for general use—can now be implemented on a wide scale through new technologies. The templates provide a series of prompts that assist practitioners in arranging text, image, and sound into frameworks that record teachers' and artists' inquiry questions and work processes, organize this data into evidence and findings, and arrange this information into a format that allows practitioners to interrogate their practice and to disseminate their insights to peers and colleagues. This allows innovative practice to be widely disseminated and, through documentation of action research, brings the Artist-Teacher-Scholar model to life in a community of professional practitioners.

The menu bar positions its content within a sequence of categories essential to understanding a public school as a music-in-education 'learning laboratory school': program overview, alignment with MIE principles [see Scripp 2007 in this *Journal*], project descriptions, underlying inquiry questions, program development as an investigation process, student work documentation, assessment, teacher professional development outcomes,

Slide 2

LLSN School
a) School Demographics, Staff Roles, Professional Dev. Plan
b) LLSN Program Description, Goals, Overarching Inquiry Questions

LLSN School Mission and Alignment With MENC Principles | LLSN Project: Description | LLSN Project: Inquiry Questions | LLSN Project: Investigative Process | LLSN Project: Student Work, Assessment Strategy and Methods | LLSN Project: Evidence of Answering Inquiry Questions | LLSN Project: Reflection/ Revision | LLSN Team: Professional Development Outcomes | LLSN Project Contribution to School Performance Goals

Ramsey IFAC Public School Music Program

All Ramsey students in grades 1-6 receive instruction in orchestral string instruments. Orchestral ensembles start in third grade. Vocal music, choir, band, and jazz band are also taught.

Ramsey has a district program for students with autism that is integrated into all grade levels, specialist programs and activities. There is also a program for English Language Learners (Spanish).

Authentic and comprehensive instruction, whole school participation, and recognition of individual excellence are the hallmarks of the Ramsey School music programs.

A second slide showcases the scope of the music programs already in place at the Ramsey School.

As a lottery arts magnet school, Ramsey IFAC actively pursues arts organization partnerships across multiple arts disciplines.

Slide 4

LLSN School
a) School Demographics, Staff Roles, Professional Dev. Plan
b) LLSN Program Description, Goals, Overarching Inquiry Questions

LLSN School Mission and Alignment With MENC Principles | LLSN Project: Description | LLSN Project: Inquiry Questions | LLSN Project: Investigative Process | LLSN Project: Student Work, Assessment Strategy and Methods | LLSN Project: Evidence of Answering Inquiry Questions | LLSN Project: Reflection/ Revision | LLSN Team: Professional Development Outcomes | LLSN Project Contribution to School Performance Goals

Ramsey IFAC – Arts Learning Partnerships

Ramsey has been a Fine Arts Magnet school since 1989. Ramsey has received Annenberg and Arts for Academic Achievement grants since 1994 to develop and implement arts partnerships with all grade levels and various artists and arts organizations in the community.

• Some of the artists and arts organizations this •year include:

Learning Through Music Consulting Group
Kenwood Symphony Orchestra
Thursday Musical
MacPhail Center for Music
Galumph Theater
St. Paul Chamber Orchestra
Leo Lara, musician
Helen Chang, violinist
Chris Griffith, puppetry and theater
Dreams that Fly, dance program
Ordway Center for the Performing Arts
Connect program
Vocalessence

Helen Chang, a Pen Pal from the Minnesota Orchestra, performs a movement from Vivaldi 's Four Seasons with Kenneth Freed and the Kenwood Symphony Orchestra.

Slide 5

LLSN School
a) School Demographics, Staff Roles, Professional Dev. Plan
b) LLSN Program Description, Goals, Overarching Inquiry Questions

LLSN School Mission and Alignment With MENC Principles | LLSN Project: Description | LLSN Project: Inquiry Questions | LLSN Project: Investigative Process | LLSN Project: Student Work, Assessment Strategy and Methods | LLSN Project: Evidence of Answering Inquiry Questions | LLSN Project: Reflection/ Revision | LLSN Team: Professional Development Outcomes | LLSN Project Contribution to School Performance Goals

Partnerships – Kenwood Symphony Orchestra

At Pen Pal concerts, Ramsey students often join the orchestra.

The Kenwood Symphony Orchestra's motto of "Playing, Sharing, Inspiring" and its mission of "bringing learning to life"speak to the orchestra's core value of community service. The orchestra's identity and artistic mission are inseparable from the life of learning at the Ramsey School. Through the Pen-Pal Project, relationships between students , teachers and musicians are formed which engage students not just at the 10:00 am concerts, but in the classrooms as well. One of the Kenwood Orchestra's founders recently mentioned that what the orchestra is now doing at Ramsey is what the Founders envisioned for the orchestra 30 years ago at its inception. The orchestra's home at Ramsey is one where beautiful music carries far beyond the walls of the auditorium and finds resonance in the hearts and minds of the children.

The Kenwood Symphony Orchestra residency became a catalyst for developing the Learning Through Music program at the Ramsey School.

The mission of the Learning Through Music Consulting Group at the Ramsey School was to guide the development, documentation, and assessment of music and music-integrated teaching and learning across the curriculum.

Slide 6

LLSN School
a) School Demographics, Staff Roles, Professional Dev. Plan
b) LLSN Program Description, Goals, Overarching Inquiry Questions

LLSN School Mission and Alignment With MENC Principles | LLSN Project: Description | LLSN Project: Inquiry Questions | LLSN Project: Investigative Process | LLSN Project: Student Work, Assessment Strategy and Methods | LLSN Project: Evidence of Answering Inquiry Questions | LLSN Project: Reflection/ Revision | LLSN Team: Professional Development Outcomes | LLSN Project Contribution to School Performance Goals

Learning Through Music Consulting Group Partnership

Learning Through MUSIC consulting group

LTM consultants provide guidance through models of integrated music and academic teaching and learning

The LTMCG, an arts-learning group founded in 2003, has provided the support that makes the Ramsey project possible. Based on the Learning Through Music methodology and frameworks from the New England Conservatory Research Center, the Consulting Group serves schools and children by providing a variety of services in partnership with performing arts groups, higher education, and the classroom and music teacher, all to better engage and serve children's learning.

The Consultants provide:
• Professional development for artists, administrators and teachers; • Interdisciplinary curriculum design guidance
• Assessment and documentation design and support
• Engaged musical partners; •Community support

The goal of the Learning Through Music Consulting Group is school improvement. Music integration can only occur when children receive authentic, sequential learning in music.

LTMCG provides guidance for developing teaching portfolios, designing documentation of student work, examining the work, and carrying out the assessment process. Teachers' input produces documentation and assessment that is grounded in both practices and values of the school.

Each Learning Through Music Project at the Ramsey School provided a particular emphasis on music's contribution to learning based on the musical repertoire of the orchestra, the curricular objectives of the music teachers, and the desire of both music and classroom teachers to align these projects with academic standards and with the social-emotional, cultural, and professional community goals of the school.

presentation of evidence of school, teacher, and student learning outcomes, and reflection on the program's impact on school performance.

INTRODUCING COMMUNITY MUSICIANS INTO THE SCHOOL CURRICULUM AND CULTURE

The 'Sorcerer's Apprentice' Orchestra Project

Corey Sevett

The remaining sections of this case study report outline selected projects and outcomes from the Learning Through Music projects at the Ramsey school from the perspective of the LTMCG consultants and collaborating faculty members. These descriptions illustrate how the overall scope and depth of the Learning Through Music program 'mosaic' evolved through the individual contributions of each individual project.

Paul Dukas' orchestral fantasy "The Sorcerer's Apprentice" was the first step in the process of incorporating the Kenwood Orchestra as a whole (and its members as LTM pen pals) into the Ramsey curriculum. Dukas' work became a marvelous means to bring orchestral music into the classroom to teach language and literary skills. The Learning Through Music lessons found a way to include some math lessons as well. As seen in the examples below, many education standards were covered as the orchestra pen-pals collaborated with the classroom teachers

Teachers and orchestra members knew that kids love the vivid music Dukas wrote, but few realized that the inspiration for the music was Goethe's poem, which describes the action that most people know from Walt Disney's animated film, "Fantasia." The excerpt below suggests how poetic images can inspire music. Through the LTM lesson, students were challenged to investigate the content and form of the poem through its connections to music, math, and language arts.

Using the poem, Ramsey classes explored a wide variety of topics tailored to their grade level and verbal skills. For example, the younger children could:

- find rhyming words;
- listen to the rhythm of the words and discover the rhyming scheme from stanza to stanza;
- find words that relate to water and increase their vocabulary;
- learn about onomatopoeia through the use of water-related words;
- increase listening comprehension by identifying the story and creating a story-board summary of the action;
- explore and describe the plot, characters and action, and discuss the consequences of the actions;
- improve their critical listening by identifying when the main themes of the music are heard; and
- explore ways to act out the story as it is read, and then again as they listen to the music.

Older children could also explore rhythm, rhyme, and organization in poetry in more depth. They could think about how stories are told through poetry, compare poetry and prose, and create their own poem stories or find other examples in the school library. They could define many new words from the poetry and explore plot, characters, action and consequences. Critical listening skills were improved by identifying the many instruments used, as well as the musical themes and how they were used in various ways throughout the music. The students could work at identifying exactly what they think is going on in the action while hearing the music.

By graphing the main melody, with the "x" axis as rhythm and the "y" axis as pitch, kids got an idea of how music and math skills could be combined. They could see patterns in the graph that are more difficult to see in musical notation. They could create upside-down versions of the melody. They could graph other melodies to get practice with graphing skills. While listening to the music, the students tallied how many times they heard the two main themes throughout the piece. They then tabulated the responses, and illustrated average, range, mean, median, and estimation. This was a situation where there was no right answer to "how many times did you hear the main theme?" Each person's answer was right for him/her.

Other lessons that various LTM artists developed in their work with classrooms included: teaching the kids how to make "water" sounds on their violins and then having them come up with new ways using instruments or found objects; reflecting on other music and how it tells stories; making up music that tells a story from a book or from their imagination; and translating the translation of Goethe's original German poem into "today's" English.

In the Portfolio Exhibit that follows, Terry Wolkowicz, an NEC LTM doctoral student guided intern, provides a curriculum model and resources for upper elementary and middle school students. The form used in this example is different from most unit planners in that it asks the teacher to specify fundamental concepts and processes shared between music and other disciplines. The materials and assessments are offered to help the teacher and student see the basic principles of music integration throughout the course of the lesson implementation and assessment processes.

The poster for the first annual "Sorcerer's Apprentice" Pen Pal Concerts invited students and their parents to attend an interactive musical event that was based on the introduction to Dukas' music in classrooms. Over the years this music was repeated every fall with a special focus on grade level projects in musical composition, analysis, and the relations of music to literature.

"The Sorcerer's Apprentice"
By Johann Wolfgang von Goethe 1779
(Translation by Paul Dyrsen, 1878)

Gone's for once the old magician
With his countenance forbidding;
I'm now master,
I'm tatician,
All his ghosts must do my bidding.
Know his incantation,
Spell and gestures too;
By my mind's creation
Wonders shall I do.

Flood impassive
With persistence
From a distance
Want I rushing
And at last abundant, massive
Here into my basin gushing.

Translation of Goethe's Poem that inspired Dukas' composition "The Sorcerer's Apprentice," an orchestral work performed annually for Learning Through Music pen pal concerts and used as the point of departure for the development of LTM music-math-language arts curricular units.

BY GRAPHING THE MAIN MELODY, WITH THE "X" AXIS AS RHYTHM AND THE "Y" AXIS AS PITCH, KIDS GOT AN IDEA OF HOW MUSIC AND MATH SKILLS COULD BE COMBINED. THEY COULD SEE PATTERNS IN THE GRAPH THAT ARE MORE DIFFICULT TO SEE IN MUSICAL NOTATION. THEY COULD CREATE UPSIDE-DOWN VERSIONS OF THE MELODY. THEY COULD GRAPH OTHER MELODIES TO GET PRACTICE WITH GRAPHING SKILLS.

PORTFOLIO EXHIBIT:

A Sorcerer's Apprentice Curriculum Unit Sample

The following figures capture the essence of the Learning Through Music Consulting Group approach to the creation of music integration units based on musical works presented and studied at the Ramsey School.

The Sorcerer's Apprentice Thematic Interdisciplinary Project
(Music-Math-Language Arts)

1. **Project title:**

Measuring Up to the Sorcerer

2. **What is the Overarching Theme?** *(List theme and set of key questions to be used for inquiry.)*

Theme: Measurement in math and music and musical story-telling
Key Questions: How did the composer use the Magic Theme to convey the characters and events of the story? How are the musical elements altered in the magic theme in order to represent the events of the story? How can the Magic Theme's musical range be measured and represented? (interval, piano keyboard, inches)

3. **How will this TIP support the state standards for academics, music, and other arts?**

Music-
•Reading and notating music
•Composing and arranging music within specific guidelines
•Listening to, analyzing, and describing music
•Understanding relationship between music and the other arts and disciplines outside the arts

Math
•Understanding and describing patterns in tables and graphs
•Grades 1-2: Comparing the length of two or more objects by using direct comparison
•Grades 3-4: Demonstrating an understanding of length and selecting the appropriate type of unit for measuring its attribute
•Grades 5-6: Solving problems involving proportional relationships and units of measurement

Language: Storytelling (themes, characters, plot beginning middle and end, poems)

4. **What are fundamental concepts shared between music and other subject areas?**

Music-Language arts
•Reading and writing, storytelling, listening to, analyzing and describing stories, story structure, theme, character, main topic supporting details

Music-Math
•Problem solving, sequence, number awareness, measurement, ration, pattern (inversion, retrograde, retrograde inversion), mapping coordinates

Figure 15a-b: Using a standard LTMCG curriculum design sheet, teachers and consultants work out a Learning Through Music Unit that specifies strategies for engaging five fundamental LTM learning processes, fundamental concepts shared between music and other disciplines, documentation methods, culminating products and assessment rubrics.

5. **In terms of the *5 Fundamental Learning Processes*, what evidence of learning will be found in the *final products (artifacts?)* and *culminating event(s)?***

- Listen/perceive/describe

Listen to musical performance of Sorcerer's Apprentice with special attention to the magic theme
Learn to recognize stressed notes in the theme, musical elements used to create mystical/magical effect

- Question/investigate/discover

• Investigate how the composer used specific musical elements to create a mystical and magical effect.
• Investigate where the Magic theme occurs by examining the violin part from the Sorcerer's Apprentice
• Investigate how the theme is changed throughout the piece (musical notation and/or graphs)
• Investigate how to represent musical range in relation to space on the keyboard and inches on a ruler
• (Older students) Investigate how to identify and represent musical range in intervals.

- Create/transform/improvise

• Create listening maps of the Magic Theme in the Sorcerer's Apprentice
• Create magic wands that correspond in length to the range of magic themes in the piece (younger grades)
• Create and notate two melodies that represent the beginner and expert (apprentice/expert) in a student-selected activity (e.g., riding a bike, skipping rope)

- Perform/demonstrate/interpret

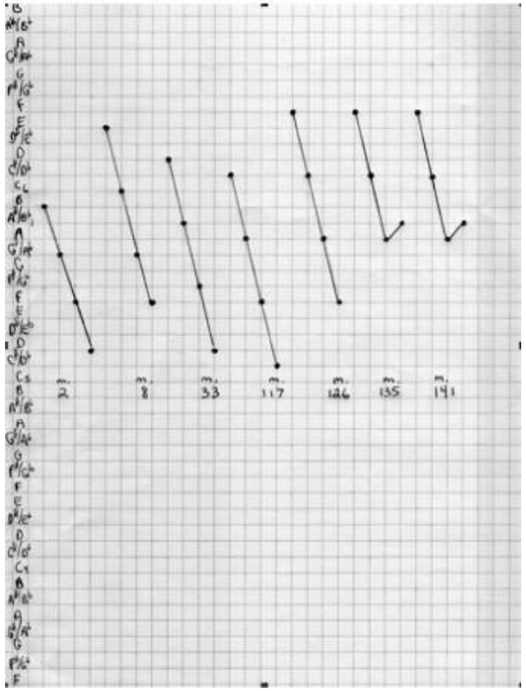
• Move in time to the music, demonstrating stressed and non-stressed beats and meter (younger students)
• Class performance of the apprentice/expert melodies
• Demonstrate ability to use various measurement devices and symbols to represent the variations of the Magic Theme throughout the composition (older students-interval)

- Reflect/connect/assess

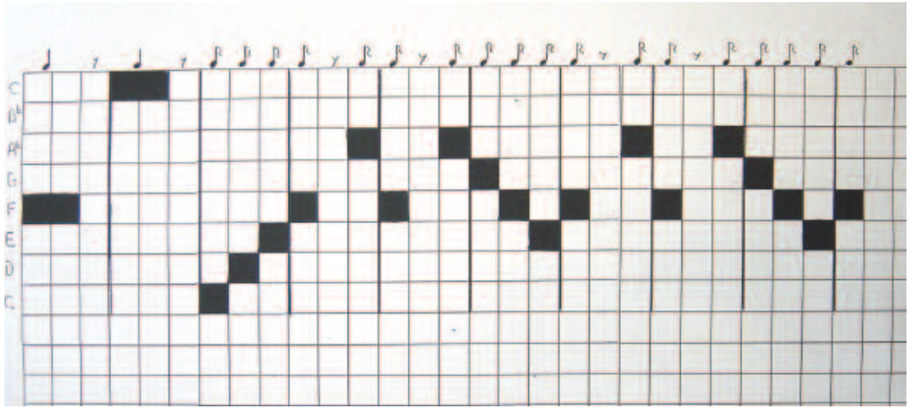
• Reflection sheet on the listening/drawing exercise, measurement exercise (relationship of keyboard to ruler)
• Connect the apprentice/expert concept to activities in their own lives
• How is the keyboard like a ruler? How is it different?
• How does Dukas help the listener imagine the story?
• How does Disney's "Fantasia" take advantage of the structure of the music to depict the action? (Specifically the magic wand theme).

6. **How will student learning be documented and assessed over the course of this project?** *(pre-post testing, performance and/or academic rubrics, reflections, audio/video taping, photographs, peer interviews, etc.)*

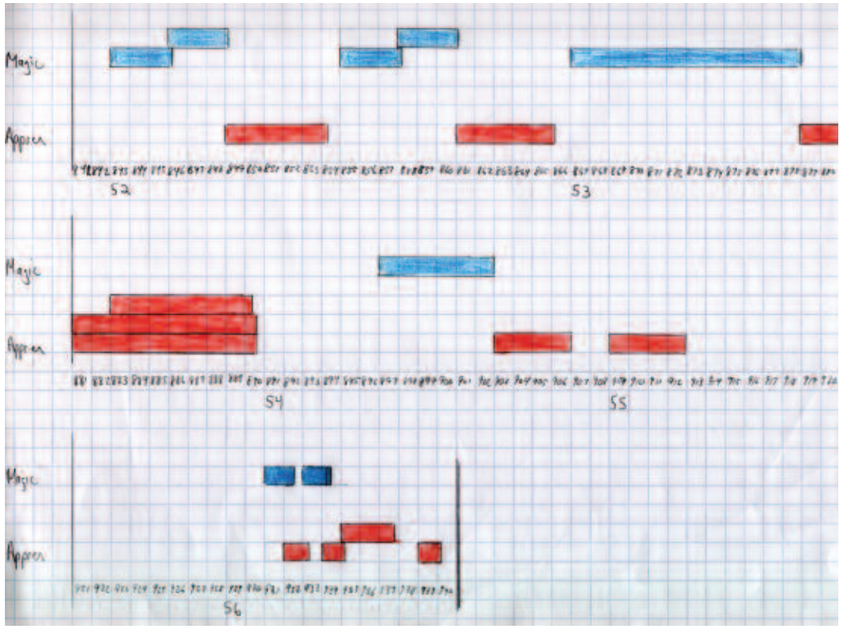
Listening Maps: pre and post: drawings that describe what students perceive as they listen to the Magic theme of the Sorcerer's Apprentice (pre, during and post documentation)
Magic Music Wands: student constructed wands in corresponding lengths to the musical examples (rubric) (K-6)
Apprentice/Expert melodies: illustrates how musical elements can be used to illustrate a beginner and expert in relation to a student-selected skill (bike riding, skipping rope etc.) (rubric)
Recording of Class Performance: performing original apprentice/expert melodies (video and rubric)



Student representation of the Magic Theme on graph paper identifying the four-note figures at various measures in the music.



Students are challenged to write music in graphic notation (x axis equals time; y axis equals pitch) in order to keep track of the structural features of the Sorcerer's Apprentice.



Student representation of the overall structure of the Sorcerer's Apprentice that shows in time the placement of the sorcerer's theme (in red) and its variations (length, overlap, etc.) from the magic theme (in blue) and its changes in duration at various measures in the music.

Kenwood Symphony Orchestra conducted by Kenneth Freed as the "Sorcerer's Apprentice," orchestra members in Halloween costumes, students on stage interacting with the orchestra members, and Ramsey Principal Steve-Norlin Weaver in full costume as the "Sorcerer" who must rescue the orchestra from the musical chaos created by Dukas and Maestro at the end of the performance.

DEVELOPING AND IMPLEMENTING A PROTOTYPE LTM UNIT

Pachelbel's Musical Matrix and the Understanding and Application of Coordinate Systems in Music, Math, and Geography

Larry Scripp and Dee Lundell

At the Ramsey K-8 School, understanding the design and implementation of a Learning Through Music unit is often grounded in an investigation and experience of a musical work. The prototype Learning Through Music unit developed at the Ramsey School described here centers on Pachelbel's *Canon for Strings*. Over the years it has turned out to be a critical piece of the LTM orchestra professional training and Pen Pal program, as well as a model for music and music-integrated learning collaborations between the LTM consultants, music, and classroom teachers.

As described earlier, the action research process and its unfolding through the RUBRICS CUBE system begins with inquiry questions. At Ramsey the inquiry questions start with the music: What do we learn about students' understanding of music when they are asked to represent what they hear in the Pachelbel Canon? How does their understanding of music and its relation to other kinds of learning change when students explore fundamental concepts shared between reading representations of musical patterns in the Pachelbel Canon and analyzing coordinate systems in fourth grade math?

The exploration of these learning processes involved music specialists, classroom teachers, and volunteer community orchestra members guided by Learning Through Music consultants. Students learned how to play the music on the violin through classroom instruction and were invited to perform with their Pen-Pals from the Kenwood Orchestra; Kenwood pen-pals also presented listening and notation exercises in collaboration with classroom teachers. Finally, orchestra members and LTM consultants collaborated with both music with classroom teachers to investigate the interdisciplinary implications of Pachelbel's Canon in the curriculum by focusing on concepts shared between music and math, such as order, sequence, and pattern as represented in standard coordinate systems.

THE PACHELBEL UNIT AS A CURRICULUM INTERVENTION

For Dr. Dee Lundell, a fourth grade teacher with a special education background and no music background who now serves as the principal academic LTM consultant, the Pachelbel project revealed how music reading, much like map reading, depends on a fully operational understanding of the coordinate system usually associated with visual-spatial mathematical reasoning. From her point of view, the Pachelbel Unit became a way for her students to discover connections between math and music in the context of a newly formed alternative fourth grade classroom:

Dee Lundell[4]: The 4th grade team decided that to meet the needs of more of the kids, I would take twenty of the students who were referred by their third grade teachers as kids who were really struggling but not in special education. Some weren't in class much because they were removed from class for behavior issues. Their academic achievement scores were generally lower than their peers. I found these students to be multi-sensory learners...with almost classic LD profiles in the sense that they could be very bright, but hadn't yet figured out a simple system for math or reading. I knew they were mostly smart kids just by the kinds of questions they would ask. Their strings teachers were saying they were often good musically. So I would ask the kids 'Why are you good musically and yet you don't understand what's going on in reading or math?'

"I had never really used music in the classroom other than as a pneumonic, sing-song, multiplication rock, those kinds of things. I'd never looked at music or musical concepts as a way to teach reading, language arts, math, or any other curriculum content areas."

Some answers to her questions emerged through collaboration with Ken Freed and Nick Raposo in the LTM Consultant Group. Ken, a violist with the Minnesota Orchestra and conductor of the Kenwood Orchestra Pen-Pal Program at Ramsey at the time, played the part of an absent-minded musician who needs help finding out where to go on his orchestra tour. Nick, a screenwriter and son of composer Joe Raposo of Sesame Street fame, created email correspondence addressed to the entire class from a fictitious character, Major Scale, KBE. The "Major" wrote emails to Dee's students, described Ken's travel predicaments in Europe, and asked for help. He gave the students clues as to the whereabouts of concert halls in Europe and requested that the students translate this information to musical notation so that Ken could save his career in music by arriving at the correct destination in several major cities across northern Europe.

Fourth grade students were thrilled to get email correspondence from Ken Freed while he was on tour with the Minnesota Orchestra, to learn about his travels in Europe, and to honor his need for geographical coordinates to be translated into musical notation. Being 'geographically challenged' Ken needed help finding his destinations in Europe. To help the conductor of the Kenwood Symphony Orchestra, the students devised many maps that made the connection between geographical and musical coordinates explicit. Typically Ken would receive an email similar to the student work sample on the previous page.

HELPING MAJOR SCALE

Message for Ramsey Fourth Grade Students: Major Scale, KBE, has a task and asked our help. His friend Ken keeps getting lost on his concert tour of Europe. Our job is to help Ken get to the right city and then, using musical notation coordinates, get Ken to the hotels and the concert halls on time. We will have to use musical notation coordinates because Ken can't read traditional map coordinates so we will have to translate the map coordinates into musical coordinates for him.

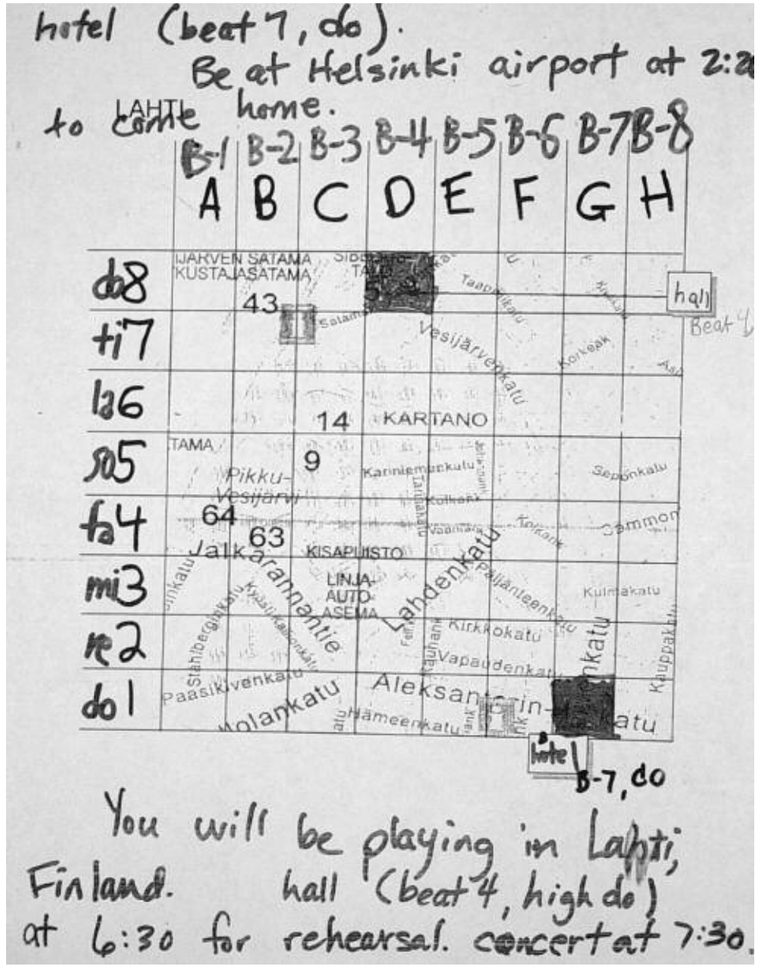
The email correspondence referring to the fictitious character Major Scale often referred to music-geographical coordinates unit focused on the translation of coordinate systems across disciplines.

Fortunately for Dee Lundell, the work with the Pachelbel Canon in general music classes provided a preparation point for students in her classes to develop new understandings of the coordinate system through their knowledge of its connection to music and music notation. As Dr. Dee explains,

Dee Lundell: Ken Freed, conductor of the Kenwood Symphony Orchestra, was the pen pal for my class. He visited and talked about the European tour the Minnesota Orchestra was about to take. He left, leaving his itinerary. The plan was for the students to get an email from Major Scale telling us that Ken was lost. I had taken a map of each of the cities where the orchestra was going to perform. I made photocopies of the map of the city, drew an XY grid to overlay on the maps and made transparencies so the whole class could see it. The scale was on the Y axis and the beats 1-8 were on the X axis. Every day the students would read the email from Major Scale and figure out the city based on the clues in the email. Then they would find the coordinates for the hotel and the performance venue.

"However, because Ken pretended that he didn't understand map coordinates, the students had to translate the map coordinates into musical notation. A hotel could be at (2, La) and the venue could be at (4, Re). The students would then compose and send an email to Major Scale to get to Ken. After the email was sent, the entire class would "sing" the grid. One student would "conduct," one student would keep the beat, and one student would point to the beats on the X axis on the transparency starting at the (0,0) and then going right, marking the beat or pointing to each point on the X axis. When the Y axis had a coordinate on the scale, the students would sing that note. For example, if the two coordinates the class had sent to Ken were (2,Re) and (5,Ti), the student pointing to the grid would be pointing to [1, Re, 3, 4, Ti, 6, 7, 8, (and repeat) 1, Re, 3, 4, Ti, 6, 7, 8.] The class would sing [rest, Re, rest, rest, Ti, rest, rest, rest (and repeat)]. When we overlaid transparencies of different cities, the same 8 beats were there, but the Y coordinates were at different points on the scale, thus producing a melody of sorts. Sometimes there would be two different notes on the same beat. Half the class would sing one note and the other half the other note. Given these coordinates weren't planned for the purpose of producing music, the class would groan when the chord was dissonant."

Thus, as children mastered solving geographical mysteries from reading music notation, they became aware of the explicit



A map of Helsinki specified the location of the hotel and concert hall for his Minnesota Orchestra performance. The students were then required to mark the coordinates for the hotel and concert hall locations and then fax the correct geographical coordinates translated to a musical pattern to Major Scale. Later on they were asked to verify the locations by reading the map as if it were a music notation system.

Implementation and Documentation Standard for LTM Curriculum Units

Drawing on the Five Process Framework, the LTM lesson units were structured and implemented through the engagement of five fundamental learning processes as sequenced in the examples below.

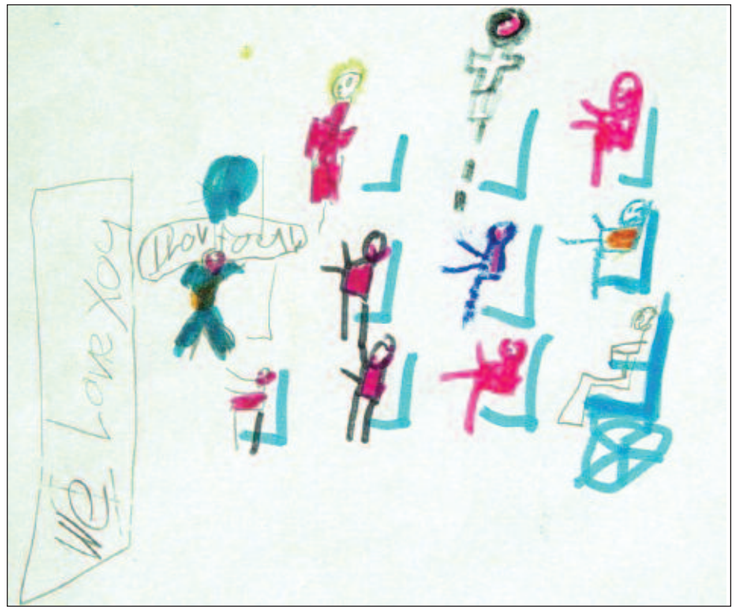
LTM PROCESS 1
Guided Listening

Attending to music rigorously requires listening repeatedly for different things at different times. The LTM Pen-Pal engages classroom with listening exercises, demonstrations and discussion interlaced with musical demonstrations.

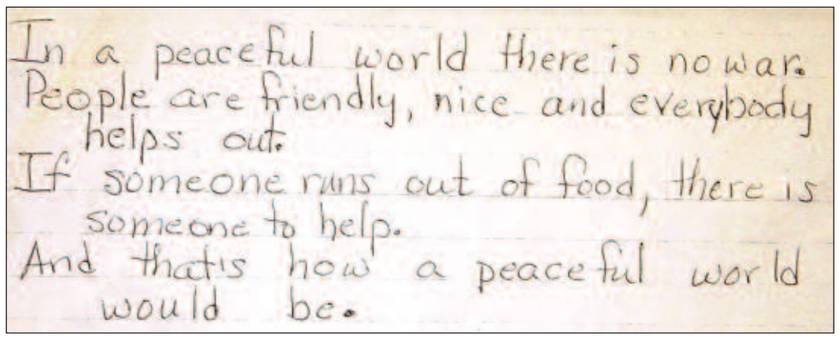
> INSTRUCTIONS FOR YOUR LTM PEN-PAL LISTENING PROJECT: Like art, literature and dance, music can also tell a story or express feelings. Like math and science, music can be understood as patterns and things. While you are listening to this piece, try making a list of words that describe what you are hearing, and what you imagine the story being told or the feelings expressed by the music might be. The words might describe the sounds you hear, name the instruments you recognize, or tell about the feelings you have when you hear the different parts of the piece. Or, you may choose to draw the way you feel about the music. Or, you may find a way to express the pattern, structure, or order of the music.

Sample guided listening instructions for the first stages of the Pachelbel's Musical Matrix unit. Students are initially asked to respond to recordings of the Canon through guided listening exercises and are prompted to pay attention to language, math, science, aesthetics and emotions of music.

A drawing in response to the guided listening prompt that combines the feeling of being underwater and the patterns of jellyfish movements that reminded the student of what it was like to listen to and think about how to represent the patterns in Pachelbel's Canon.



Another example of guided listening student work that depicts the human effect of musical performance as peacefulness, love, and perhaps transcendence for the orchestra member in the center of the top row.



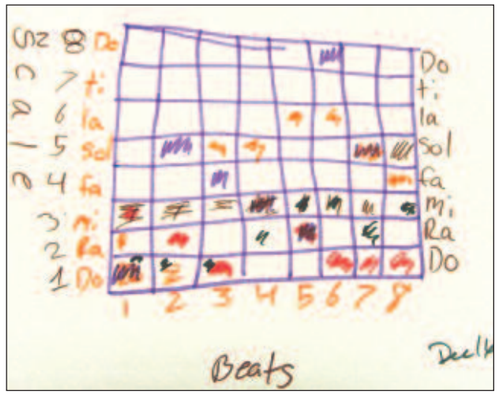
In the final guided response sample, a student creates an ode inspired by the Canon and linked to other student representations of the peaceful quality of the music listening experience.

LTM PROCESS 2
Guided Inquiry

All aspects of music experience and learning is enhanced by personal and group inquiry. In the Pachelbel unit, students learn to investigate questions concerning the structure, impact, and representation of the music and its foundation in the coordinate system common to math, music, and geography.

Inquiry questions focused on the fundamental concept of a coordination system shared among music, math, and geography problem solving tasks. Questions such as the following were posed during teacher/artist professional development sessions as well as classroom or rehearsal activities at the Ramsey: What is a matrix? What is a coordinate system? How are these understandings shared with music reading in standard or invented notation systems? How are both of these understandings applied to map reading?

Students were also asked questions about the process of investigating questions across disciplines such as: What is it like to learn concepts in two different ways and with two different symbol systems? As described in the figure below some students posed their own questions about how to use matrices to compare melodic structures of the songs they know.



After working with a matrix (see figure 25) model of musical notation, a student explores on her own how many different tunes can fit into a musical matrix: red=Hot Cross Buns; yellow=Twinkle, Twinkle, Little Star; green=Row, Row, Row Your Boat; blue appears to be similar to the 'Star Wars' Theme by John Williams.

LTM PROCESS 3
Guided Performance

As students learn to read music with the matrix they can also demonstrate understanding of the melodic and harmonic patterns through performance of the music using string instruments, voices, bells, and percussion instruments.

The centerpiece of the Pachelbel Canon study is the bass line and harmonic structure of the Canon as represented in this unit not by standard musical notation, but by the music-matrix below. As a professional development strategy, classroom teachers grow to understand the musical staff in terms of a coordinate system. The x axis coordinates represent the placement of the repeating chords and bass line of the 'canon'; the y axis coordinates trace the patterns of musical scale steps over time.

Students, classroom teachers, and audience members at the Pen Pal concerts were challenged to follow the matrix throughout the performance of the Canon and to notice the changing patterns and orchestration in relation to the shaded note pattern, the musical figure that repeats throughout the entire performance.

Pachelbel Canon: All Pattern Matrix
Time Sequence

	1	2	3	4	5	6	7	8	
8	Re		Re		Re	Re	Re		8
7		Do#		Do#				Do#	7
6			Si		Si		Si		6
5	La	La		La		La		La	5
4					Sol		Sol		4
3	Fa#		Fa#	Fa#		Fa#			3
2		Mi					Mi	Mi	2
1	Re		Re		Re	Re			1
	1	2	3	4	5	6	7	8	

Pachelbel's Musical Matrix captures the harmony and the repeating bass line of the "Canon" as represented by the coordinates between the x axis (time) and y axis (pitch scale degrees) which are represented in two ways: the relative scale degrees are indicated by the numbers, the absolute pitch names are represented by the sol-fa syllables (re = the note D, mi = the note E, etc.).

LTM PROCESS 4
Guided Creation

As Piaget has said, "To invent is to understand," and students at Ramsey found ways to improvise new counter melodies to the Pachelbel Canon using numbers, sol-fa syllables, staff and matrix notation systems displayed in the previous figure above.

Students used Pachelbel's Musical Matrix to discover new pathways or 'voicings' as the harmony progressed. In addition, students used laser pointers (while performing the previous figure) to spontaneously lead the classmates through the music in ways that challenged their 'music coordinate' reading and creative skills.

LTM PROCESS 5
Guided Reflection

There are many connections between the music, math, and geography inherent in the curriculum design and the "teaching for transfer" strategies employed throughout the implementation of the Pachelbel Canon Music-Matrix Unit. A commitment by Ramsey teachers and consultants to reviewing documentation, interpreting student work, self-assessing professional development outcomes, and addressing long-term questions helped to create a 'culture of inquiry, investigation, and evidence' as part of the laboratory school LTM program at Ramsey.

Starting with the inquiry questions, lesson planning, and teaching and working through the five processes framework, a considerable amount of student work was generated. The impact of the school-wide study of the Pachelbel Canon in connection with the Pen Pal program generated professional development outcomes as well.

Students in Dee Lundell's classroom were challenged to connect their music reading skills with map reading. Students learned to read geographical maps and music using the same coordinate system grids.

connection between reading music and reading maps. When Ken Freed arrived back from Europe, he effusively expressed his gratitude for the students rescuing him from being late or lost throughout his tour. He also indicated that he wanted to know how the students solved his geographic problems through music and asked that the kids bring their instruments to class to demonstrate their understanding of music and map reading.

The day Ken returned to the classroom, Dr. Dee selected some of the transparencies of the cities of the orchestra tour. Maestro Freed was then able to hear the kids play the music that resulted from locating geographic locations in Europe according to the music-map coordinates. In addition, the students were challenging their classmates to close their eyes, listen to the melodies they were playing on the violin, open their eyes and locate the place in the map where the melody ended. To trained musicians, this task resembles melodic dictation, the ability to write down what you hear. To math-music map readers, this task required translating coordinates into locations, and consequently, translating locations into graphic music notation.

One student in particular stumped the class, playing a melody on the violin that the class could not locate on the matrix. After offering another clue, the student at last admitted he was playing the music backwards! As Dr. Dee describes it,

Dee Lundell: The kids were having fun and having a good time. Then, we asked the question, 'Can you read the melody backwards to find out where we are?' At first, the kids didn't understand what it meant, and I think someone got up and pointed to the notes and said, 'Just play it backwards. Don't go from left to right, go from right to left.' Well, this is where Warren, a student who was having a hard time progressing in class - even though he was a doing well in music – claimed he could not play it backwards."

The moment in the Music-Math Coordinates projects described above took an unexpected turn that would change Dr. Dee's expectations for how music skill and conceptual understanding can intersect with basic concepts of math and geography.

THUS, AS CHILDREN MASTERED SOLVING GEOGRAPHICAL MYSTERIES FROM READING MUSIC NOTATION, THEY BECAME AWARE OF THE EXPLICIT CONNECTION BETWEEN READING MUSIC AND READING MAPS. WHEN KEN FREED ARRIVED BACK FROM EUROPE, HE EFFUSIVELY EXPRESSED HIS GRATITUDE FOR THE STUDENTS RESCUING HIM FROM BEING LATE OR LOST THROUGHOUT HIS TOUR. HE ALSO INDICATED THAT HE WANTED TO KNOW HOW THE STUDENTS SOLVED HIS GEOGRAPHIC PROBLEMS THROUGH MUSIC AND ASKED THAT THE KIDS BRING THEIR INSTRUMENTS TO CLASS TO DEMONSTRATE THEIR UNDERSTANDING OF MUSIC AND MAP READING.

Dee Lundell: I was sitting there watching and thought, 'Well that makes sense. He has no concept of reversibility in math.' He still wasn't understanding the concept of subtraction in relation to addition. He doesn't understand division as the reverse of multiplication. He had very rigid thought processes. He could play his music from left to right and was pretty good at it, but not in reverse. After practicing a while in class and really looking at each note, he began to play the music backwards.

"After practice he began to add fluency to playing backwards. It was as if a long-standing barrier had been broken. He began to realize that notes could be played from left to right and right to left and that they were the same notes. I should teach the concepts of reversibility in math using this new knowledge. I used beans like notes and demonstrated for him the total number of beans was the same, what you did with them, as adding parts together or separating the total into parts, the whole was still the same. Warren began to be able to move the beans forward and backward. I don't know if that relates to the music itself, but having Warren struggle with playing music backwards really, really conceptualized for me that he did not grasp the concept of reversibility, and now I had another way to think of teaching math."

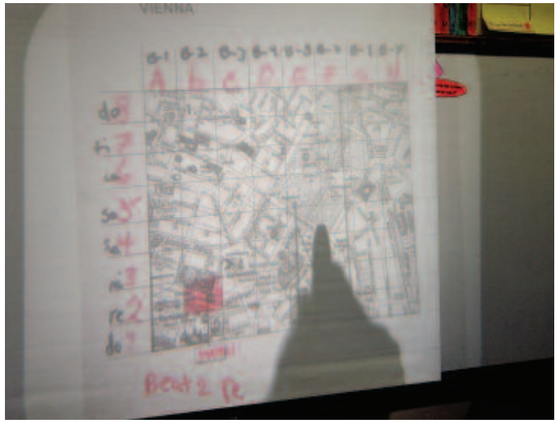
During this Learning Through Music intervention, the fundamental concept of coordinates and their representation in both music and map matrices led to other embedded complexities: the concept of reversibility, a hallmark of Piaget's concept of concrete-operational stages of general cognitive development, in this case applied to music [Davidson & Scripp, 1989, 1992]. This new-found ability to perceive, represent, and apply the concept of reversibility emerged in Dr. Dee's learning-challenged fourth grade classroom as part of a multi-

Both Dr. Dee Lundell and Ken Freed noticed that the concept of 'reversibility' is equally troublesome for students who are struggling to learn the coordinate system as it is for those who do not read music well.

In another performance assessment task, Ken asked students to play the map coordinate melody on the board depending on the route taken from one location to another.

One student was able to stump the class by playing the melody backwards (east to west instead of the usual west to east reading of the musical notation). Another student started in the middle and challenged the class to find him on the map.

One performance assessment task at Ramsey involved having students identify places on a map by listening to one student play the violin.



In the final performance assessment task, students were challenged to listen to the violin and point out errors in note reading and where the player had gone off track.

dimensional investigation of the coordination system that, previous to the LTMCG program at Ramsey, did not include inquiry and reflection into the music reading system. Thus, in this context, a comprehensive investigation of music reading processes served as a medium and as a model for the assessment of a deeper and broader understanding of mathematical literacy. For Dr. Dee, the aftermath of the Major Scale project resulted in significant momentum in her teaching toward a conceptual understanding of math's deep connection with music through skillful understanding of the coordinate system:

Dee Lundell: Well, later on Warren was bragging about how he was playing his music backwards, and I could swear that the more he played his notes backwards the better, the more flexible, he became in his thinking and understanding about reversibility. After all, he was able to express a new understanding of math. He was beginning to understand his division and his subtraction. First of all, he didn't quit in the middle of the problem solving process, and second, it was like the light bulb had gone off. An 'ah-ha' for both of us.

"This led me to thinking that we probably ought to have kids playing music backwards at the 8 to 9 year old level where reversibility developmentally is supposed to come into play. If the kids can play their music backwards, then maybe that makes the connection of reversibility.

"Later in the year when we had part of a math test that required them to do coordinates, all of a sudden they understood coordinates. Now, that could have been because of daily practice, but I think it was also because of their assignments to translate the coordinates into musical notation to help Ken find his way—a completely different, meaningful exercise in coordinates. Something they'd never done before."

In Dr. Dee's class, problem solving based on simulating the predicament of the touring musician lost in Europe provoked a need to expand both the purview of music reading skills and the scope of coordinate systems in order to employ dual symbol systems to solve geographic problems all adults will face later in life. What surprised Dr. Dee was that the music students were no more likely to make the connection between music staff reading and map coordinates than were teachers.

THUS, IN THIS CONTEXT, A COMPREHENSIVE INVESTIGATION OF MUSIC READING PROCESSES SERVED AS A MEDIUM AND AS A MODEL FOR THE ASSESSMENT OF A DEEPER AND BROADER UNDERSTANDING OF MATHEMATICAL LITERACY.

Dee Lundell: Many of these kids have had music, strings lessons, since first grade. So the question for me as their classroom teacher was 'Did coordinates make more sense because we had the lesson and transcribed the coordinates into musical notation and they thought of it as a game? To keep Ken from getting lost, did they make connections between music and math?'"

Reflecting on the challenges of such a complex constellation of activities, Dr. Dee reveals a tension between curriculum coverage and the type of project-based instruction necessary for music and music integration to take place in her classroom.

Dee Lundell: I learned at least three major things from this lesson. The first was that I should have the students bring their instruments into the classroom more often. They were having so much fun playing their instruments, translating the math and geography into music. The second was that I definitely needed to sit down and think about the act of playing music backwards and how it seemed to help the kids who are really stuck and haven't moved into the developmental stage of reversibility. That was such a 'Wow' for me. And last, but probably most important, the unit took a huge chunk of time out of our regular class schedule, and yet, we had lessons in writing, comprehension of clues, geography, using resources such as encyclopedias, globes and atlases, math, composition, reflective writing, whole group activity that included using leadership skills in the form of conducting and keeping the beat, and on top of all that...music activities."

For many teachers music integration is a matter of conscience. To what extent can a teacher dedicate time to music when academic demands are increasingly limiting time that can be spent on curriculum extensions? Dee responds:

Dee Lundell: I'm really not sure why I took that much time out of my regular classroom curriculum schedule. It just seemed to make sense. I often had to go ask Stacy (the strings teacher) about what I was doing. I would ask him if my ideas were possible and did they make sense, like having students conduct and keep the beat. From what I learned during the staff development workshop, something somewhere was making sense. I just couldn't explain it. Nobody told me what to do; we were developing the lessons as we went along. I would email Nick (Major Scale) and ask if and how to do things. Between him and Stacy, I received a lot of answers. Stacy came into the class and taught the kids how to conduct. They gave me courage to try a lot of things. My teammates and other teachers in the building would say, 'Isn't this taking a lot of time?' Yes it was, but the number of different content areas that we were able to cover and integrate was amazing, and they were all integrated through music. And I thought, 'Isn't this what instruction is supposed to be like?' I was very excited about it, because it was engaging for the kids and really fun for me, the teacher."

EVOLVING DESIGN STANDARDS FOR CURRICULUM, TEACHING AND ASSESSMENT

As a result of extensive development of the Pachelbel project, LTMCG consultants continued to develop units for orchestra Pen Pal programs that resulted in music integration units and assessments based on the Learning Through Music frameworks. Figure 37 provides excerpts from the "Vivaldi Four Seasons" unit planner.

LTM Curriculum Unit Developed for the "Vivaldi Four Seasons" Pen-Pal Project

RAMSEY IFAC-LTMCG: VIVALDI "FOUR SEASONS" MULTI-LESSON UNIT
Developed by
Dee Lundell, Corey Sevett, Ken Freed, Maureen Koelsch, Larry Scripp

This multi-lesson is written for grades 1-5. Teachers will need to contract and extend the lessons based on the knowledge and skill levels of their students.

The general assessment goals of this multi-lesson for documentation and evidence are:

- Students will understand how poetry and music can stimulate thoughts about the seasons;
- Students will understand how poetry and music both have rhythm, pattern, and tell stories;
- Students will be able to demonstrate their response to music through drawing and/or writing;
- Students will develop and use vocabulary to describe the seasons;
- Students will be able to reflect how instruments and words are used to describe the emotions and sounds of seasons;
- Students will further develop auditory discrimination skills by using differentiated listening skills.

The goal is to complete these lessons before the April 15, 2005 Kenwood Symphony Orchestra Concert that will feature Vivaldi "Four Seasons" the spring and winter movements.

Remember, APRIL IS POETRY MONTH. For older students this may be a good time to teach Haiku because it is a composition in praise of nature; Acrostic to express a subject in an innovative way; Cinquain to transform the topic uniquely; Onomatopoeia - using words to demonstrate sounds.

SHARED CONCEPTS/PROCESSES

Music -- Aesthetic Response, Listening: listening for details, discrimination, differentiated listening skills, use of music to describe emotions and sounds of seasons;

Music -- Language: using rhythm, pattern, beats, to elicit feeling and emotions, to tell a story in poetry and music;

Music -- Language Arts: using music to stimulate creative drawing and/or writing about the emotions and sounds of the seasons;

Music -- Science: using music and poetry to depict natural phenomena in the seasons, e.g. thunder, lightning, rain, wind and other aspects of weather.

SHARED STRATEGIES

Auditory discrimination (auditory thinking skills - phonemic awareness), compare/contrast (Venn diagram, alike/different charts), reminds one of (memory), KWL (graphic thinking organizer)

VOCABULARY

SHARED: seasons, chorus, soloist, beat, tempo, rhythm, pattern, shape, and story.

MUSIC: score, orchestra, composer, movement, trill, arpeggio, virtuoso, foreground, background, instruments, strings, concerto, and melody.

POETRY: poet, verse, and rhymes.

A later version of the LTMCG standard format was used for more detailed music and music integration lesson planning by the Ramsey LTMCG team. The Rubrics for this unit were displayed in the RUBRICS CUBE article in this Journal *[Scripp 2007].*

Music Integration Assessment Rubrics

LTM consultants now develop assessment rubrics that are balanced equally between an emphasis on academic and music skill outcomes. The examples in this section reveal how integration assessment rubrics drawing on the RUBRICS CUBE system can be structured based on the assumption of skill development that is based on fundamental concepts and processes shared across disciplines. Starting with music alone, then combining subject areas (music-language arts listening comprehension; music and map coordinate reading skills), and finally focusing on math learning outcomes provides a sequence of scoring rubrics that combs through the multiple phases of the music matrix project. Additional rubrics were developed specifically for geographic skills and vocabulary assessment, though not featured here.

MUSIC-LANGUAGE INTEGRATED LEARNING: INDEPENDENT (SOLO) AND GROUP (ENSEMBLE) READING AND LISTENING COMPREHENSION RUBRIC

Weak ——> Strong
1 2 3 4

1. The Decoding Process: The Translation (Interpretation) of Musical Matrix Coordinates into Musical Performance Through Vocal and Instrumental (String Instrument) Production

☐ ☐ ☐ ☐	The reader can perform fluently and accurately common notes and phrases with appropriate diction, solfa syllables,, or instrumental technique.
☐ ☐ ☐ ☐	The reader uses various strategies for decoding unfamiliar music.
☐ ☐ ☐ ☐	The reader can perform with dramatic inflection, nuance, appropriate to the characters, setting and syntactical structures of the composition.

2. Reading Comprehension and Aesthetic Response

☐ ☐ ☐ ☐	The reader/listener can find vivid descriptions that bring the musical composition alive.
☐ ☐ ☐ ☐	The reader/listener can find places where the author expresses musical ideas clearly, using well-chosen words and phrases.
☐ ☐ ☐ ☐	The reader/listener can find places where the composer expresses emotions effectively in the music.
☐ ☐ ☐ ☐	The reader/listener can identify interesting characters and their development within the musical composition.
☐ ☐ ☐ ☐	The reader/listener can identify places where the writer evokes a particular setting, period, action, or mood in the music.

3. Operational and Reflective Understanding of the Composition

☐ ☐ ☐ ☐	The reader/listener can identify and describe how a matrix can be used to write and read musical patterns.
☐ ☐ ☐ ☐	The reader/listener can create, keep track of, and perform new patterns on filled musical matrix.
☐ ☐ ☐ ☐	The reader/listener can create, keep track of, and perform new patterns on the open musical matrix
☐ ☐ ☐ ☐	The reader/listener can provide musical details, information, and explanations as needed to demonstrate connection of music reading to the graph.
☐ ☐ ☐ ☐	The reader/listener can describe how parts of the musical composition work together to create a unified and consistent whole.
☐ ☐ ☐ ☐	The reader/listener can describe and demonstrate how a graph of a whole musical piece can reveal understanding of musical form and content

This rubric is used to rate fundamental parallel concepts and skills in both music and language arts (e.g., the language or music reader is at once a listener and a performer, translator, and interpreter of symbols that arguably have syntactical and semantic content).

MUSIC-MATH INTEGRATED LEARNING RUBRIC: PERCEPTION AND PROBLEM SOLVING WITHIN THE ORGANIZATIONAL STRUCTURE AND PATTERNS IN PACHELBEL'S CANON AND ITS APPLICATION TO MAP READING AND SYSTEMS THINKING

Weak ——> Strong
1 2 3 4

1. Understanding Coordinate Systems

☐ ☐ ☐ ☐	The student can identify coordinates on an x and y axis matrix.
☐ ☐ ☐ ☐	The student can identify patterns mapped onto an x and y axis matrix.
☐ ☐ ☐ ☐	The student can use a matrix to identify similar patterns represented across diverse dimensions such as music [time sequence, pitch frequency] and geography [east-west, north-south].
☐ ☐ ☐ ☐	The student can take a given map, a coordinate system, and data displayed on these representations and create stories based on it.
☐ ☐ ☐ ☐	The student can elaborate on a data display story by including details, information, and explanations as needed in relation to numbers, distances, time, measurements, intervals, etc.

2. Understanding Math Principles

☐ ☐ ☐ ☐	The student applies mathematical thinking in coordinate systems toward the design of an object, building, plan, letter, melody, etc.
☐ ☐ ☐ ☐	The student expresses mathematical ideas and concepts embedded in maps, melodies, clearly, using well-chosen words and phrases.
☐ ☐ ☐ ☐	The sequence of math procedures used to solve problems related to map reading can be described in a coherent and logical manner.

3. The Application of Mathematical Understanding to Solving New Problems

☐ ☐ ☐ ☐	The student plans the formulation and solution of solving data reading problems in coordinate systems across various phenomena.
☐ ☐ ☐ ☐	The student uses several resources for ideas and information about solving a problem.
☐ ☐ ☐ ☐	The student takes risks by trying out new ideas or techniques in translating one mapping system to another (geography to Battleship game to melody reading).

This rubric is used to rate fundamental parallel concepts and skills in both music and math (e.g., the math or music reader must both translate and interpret symbols that are arguably drawing on common understandngs of units, sequence, order, ratio, proportion, duration, etc.). In this LTM unit the rubric can measure the application of music-math skills to reading in other kinds of coordinate systems such as maps or game boards, etc.

STUDENT REFLECTIONS ON THE PACHELBEL UNIT

The students in the class were seen as bright kids interested in music, yet designated as learning challenged in math and language arts. The Musical Matrix unit became a prototype intervention where music and storytelling (the adventures of a musician getting lost in Europe) activated music integration learning experiences.

When asked to name "things that you have learned, relearned, would like to know," students did not typically limit their responses to a single discipline. It was not uncommon to get responses that blended the concept of music reading and understanding math such as:

> "I learned about musical notation and the coordinates, too."
>
> "I relearned the do re mi and beats and to get at the right time."
>
> "I want to know more about coordinates and beats."

Virtually all the students indicated that the problem solving aspects of the units were the most fun, particularly when "we were finding Ken, and Major Scale was helping us." Looking over additional samples provides a window into these students' growing curiosity about new ways to explore music, music-math-geographic coordinates, Europe, and Ken the traveling musician.

> "I was learning to use musical notation and to help Ken and find Ken's way."
>
> "I relearned how the use musical notation."
>
> "I would like to know about the coordinates that Ken was in."
>
> "I learned music notation and the scale and the coordinates."
>
> "I learned that Stuttgart was in Europe, Cologne was in Europe, and Dusseldorf, too."
>
> "I relearned traditional musical notes and London is the capital of England."
>
> "I want to know more about Europe."
>
> "I want to know more about Ken."
>
> "I had fun writing a letter to Ken."

When challenged to come up with more types of assessment for the lesson, Dee responds, "Now the students will have a much better time playing the 'Battleship game' actually knowing what the coordinates are during the course of the game!"

SUMMARY

In the model building phase of the Learning Through Music Project, standards were set for design, teaching, and documenting the work of teachers, music teachers, orchestra members, and LTM consultants all focused on the Pen-Pal concerts with the orchestra. In terms of the RUBRICS CUBE evaluation frameworks, the design quality of the LTM units increased in terms of design specificity, adherence to LTM principles, and relevance to the Ramsey School music and academic curriculum. Baseline standards for quality of student work documentation also were established.

The next section of this Case Study Report focuses on an LTM approach to one of the most successful music residency projects found in public schools today: creating original opera.

THE FOURTH GRADE OPERA-MAKING CURRICULUM AT THE RAMSEY SCHOOL

A Music-in-Education Approach

Dee Lundell, Corey Sevett, and Larry Scripp

OPERA MAKING AND THE MIENC

In 1983, the Metropolitan Opera Guild received a grant from the National Endowment for the Arts to develop a professional development program for Creating Original Opera based on a residency model that began in 1977. In the *Champions of Change* report over 10 years ago, Dennie Wolf reported that learning outcomes in creating original opera programs were focused on language arts acquisition, higher forms of reasoning and reflection that emerged in the opera-making process, and community building. [Wolf 1999].

After joining the MIENC, the Guild has evolved beyond the Creating Original Opera model [previously reported in the *Journal for Learning Through Music* 2003] and has developed a new program called the "Research and Professional Development Opera Institute," of which a New York based LLSN school (PS 10 in Brooklyn) is a part. Far from the 'add water and stir' approach to curriculum implementation programs in the past, the Guild's 'creating opera' programs are now in line with the music-in-education models of program dissemination practices that build opera making into the context of authentic, comprehensive, and interdisciplinary music teaching and learning practices. As a result of joining the MIENC, the Guild's leadership took a serious look at all their programming in terms of higher education guided intern programs and research-assessment models for music and music-integrated teaching and learning. Today spin-offs of the creating opera residencies have become commonplace in schools dedicated to arts learning and often function as a centerpiece of interdisciplinary music learning.

From the MIENC perspective, the most important developments are those that continue to build evidence-based assessment practices into the school opera-making residencies. Following this case study report, Carroll Rinehart poses research questions for creating opera programs stemming from his vast experience in many areas of the country, such as the "Music! Words! Opera!" program used by the Opening Minds Through the Arts program in Arizona [see "Creating Opera in Schools: Music as a Model for Integrated Learning"].

In the Consortium Learning Laboratory Schools, researchers and faculty at PS10 are looking at issues of pre-literacy and student self-esteem as learners, and Long Island City High School is focusing on reflective thinking, creativity, and life skill preparation for the students involved in secondary school opera classes. The Ramsey School LLSN team has developed their own creating opera program, now guided by Learning Through Music curriculum-assessment consultants and currently focused on social studies and a wide range of "music literacy-language literacy" connections.

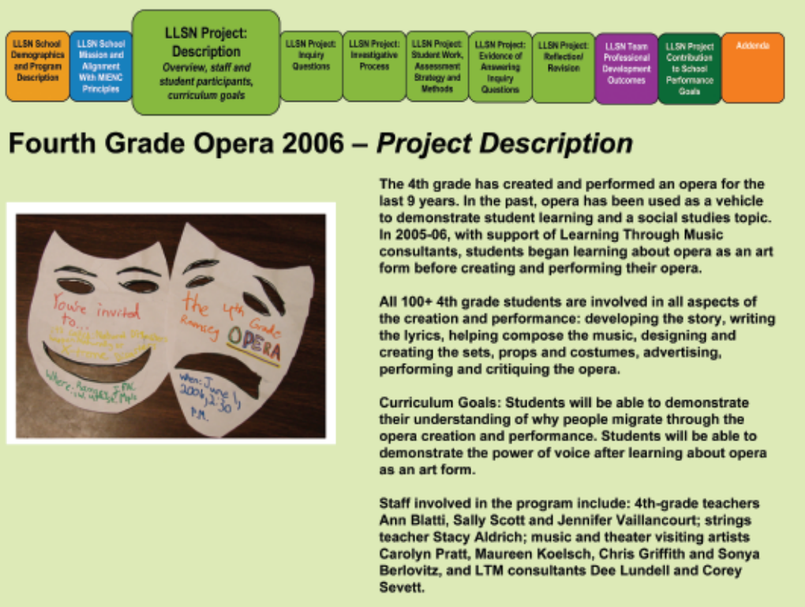
TRACING THE EXPANDING ROLE OF OPERA MAKING THROUGH THE DIGITAL PORTFOLIO SYSTEM

In the Learning Laboratory School Network the RUBRICS CUBE based digital portfolio system serves as an interactive presentation device for communicating complex program development and its impact to peer schools. The slides selected from the project section (green slides) below provide a visually and aurally (some of the screen artifacts activate QuickTime movie files) illustrated narrative understanding of the fourth grade opera program, a project that has evolved over many years at the Ramsey School.

The first slide sets the stage for understanding how the creative process of making opera in schools fits into the Learning Through Music program development guidelines. Not surprisingly, the project embraces academic and artistic goals simultaneously in the form of the study of human migration and the power of the voice to express this understanding through storytelling, songwriting, and the production of an opera as a public demonstration of this understanding.

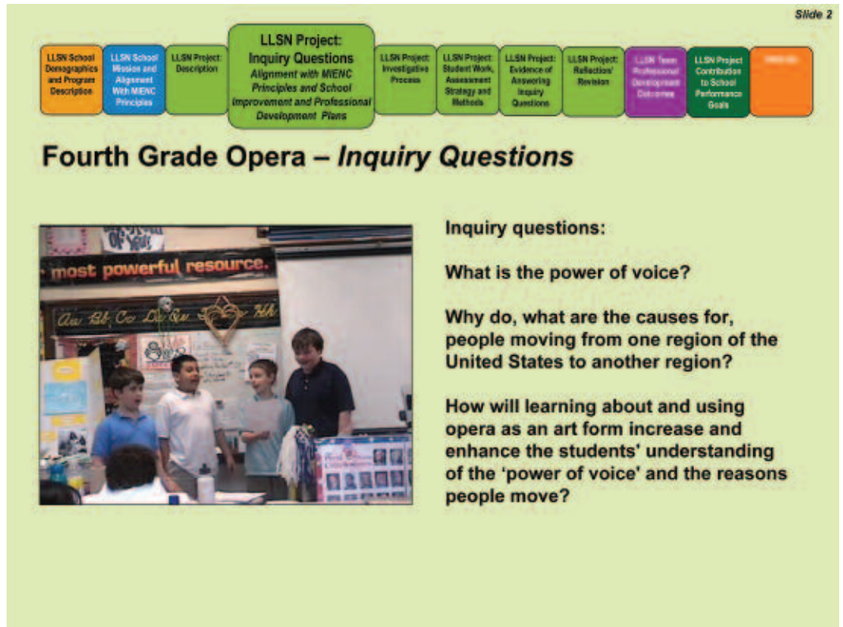
THE PROJECT EMBRACES ACADEMIC AND ARTISTIC GOALS SIMULTANEOUSLY IN THE FORM OF THE STUDY OF HUMAN MIGRATION AND THE POWER OF THE VOICE TO EXPRESS THIS UNDERSTANDING THROUGH STORYTELLING, SONGWRITING, AND THE PRODUCTION OF AN OPERA AS A PUBLIC DEMONSTRATION OF THIS UNDERSTANDING.

THE RAMSEY OPERA PROJECT DIGITAL PORTFOLIO SLIDE SHOW EXHIBIT

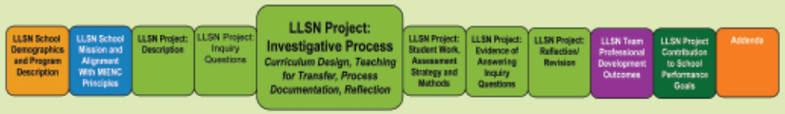


The opera project overview stresses the evolution of opera making at Ramsey from purely academic curriculum connections toward including a focus on music content understanding and skill development.

As the digital portfolio progresses, the popup menu bar illustrates how the goals of the opera project are transformed into an expanding set of inquiry questions that guide the development of the project from the learner's viewpoint. Guided inquiry questions such as those listed here became the driving forces behind the development of the opera project. Assessment questions focused also on the nature of setting text to music, a topic that connected this project to other music writing projects at Ramsey, including the Setting Odes to Music project already in place in the third grade classrooms.



This slide demonstrates a commitment to action research as an ongoing investigative process of the inquiry questions. The documentation sheet embedded in the slide captures the purposeful as well logistical aspects of project development guided by the LTMCG consultants. The LTMCG project development and management process documentation sheet helped teachers revise their planning process from year to year.



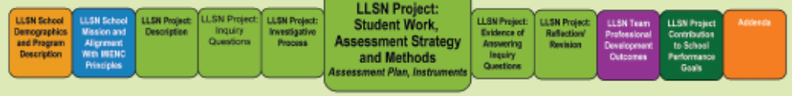
Fourth Grade Opera – *Process Documentation*

As the opera program has developed into a year-long project, a curriculum and assessment scope and sequence is needed for both teaching opera as an art form and social studies content as well as the plan for creating and performing the opera. As the team experiences and reflects on the project, new items are added to the scope and sequence.

4TH GRADE OPERA CURRICULUM PLAN – Working Document

Time line	Activity	Purpose/goal	Things need to be done to execute	Who's in charge?	Document Media
Aug	Bakken workshop	Workshop storytelling & science; offerings from Bakken	Attend	4th teachers	
Sept	4th grade team meet with consultants	To determine the calendar and events for the opera program; To write the essential questions; To determine the assessments; To discuss the portfolio and things that will need to be done; To determine the layout of the journal; To plan cross class curriculum integration between strings and 4th grade	Set up meeting(s) time(s) to do this; includes 4th grade teachers, Corey, Dee, Stacy, Jana? - contact Carolyn Pratt - set up date for presentation	Dee	Photos of team planning
Pre Thurs. musical	Pre-Assessment -- what do you know about opera? Begin journal	To document growth in knowledge To begin to document the entire process of the opera program	- written based on the question we want answered; - Journal needs to be developed		
Early Oct	- Set topic for opera - begin development of potential stories;	To have a better timeline for the opera; To separate story development from lyric writing for the opera; To practice story telling beginning, middle and end To introduce the elements of opera	- team has to decide on topic; -	team students Thurs. Musical	Video and pix

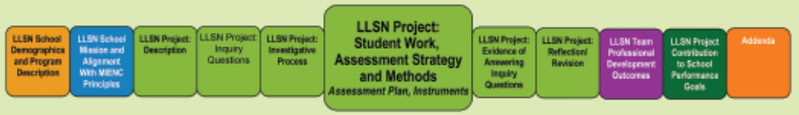
The elaborate storyboard in this portfolio page captures the student's understanding of aspects of human migration as storytelling. Additionally, the storyboard illustrates the quality and purpose of data collection and analysis of student work in the context of the opera making projects.



Fourth Grade Opera – *Student Work*

As part of the process of developing the story for the opera, students created 8-cell story boards by themselves or with partners. They then presented the stories to the classes. All the regions of the country, reasons for moving, characters in the family, were collated. The teachers ruled out the violent reasons for moving and the 4th graders voted on their top ideas. The disaster reasons received the most votes. After settling on 3 major disasters, students began large group activities developing the characters, plot, and lyrics.

Storyboard

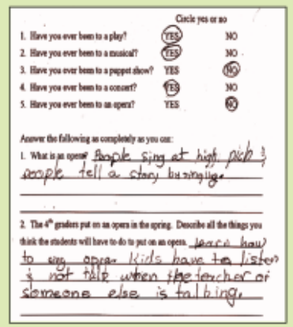


Fourth Grade Opera – *Assessment Instrument*

The team wanted to know how much the students knew about opera before beginning the unit. All students completed a pre-opera questionnaire. These were evaluated by counting the number of ingredients the student identified.

Before the students began creating their own opera, students completed another questionnaire about what they had learned so far.

Finally, after their performance, students completed an essay.

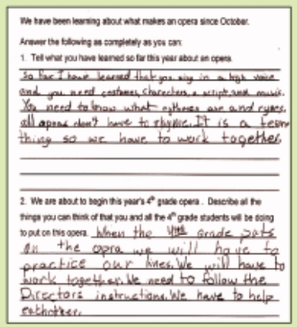

Circle yes or no

1. Have you ever been to a play? YES NO
2. Have you ever been to a musical? YES NO
3. Have you ever been to a puppet show? YES NO
4. Have you ever been to a concert? YES NO
5. Have you ever been to an opera? YES NO

Answer the following as completely as you can:

1. What is an opera? people sing at high pitch & people tell a story by singing.

2. The 4th graders put on an opera in the spring. Describe all the things you think the students will have to do to put on an opera. (peace how) to say, opera kids have to listen & not talk when the teacher or someone else is talking.


We have been learning about what makes an opera since October.

Answer the following as completely as you can:

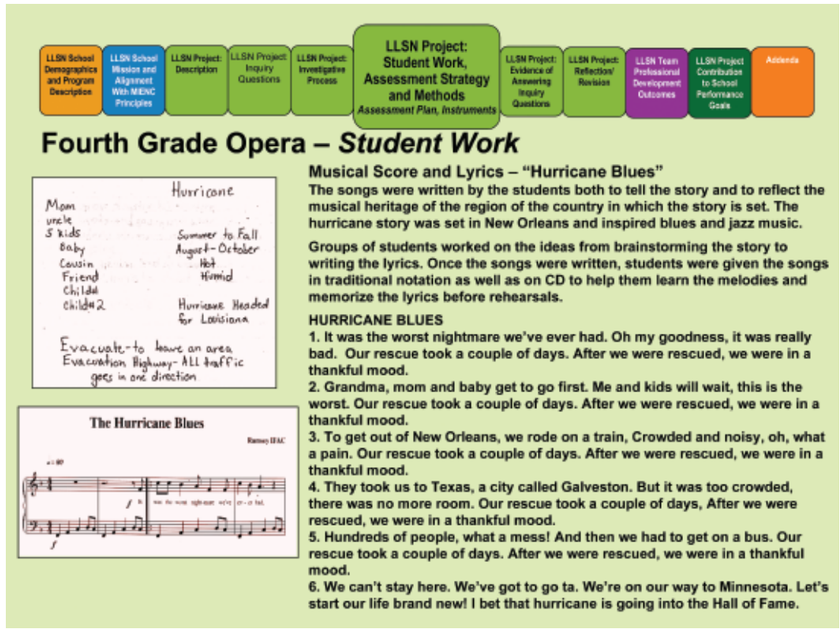
1. Tell what you have learned so far this year about an opera.

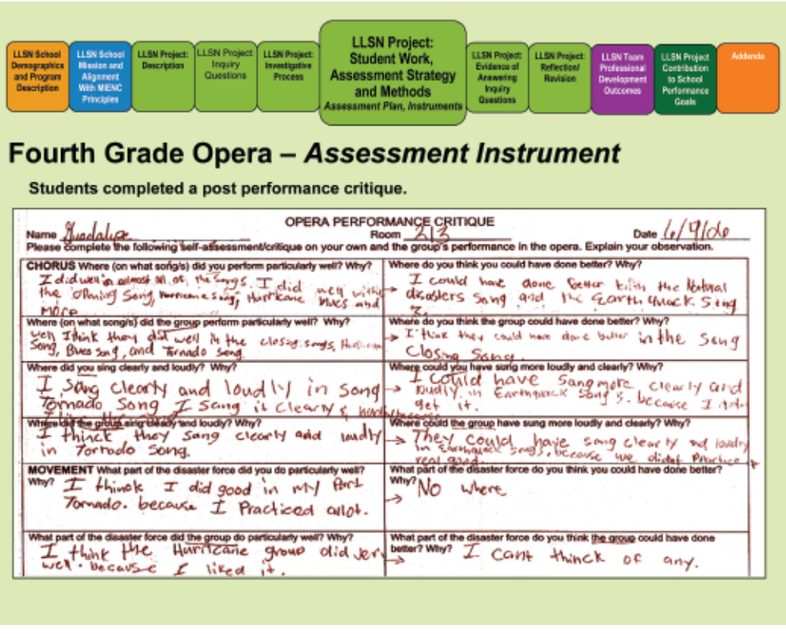
So far I have learned that you sing in a high voice and you need costumes, characters, a script and music. You need to know what ophelias are and ryans, all opera does? have to practice. It is a team thing so we have to work together.

2. We are about to begin this year's 4th grade opera. Describe all the things you can think of that you and all the 4th grade students will be doing to put on this opera. When the 4th grade gets on the opera we will have to practice our lines. We will have to work together. We need to follow the Director's instructions. We have to help eachother.

Dr. Dee Lundell, the LTMCG academic consultant, created multiple assessments for capturing and evaluating student learning in the opera project. Seen here is a sample student open-ended guided response assessment instrument developed for the opera project. This portfolio page reveals a clear conception of opera making as a collaborative process that requires attention to details of rhythm and rhyme in composition and ensemble performance.

Collecting individual student and group composition work samples is a critical strategy for evaluating the music literacy connections to opera making learning goals in music. Student engagement in the composing process takes many forms in the opera project. The artifacts in this portfolio page suggest how the brainstorming process and the final collection of verses for the 'Hurricane Blues' became part of the opera.





Opera project post-performance critique sheet captures stages of reflective thinking with regard to performance aspects of the project. The post-critique assessments revealed the extent to which students were able to discern and reflect on multiple aspects of the opera performance.

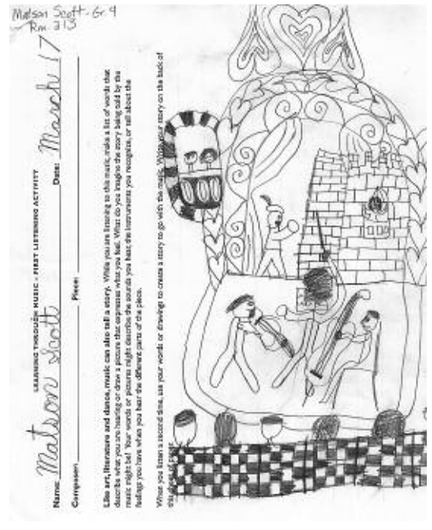
EVIDENCE OF STUDENT REFLECTIVE UNDERSTANDING OF OPERA

Ramsey's mission, "To engage all students' passion for learning in and through the arts," is fully embodied in the opera program, with learning activities in lyric and music writing and in costume, set and prop design and construction. All the 4th grade students take part in all aspects of opera production. Lessons take place throughout the school year and culminate in a 4-week period of intensive writing, rehearsing, and performance.

Teaching opera as an art form has become a more extensive component of the 4th grade opera project. Before the writing of the opera begins in the spring, students experience a number of lessons and field trips and work with visiting artists and the Kenwood pen pals. Activities include presentations by opera singers and a costume designer; a tour of the Minnesota Opera facilities; lessons on setting text to music with a visiting composer; "Ode" writing; attending an opera performance; and analysis of previous years' opera productions.

A Kenwood Orchestra Pen Pal and teaching partner point out details of a projected score from Puccini's 'La Bohème' for a fourth grade Learning Through Music unit on patterns in music and math.

A student illustrates the final scene from Puccini's 'La Bohème' where 'Mimi is dead and people are standing around her.' Another student states in an interview that the 'slow music sounds beautiful, like the Pachelbel Canon only with voices.'



A highly detailed and expressive student drawing submitted as a reflection on opera after seeing a live opera performance.

SUMMARY: OPERA LEARNING AND THE PRINCIPLE OF DIFFERENTIATION AND SYNTHESIS

The digital portfolios make clear that the opera project is aligned with the MIENC principle that "a comprehensive music program assumes its full power in education through the dynamic tension between music as a distinct authentic subject area and as part of a rich curriculum integrated with other subject areas." Thus, opera study and opera making serve as a medium and model for arts-integrated learning through music.

The portfolio examples also demonstrate alignment with national and district standards for both music and social studies. The fourth grade opera program is a year-long project with two strands of curriculum, opera as an art form and social studies. These two strands are taught separately and then integrated by students creating and performing an opera based on the broad social studies topic of 'Regions in the United States,' a topic that was of considerable interest to students due to their awareness of people needing to move from New Orleans to Minnesota because of Hurricane Katrina.

The underlying RUBRICS CUBE sequence ensures that student learning is well documented and assessed, and that teachers have multiple opportunities for reflection on the design and implementation of the unit as well as on its value to the school and its professional cultures. Through engagement in all aspects of this project, students come to understand that opera has a particularly rich tradition of addressing fundamental social issues while combining various art forms such as storytelling through musical composition and performing, which also depend on acting and movement and costume, set, and lighting design. Students also experience integrated learning by paying attention to fundamental concepts of social studies, language arts, and music literacy skill development. Through documentation and assessment practices, student work and assessment data in the Ramsey portfolio provided multiple ways of demonstrating learning and competencies.

AN EXAMPLE OF STUDENT SURVEY DATA ANALYSIS

Following the RUBRICS CUBE sequence from documentation to analysis of student work to test results, the following chart is an example of the data tallied over the year on students' progress of learning and their ability to identify the "ingredients" needed for an opera. These data summarize results from both the beginning-year pre-questionnaire and end-year essays. The teachers were able to use the data to reflect on the effectiveness of instruction and problems with consistency in individual assessment measures. Results indicate significant changes in knowledge about opera as an art form as the unit progressed.

Pre Opera Program Questionnaire

Average # of ingredients	1.2	Average percentage	9.0%
Range of ingredients	0-3.5	Range of percentage	0-26.9%
Median of ingredients	1.0	Median of percentage	7.7%

Post Opera Program Questionnaire

Average # of ingredients	4.2	Average percentage	31.9%
Range of ingredients	1.5-9	Range of percentage	7.7-69.2%
Median of ingredients	4.0	Median of percentage	30.8%

Tabulation of questionnaire results regarding knowledge of the structural components of opera making.

The final performance served as a culminating learning activity.

READING TO THE BEAT

A Learning Through Music-Language Arts Curriculum Intervention

Jennifer Vaillancourt and Dee Lundell

In music-in-education laboratory schools, it is not unexpected that teachers and consultants invent new ways to incorporate music into the curriculum. In this case, Jennifer Vaillancourt, Sandi Likely, and LTM Consultant Dee Lundell initiated a pilot study focused on the effects of music for Ramsey's most challenged third grade readers.

THE PROBLEM

Some students arrive in third grade at Ramsey without having mastered high frequency/sight words. This interferes with fluent reading and affects their comprehension. They are identified as struggling readers and need a major intervention to catch up with grade level reading skills. The students demonstrate disfluent, choppy oral reading. There is little to no automaticity in their reading and thus no smooth "flow."

THE INQUIRY QUESTIONS

- How can music be used to actively engage the students in learning and developing automaticity of high frequency/sight words that will increase their reading fluency?
- More specifically, will using rhythmic beats using rhythm sticks and taiko drums increase the fluency of sight/high frequency words?
- What is the effect of drumming in a circle?

THE LEARNING THROUGH MUSIC PLAN: A DRUM CIRCLE/RHYTHM STICK/WORD FLUENCY INTERVENTION

STEP 1: Identify concepts and processes shared between language reading and music

Because the classroom teacher, Jennifer Vaillancourt, and special education teacher and taiko drummer, Sandi Likely, were part of the LTM project, they decided to design an intervention by looking at the concepts, processes and skills shared between music and language reading to design lessons for increasing the fluency of sight/high frequency words.

Students lacking word fluency skills read slowly, a word at a time, often pausing between words or phrases; they make frequent mistakes, ignore punctuation marks, and read in a monotone. Fluent readers know the words automatically and therefore move easily from word to word. Thus, the collaborative team found that skilled music performance and proficient sight word reading skills share the following concepts and qualities:

- *Rhythm*: movement, flow; characterized by regular recurrence of beat, accent
- *Tempo*: the speed at which a task is performed with a good pace and with phrasing and expression; rate of activity, timing
- *Fluency*: flowing smoothly; ease in speaking, performing, problem solving

COMMENTS ON THE OPERA PROJECT FROM THE RAMSEY TEACHERS

Most of Ramsey's teachers bring their classes to the opera performance. Comments from classroom teachers, music teachers, and parents (Figure 50) reinforce the value of the program from the whole-school perspective (RUBRICS CUBE Rubric 7):

"I take my students every year to see the 4th grade Opera because they get excited to see what they're going to be doing next year."
--3rd grade teacher

"I notice my kids know a lot about Minnesota history because that was the topic of their opera the previous year."
--5th grade teacher

"This year's was the best ever. Really liked the balance of singing, dancing, solos…and the sets were fantastic. First time ever that strings were incorporated. It was apparent in this opera that all kids had both chorus and stage time."
-- Spanish Fine Arts teacher:

"Really liked the involvement of all the students. Didn't remember that we had that many involved in the past… Could understand all the words. Very well done."
-- Music teacher:

"Greatest yet. Loved the involvement of all the students. Noted the positive climate between audience and students."
-- Another Music teacher:

"Congrats. I had a great discussion with my students about natural disasters following the opera and found that my students didn't know much about earthquakes."
--5th grade teacher:

"I didn't bring my video camera because I thought it would be just another kid's school performance. This was so much more. I regretted not having my camera, but now that I know the school has a DVD of the performance, I'm definitely buying one."
--4th grade parent:

"I can't wait until I'm in 4th grade so I can be in the opera."
-- Younger sibling of 4th-grader

Student, classroom teacher, and music teacher comments on the Ramsey Opera project.

MS. LIKELY WOULD SET THE BEAT WITH THE DRUM. THE BEAT STARTED AT ABOUT 1 BEAT PER SECOND TO GIVE THE STUDENTS A CHANCE TO COORDINATE THE BEAT WITH READING THE WORD. THE STUDENTS COPIED THE BEAT WITH THEIR RHYTHM STICKS. ONCE THE BEAT WAS WELL ESTABLISHED, MS. LIKELY ANNOUNCED THE LIST TO BE READ. THEN SHE CUED THE CLASS WITH "ONE, TWO, READY, READ!"

Professional development for teachers at Ramsey included drum circle facilitation with rhythm sticks provided by musician and music therapist Kathy Quain from Music in Schools Today, a Learning Laboratory School Network member in San Francisco.

- *Confidence*: belief in one's own abilities
- *Automaticity*: rapid, accurate, reflexive action as the result of conditioned reflex and without the need for further thought

STEP 2: Create a drum circle to change the social dynamic in the classroom.

Students who are poor readers tend to avoid reading. By third grade they usually have experienced many failures and/or embarrassing moments when asked to read aloud in the classroom. Often this leads to them not feeling part of the group. Having the students gather in a circle can help create community; in the circle there is no hierarchy and a sense of equality prevails [Stevens 2003, p.16]. The activity of group drumming alone inspires success and creates a common pulse that builds unity [Ibid., p.13]. A state of flow can be accomplished in a drumming circle. Students can meet the flow criteria of loss of self-consciousness and feel challenged and capable.

STEP 3: Embody word recognition by performing words with rhythm sticks.

The use of rhythm sticks in a drum circle is a purposeful, multi-sensory strategy to engage word fluency skills in musical performance. Drawing on the premise [Jensen 1996] that "when information is imbued with music, there's a greater likelihood that the brain will encode it into long-term memory" and that drumming would get the students immersed a "flow" state in which one "loses oneself'" in the skilled performance [Ibid., p.43; Csikszentmihalyi 1991], the team decided that the instructional strategies/activities would include the use of rhythm sticks, taiko drum, Fry's Instant Word list, choral reading, drum circle, and call and response.

IMPLEMENTATION AND ASSESSMENT GOALS

The instructional intervention activities for the 45-minute reading class included work on phonics rules, repeated practice reading easy text, work on comprehension, and practice identifying and reading sight words in conjunction with using the rhythm sticks in drum circles as a strategy for activating high frequency/sight words through the musical processes engaged in rhythmic performance. Learning goals for the 45-minute reading class were (a) to increase student speed, fluency, and confidence when reading words from the Fry Instant Word list in rhythm, and (b) to move these students from slightly below grade level to grade level reading as measured by the District Curriculum Based Measures of reading skills.

DESCRIPTION OF BELOW GRADE LEVEL STUDENTS

Of the 88 third grade students enrolled in September 2004, ten students were assigned to the below grade level (BGL) reading intervention group. All of these students demonstrated reading that was halting and slow. They had difficulty with sight words, showing no automaticity. Most of the high frequency words are not phonetically regular. Phonics strategies don't work for sight words, and the students didn't understand this. They did not have immediate recognition of these words, which slowed their reading and naturally affected their comprehension.

LESSON DESIGN ELEMENTS

The collaborative team decided to use Edward Fry's Instant Word list of 1000 most common words. The lists are broken up into blocks of 100's. The "first twenty-five words make up about a third of all printed material," while the first 100 "make up about half of all written material" [Fry 2004 p. 23; Beers 2003 p. 327]. The team used the words in block lists of 25 at a time. Each list increased in difficulty. List 1-25 was much easier than list 101-125. Over the year, only the first 300 words, those that are common through 3rd grade, were used in these lessons. If a child can read all 300 words, s/he knows about 65% of all words in any book. [Beers 2003 p.327]

For ten minutes two or three times a week, the students and two teachers were gathered in a circle on the floor. Each student and one teacher had a pair of rhythm sticks. One teacher had the "taiko" drum. The taiko-like drum was made from half a globe with the opening covered in booktape. This "taiko" drum was easy to store and transport. Everyone had a paper with a group of 25 words from Fry's list. The class started with Group 1a, the 25 most common words found in any book.

THE INTERVENTION METHODS

Ms. Likely would set the beat with the drum. The beat started at about 1 beat per second to give the students a chance to coordinate the beat with reading the word. The students copied the beat with their rhythm sticks. Once the beat was well established, Ms. Likely announced the list to be read. Then she cued the class with "one, two, ready, READ!" The class read the list—one word per beat. The routine was generally as follows, but because this was an organic, living process of student involvement, it varied creatively as the students succeeded. The variety was necessary to keep students engaged.

The class would read the list to a slow or moderate tempo. Tempo had a powerful effect of creating feeling or mood within the drum circle. Research [Marsalis 1992, p.35; Byrne, et al. 2002] has found in creating optimal experience that activities become rewarding experiences if the activity is structured so that the students' skills are matched with the challenge of the action. Accordingly, the initial beat proceeded at a slow tempo. However, if the tempo was too slow, individual students would start putting in counter-beats and the class would lose the rhythm. As the students got into the flow or 'groove' of successfully reading the list (usually within 3-4 times), the tempo would be increased.

The list was read in sequence. As the class was successful with the list, Ms. Likely would present them with challenges (e.g., dividing the class in half, with each half reading every other word; dividing the class into boys and girls reading every other word). Further variations were employed to prevent students from learning by rote:

- The list was read from the bottom up or they would read only the odd (or even) words.
- Students read the list softly or loudly.
- As students were successful, variety was introduced.
- As the class was successful, they would move on to a more difficult list for 3 or 4 mostly successful times.
- The class would revisit a previously successful list and speed up the tempo.
- When a class was successful on a given list, students took turns leading the circle, setting their own tempo.

As suggested by Byrne, et al. (2002), when the students' reading while drumming became automatic, they lost their hesitancy and apparent self-consciousness about reading aloud [3].

TIMES FOR INDIVIDUAL STUDENTS
READING OF HIGH FREQUENCY/SIGHT WORDS

READ	COLD READ	8th day of PRACTICE	COLD
	(pre-test)	(practice effect)	(post-test)
STUDENTS	Group 1a 1-25	Group 1a 1-25	Group 2a 101-125
A	13	8	15
B	18	13	15
C	16	11	18
D	17	11	17
E	18	9*	11*
F	18	11*	11*
G	20	15	17
H	21	9*	12*
I	23	13*	13*
J	13	9	13
Average	17.7 (r=13-23)	10.9 (r=8-15)	14.2 (r=11-18)

* = Highest reate of improvement from the pre-test to treatment or post-test.
The highest rated of fluence within each test is marked by yellow highlight.

The data presented here show that all students in the LTM reading intervention cohort were able to improve their reading fluency in practice trials, and that 6 out of 10 students improved on their post-test scores.

3RD GRADE DISTRICT CURRICULUM BASED MEASURE (CBM) SCORES

[correct number/minute]

(77/wpm is the third grade level standard for fall 2004)

STUDENTS	FALL 2004	WINTER 2005	Fall-Spring SPRING 2005	Pre-Post
A	81	86	90	+9
B	67*	79	85	+17
C	83	97	114	+31
D	61*	81	99	+38
E	86	113	122	+36
F	67*	82	102	+35
G	58*	85	NA	NA
H	63*	97	91	+28
I	67*	79	89	+22
J	86	106	121	+35
Average	71.9	90.5	101.4	27.9

*significantly below MPS grade level expectation in the fall of 2004

yellow highlight = highest level improvement from fall to spring test results

The data show that all students in the LTM reading intervention cohort improved in pre-post tests of word fluency, though the intervention appears to have affected some students much more than others.

THE DATA

The students were given a group of words from Fry's List of Instant words to read in a "cold read." They had as much time as they needed to complete the reading. The students were provided unknown words after three seconds. The times for reading the high frequency/sight words are listed in the table on the previous page.

The preliminary results of the drum circle intervention and its impact on word fluency post-test scores are impressive. On the cold read pre-test of the first group, it took the students a range of 13-23 seconds to read the list correctly with an average rate of 17.7 seconds. After 8 days of 10 minutes practice each day, the range of seconds for correct reading had fallen to 8 to 15 seconds with an average rate of 10.9 seconds. The cold read post-test range was 8-15 seconds with a 14.2 average, an improvement of 3.5 seconds over the average of the pre-test, a finding that stands as persuasive evidence that the intervention significantly improved sight word fluency.

Furthermore, individual analysis indicates that four of the five students who improved the most in the intervention timing (as indicated by asterisks in the middle column for students E, F, H, and I) were also the most improved on the second cold reading (also marked by asterisks in the right column). Evidently rhythm-based practice with word reading appears to improve cold reading fluency scores.

Note also that two students (A and J) who recorded fast times in the intervention tasks (marked by yellow), did not improve on their post-test timing. For the reading specialist, the reason for poor word fluency scores on the part of these students probably is predicted by other cognitive challenges to word fluency not addressed by the social and musical-cognitive effects of the rhythm stick circle intervention.

The Curriculum Based Measures test results for the intervention students are shown above. First, it should be noted that all LTM intervention students had met fall Grade 3 level standards by the winter of the academic year. These scores suggest that these students were delayed in the word reading proficiency level by only a few months, yet they all made substantial progress by increasing their average word proficiency rating by 28 words per minute in conjunction with the rhythm stick circle intervention.

In the case of intervention effects transferring directly to CBM scores, the results are less conclusive. Three of the four students who showed the most dramatic changes in word fluency scores at first did improve dramatically on their word fluency (CBM) test scores. Unfortunately, the teachers did not keep records of follow-up word fluency tests, so it is impossible to know which students benefited most from the word fluency intervention by the end of the year.

However, this much we do know: when comparing word fluency performance (CBM scores) between the fall of 2004 and 2005, there was a positive change in grade level ratings. In the fall of 2005, six out of ten students registered 10 or more words per minute lower than the district standard for grade three (see table on left). In 2006 only one of eight students returning to Ramsey received this negative rating (see table on right).

In addition, four of the eight students in the intervention study who planned to return to Ramsey in the fall of 2006 (one moved at the beginning of the year) were placed in 'at grade level' reading groups (see table on right).

WHAT THE TEACHERS LEARNED

From the RUBRICS CUBE system point of view, this study demonstrates teacher professional development as music-in-education action researchers. A third grade teacher and a special education teacher-musician, both guided by LTM consultant Dr. Dee Lundell, started with inquiry questions based on the Learning Through Music frameworks, and the LTM team devised a language arts intervention that led to many kinds of outcomes.

How can music be used to actively engage the students in learning and developing automaticity of high frequency/sight words that will increase their reading fluency? The answer comes from the description of the intervention itself and the evidence of its effects on the experimental subjects in this study. The evidence presented here suggests that using rhythmic beats with rhythm sticks and taiko drums increases the fluency of rehearsed sight/high frequency words and, in some cases, predicts faster processing of new groups of sight words. Anecdotal evidence of the effect of drumming in a circle describes the enthusiasm of students who had begun to disengage from conventional instructional practices.

As seen above, the curriculum design was clearly focused on the application of musical processes and concepts to solving symbolic literacy problems that occur in both language and music reading. In the integration of both disciplines, students benefited from a 'flow condition' of translating symbols to action fluently and meaningfully in conjunction with rhythmic performance. The student performance documentation and assessment methods capture the effectiveness of this integration of rhythm reading, though it is most unfortunate that the data collection was limited to the early stages of the project. Clearly the intervention results, though preliminary, demonstrate both the promise and challenges of conducting action research in schools when faculty are responsible for both teaching and documenting the progress of new strategies for engaging 'at risk' readers in an urban school setting.

As the classroom LTM intervention continued throughout the year, the classroom culture changes were noteworthy. Students became immersed in the drumming. They got into the "flow" and were enjoying it, and as a result became active and involved readers in class and at home. As the classroom teacher Jennifer Vaillancourt recalls,

> "One of the students had become so involved with the drumming rhythm that when he sat reading silently during his other reading activities (SQUIRT), he tapped a steady rhythm on his desk. Another student improved so much in reading fluency that in fourth grade she has become an avid reader, reading a grade level chapter book almost daily. Her parent also reports that she now reads daily at home."

4TH GRADE DISTRICT CURRICULUM BASED MEASURE (CBM) SCORES

[correct number/minute 4th grade]

(94/wpm is the fourth grade level standard for fall 2004)

STUDENTS	FALL 2005
A	90
B	74*
C	102
D	101
E	107
F	89
H	101
I	NA

*Students significantly below grade level in fall of 2005

Highlighted in yellow are the fourth grade students placed in grade level reading groups at the beginning of the year

The data show that only one LTM intervention student is significantly below reading level by the fourth grade; only 3 out of 7 students were admitted into grade level reading groups.

THE EVIDENCE PRESENTED HERE SUGGESTS THAT USING RHYTHMIC BEATS WITH RHYTHM STICKS AND TAIKO DRUMS INCREASES THE FLUENCY OF REHEARSED SIGHT/HIGH FREQUENCY WORDS AND, IN SOME CASES, PREDICTS FASTER PROCESSING OF NEW GROUPS OF SIGHT WORDS. ANECDOTAL EVIDENCE OF THE EFFECT OF DRUMMING IN A CIRCLE DESCRIBES THE ENTHUSIASM OF STUDENTS WHO HAD BEGUN TO DISENGAGE FROM CONVENTIONAL INSTRUCTIONAL PRACTICES.

In terms of contribution to the Ramsey School and the field of music-in-education, this study provides a model for teacher action research that, if pursued further, will lead to more sophisticated and generalized results based on the following questions:

- Will drumming have an effect on increasing the fluency rates on the 'above grade level' and the 'at grade level' readers?
- What effect does rhythmic drumming to increase automaticity of high frequency/sight words have on students' attitudes toward reading?
- What effect does reading to rhythmic drumming have on students' attitudes toward recreational and academic reading?
- "Reading to the beat" was done with a

small group. How can the strategy be used effectively with a regular class size of 28?

- How do CBM scores measuring fluency compare to music reading fluency?
- Would adding musical accompaniment to the rhythm drumming increase the rate of fluency or increase attention to the drumming activity?

THE RAMSEY LEARNING LABORATORY SCHOOL DATA ANALYSIS GALLERY

Statistical Evidence of the Positive Relationship between Music Skill Development and Academic Achievement

Larry Scripp, Beth Hulteng, Jane Mason, and Corey Sevett

The previous LTM intervention model emanated from a classroom teacher's desire to solve reading fluency problems through music. This intervention design, implementation, analysis, and publication indicated evidence of teacher professional development outcomes, curriculum design, innovative teaching, documentation and assessment of student work, whole school improvement, and contribution to the field of music-in-education (Rubrics 2-8),

In this section, the Ramsey Learning Laboratory School program features a gallery of statistical findings related to music learning skills aligned with instrumental and vocal national reading standards and their relationship to academic achievement. Each of the exhibits is based on analysis by the NEC Research Center of data collected by the Ramsey LLSN team.

Taken together, these data displays represent findings that tell a story about the value of systematic assessment of music learning, teacher response to assessment data, and the consequent evidence of music's contribution to learning across the elementary school curriculum.

Ramsey students learn sight reading skills and develop their posture, position, and technical skills on the violin.

PROFILES OF MUSIC READING SKILL DEVELOPMENT IN THE GENERAL MUSIC CLASSROOM AND STRING INSTRUMENT PROGRAM

The gallery tour begins with pre-post assessment profiles of general music and string class music reading skill achievement.

Jane Mason (general and vocal music teacher) and Corey Sevett (LTMCG music consultant) used the New England Conservatory Music Literacy Skills Test to track general music students' ability to perform a variety of music performance tasks by (a) listening to, clapping, reading, writing, and analyzing rhythm patterns, and (b) listening to, singing, reading, writing, and analyzing pitch patterns. These measures were chosen, implemented and validated by Jane Mason, the music teacher, with guidance and participation from LTM music consultant Corey Sevett. They asked: *To what extent are skills improving over time? What are the chief weaknesses in their performance skills? To what extent is music reading skill linked with basic word fluency skills and with academic achievement tests in reading and math?*

Keeping detailed records of music reading skills in both general music and string programs required of all K-6 students at the Ramsey school is highly unusual, if not unprecedented in public school music programs today. As part of a prototype Music-in-Education Learning Laboratory School, Ramsey teachers not only participated in the adaptation of the tests and data collection, but conferred with consultants to better understand and more productively interpret findings. Because music teachers keep students across academic school years, pre-post tests become part of the longitudinal landscape of music learning that make it possible to adjust instruction as the data begins to answer the teachers' inquiry questions.

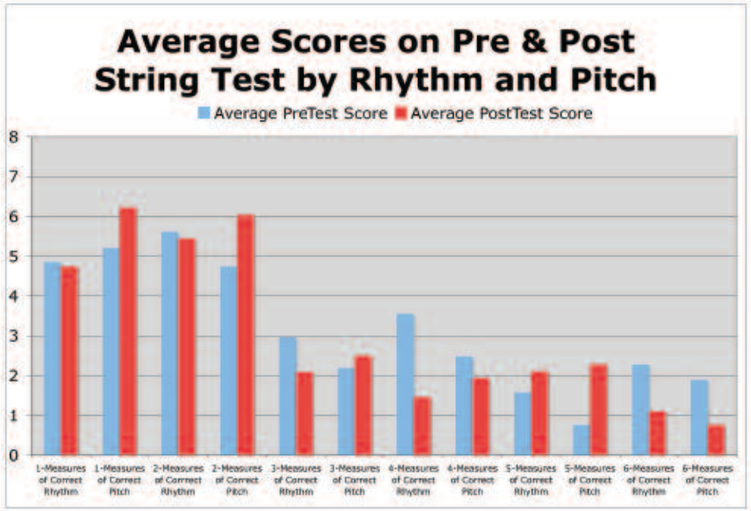
STRING INSTRUMENT ASSESSMENT AS 'REFLECTION IN ACTION'

The second exhibit displays sight reading test scores from Beth Hulteng's string classes. Beth already had experience with action research methods through the

DATA DISPLAY GALLERY EXHIBIT 1

Pre and Post-Test General Music Class Reading Profiles (Fall 2005 and Spring 2006)

FINDING: All music students at Ramsey can be rated for music reading skill ability according to a graduated test of their understanding of rhythm (clapping) and melodic (singing) patterns. Students improved on 8 out of 10 measures of music reading skill, especially with regard to improvement with rhythm error detection skills, perhaps the most sophisticated of all the rhythm tasks.



Pre-Post test results from the NEC Music Literacy Skill Test from Fall 2005 to Spring 2006 provide a profile of the relative difficulty of the rhythm and pitch literacy tasks for a random sampling of Ramsey students in Jane Mason's general music classes. Jane was pleased with the overall improvement in scores, but, after further analysis of the scores, has vowed to work on what she views as the weakest link (pitch matching and singing from notation) in the next semester's classes.

Jane Mason was delighted to find out that her students improved in most measures of rhythm and pitch performance skills. For the first time, she now had substantial evidence of her students learning in the context of her traditional and innovative Learning through Music lessons in her general music classroom.

The profile also provided insight as to the progression of the tasks themselves. She discovered that, in the pre-test, the tasks were all progressively more difficult for the students. Taking that information, Jane decided to emphasize more the distinction between beat and rhythm and, as a result, the post-test reveals solid progress in that area.

Jane learned that error detection skills in rhythm have become a prominent skill for her third graders, indicating that students are now much better able to discriminate between what is written and what is performed in their music classes.

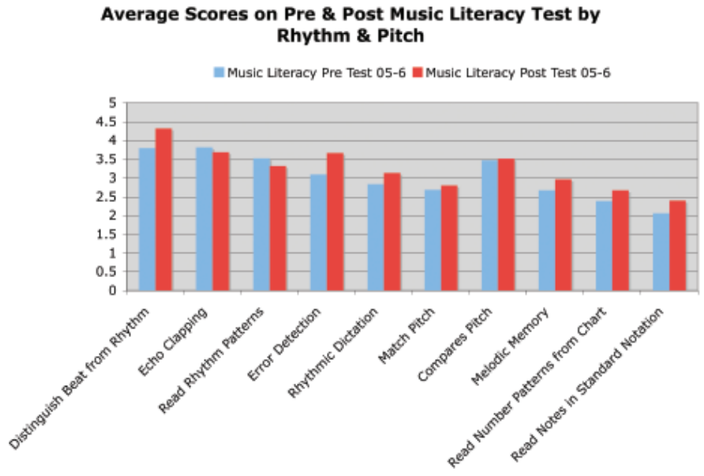
Jane Mason, general music teacher and vocal program director at the Ramsey School, incorporated Learning Through Music curricular innovations and assessment tools into her classroom teaching.

Her new inquiry questions now focus on pitch skills. Why is accurate pitch matching with the voice more difficult for her students than singing melodic patterns? Jane feels that improving pitch matching would result in higher confidence in sighting skills in class, as well as higher scores on most aspects of the pitch tasks in the Music Literacy Skills test.

DATA DISPLAY GALLERY EXHIBIT 2

Pre and Post-Test String Instrument Music Reading Profiles (Spring and Fall 2006)

FINDING: All students at Ramsey can be rated for their music reading skill ability according to a graduated test of their understanding of rhythm and melodic patterns on a stringed instrument. Comparisons between pre- and post-test data were mixed, suggesting that music reading skills on the violin are not yet fully stabilized by the fourth grade.

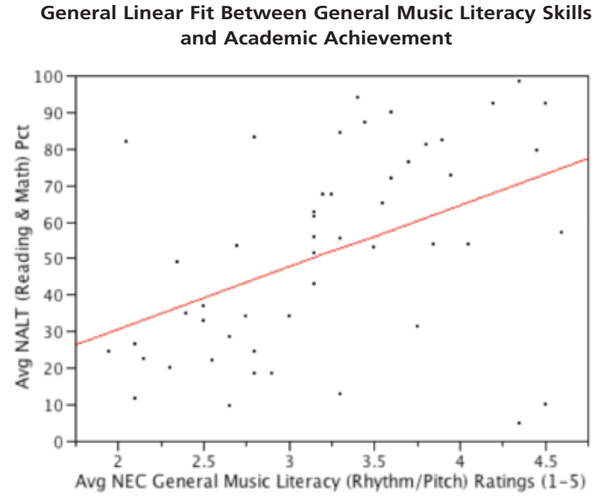


Results from an adaptation of the Watkins-Farnum Music Reading Tests originally designed for high school music students. The precipitous drop in scores starting with task 3 indicates a categorically different level of sight reading skill. The mixed results in pre-post test scores suggest that these levels of sight reading skill are unstable and subject to the particular repertoire rehearsed previous to the testing period.

DATA DISPLAY GALLERY EXHIBIT 3

Bivariate Relationship Between General Academic Percentiles and Averaged Music Literacy Scores

FINDING: There is a significant, positive relationship between averaged academic skills (language and math) and the understanding of non-instrumental music literacy skills consistent with the hypothesis that music and academic skills share fundamental literacy concepts and processes and may be enhanced by their interaction in music and music- integrated units.



This scatterplot reveals a positive linear fit between general music reading skills and Northwest Assessment Levels Test (NALT) academic achievement percentiles based on data collected in the fall of 2006 by the LLSN project members at the Ramsey school. The linear fit and correlation between these data is statistically significant ($p < .0001$), though music reading scores may only explain 20% of the variance in academic achievement ($n = 55$; $r2 = .20$; F ratio $= 12.66$).

school district's professional development program. Her research in the past centered around differences in how students understand the musical staff system and, much like the rhythm stick intervention described previously, an investigation of teaching methods and materials that may help accelerate slow or inaccurate music readers.

The data collected in the spring (third grade) and then fall (fourth grade) of 2006 is somewhat puzzling [see above]. It appears that pitch skills are improving in the first two less difficult sight reading examples while the rhythm is holding steady.

Then there is a huge drop off in sight reading skill in the last four items, with some items improving and others worsening on the post-test. When asked to explain the lack of stability in sight reading skill development over time, Beth responds that the latter scores reflect the context of the class repertoire. That is, sight reading scores are affected by how well the scale (fingering) or rhythm (bowing) patterns employed in the semester's concert repertoire match up with the key and rhythm challenges of the particular test items. Her goal over the next two years is to provide enough experience reading music in different keys so that disparities in particular sight reading tasks results will no longer depend on the most recently rehearsed scales or most frequently performed melodies, but would instead reflect a stable of sight reading skills across a wide variety of melodic structures.

Reflections by students after the performance tasks provided additional insight into the value of tests for Beth's students. Reviewing videoclips of the string instrument testing process, Beth and other teachers took notice when one student remarked that the tests "allowed me to see what was coming next in the string classes and what I should be working on more." Consequently, the assessment profile has become a generative tool for discussing learning goals in the string instrument studio classroom.

DETERMINING THE STATISTICAL RELATIONSHIP BETWEEN GENERAL ACADEMIC ACHIEVEMENT AND MUSIC READING SKILLS

In the exhibits following, *scatterplot data displays* allow Ramsey teachers to see each student's standing in an amalgamated rating of music reading skill development (rhythm and pitch task ratings) in relation to general academic achievement (averaged reading and math standardized test scores). *Linear fit modeling* allows teachers and administrators to understand the overall relationship between music skill development and academic achievement.

From the perspective of the MIENC Laboratory School RUBRICS CUBE System, revisions of teaching practices that draw on discussions about the interpretation of these kind of data constitute substantial evidence of professional development outcomes that can reinvigorate music-in-education curricular design and teaching practices for years to come.

In the first display of this exhibit above, Jane Mason marveled at the close relationship between general music class reading skills and overall academic achievement ratings for her students. She was also mightily concerned for the exceptions to the statistical pattern. She asked, Who were those two students in the bottom right hand corner who performed very well in music literacy tests and yet showed no evidence that their music skills were connected to academic learning? And, vice versa, she wondered, Who was that one student in the top left corner who does well in language and math, but has not figured out how they connect to music reading? And what can we do for the students in the 'southwest corner' who are equally poor at music and academic skills tests?

THE INCREASING STRENGTH OF CORRELATION BETWEEN INSTRUMENTAL MUSIC READING SKILL AND ACADEMIC ACHIEVEMENT OVER TIME

Exhibits 4 & 5 (pre- and post-test results) examine the relationship between academic achievement and instrumental music reading skills.

The positive relationship between music reading and academic achievement is similar to the general music data displayed above; however, the linear fit and explained variance are considerably more powerful with respect to 'cold reading' skills executed on a string instrument.

Note in the plot in Exhibit 6, the outliers that appeared in the general music classroom did not obtain in the string instrument reading data. However, much of the correlation predicts mutually ineffective levels of academic and music literacy achievement (in the 'southwest corner').

UNDERSTANDING THE 'DEGREE OF INTERCORRELATION' BETWEEN MUSIC READING AND GENERAL ACADEMIC OUTCOME VARIABLES

Teachers are sometimes delighted and puzzled by the positive intercorrelation of test results. As indicated in other RUBRICS CUBE based analyses [see Scripp & Reider 2007], correlations can imply causal links in learning transfer, indications of the coherency and rigor of integrated learning, and/or evidence of embedded concepts or processes intrinsically shared across disciplines.

The table in Exhibit 6 shows that reading skills across disciplines at Ramsey are highly positively intercorrelated. Taking into account Ramsey's arts learning mission and its commitment as a music-in-education learning laboratory school, intercorrelations suggest evidence of music and music learning integration is occurring by design.

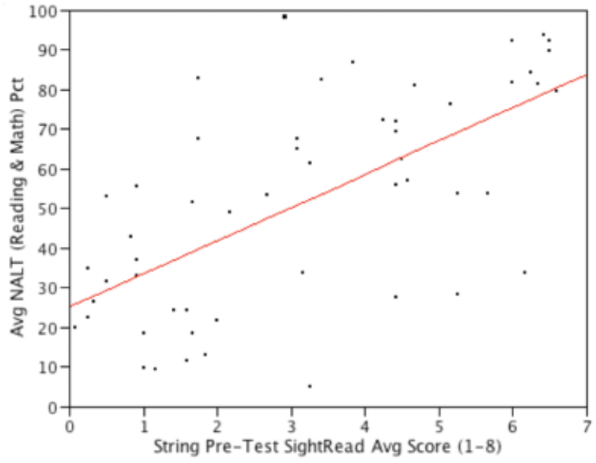
The table shows that both general music and string instrument performance measures of music literacy correlate highly and significantly with both the CBM word fluency tests (described in the drum-rhythm stick intervention above) and

DATA DISPLAY GALLERY EXHIBITS 4 & 5

Differences in Pre-Post Bivariate Relationship Between String Instrument Sight Read Skills and Academic Achievement

FINDING: Pre-Post comparisons between averaged academic skills (language and math) and the understanding of instrumental music literacy skills reveals an increasingly strong, positive relationship between these two factors. The growing correlation is consistent with the hypothesis that music and academic skills share fundamental literacy concepts and processes that may be enhanced further through their implicit or explicit interaction in music and music-integrated classes over time.

PRE-TEST General Linear Fit Between String Instrument Sight Reading Skills and Academic Achievement (Spring 2006)



This scatterplot reveals a positive linear fit between general music reading skills and Northwest Assessment Levels Test (NALT) academic achievement percentiles based on data collected by the LLSN project members at the Ramsey school. The correlation between these data is highly significant ($p < .0001$), and string instrument reading scores explain 40% of the variance in academic achievement ($n= 55$; $r2 = .40$; F ratio = 36.08).

NALT tests of math and reading achievement. What is astonishing to teachers and administrators at Ramsey is that string reading test scores predict overall academic achievement in the NALT test (see line four, r=.66) as reliably as do the CBM test scores (line one, r= .68). Is it possible that music assessments represent a bridge to academic learning on a par with other interrelated academic tests?

SUMMARY: PROGRAM INNOVATION, SCALE-OUT PLANNING, AND FUTURE COLLABORATIONS

After four years the Ramsey-LTMCG partnership evolved into the creation of a prototype music-in-education laboratory school. At Ramsey music has become a strategic priority for fulfilling their mission for arts and arts-integrated learning for every child. The LTM Consulting Group carried out a number of initiatives, starting with the Kenwood Symphony Orchestra Pen Pal program, that led to the creation and ongoing development of music and music-integrated curricular units that continue to engage students' curiosity for learning concepts and skills shared across disciplines yet always linked to their musical studies.

Following the RUBRICS CUBE sequence, this "learning laboratory school" generated a series of case study portraits and portfolio collections that, taken together, illustrate:

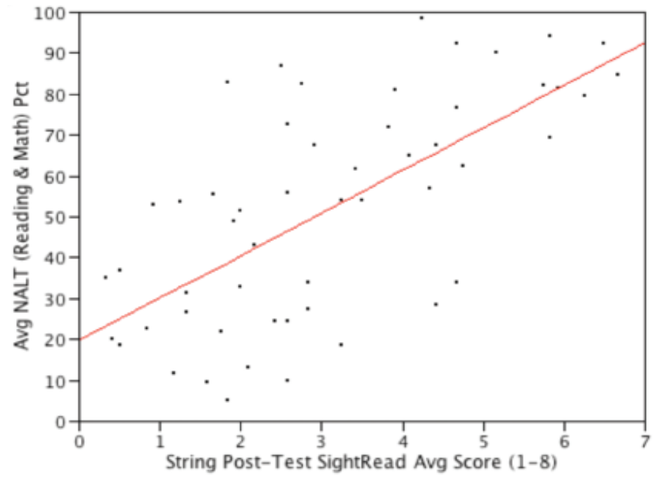
- Key prototypical features of the MIENC Learning Laboratory School Network, such as (a) a commitment to authentic, comprehensive, and interdisciplinary music learning for all children, (b) the leveraging of arts and higher education partners to support action research processes as a method for music-integrated learning program development and teacher professional development, and (c) dedication to building the capacity for a culture of inquiry, documentation, and evidence;

- Critical supporting roles for teachers, music specialists, community musicians, and consultants in the development of learning through music program practices, such as (a) pen pal programs that include community musicians as private lesson instructors, small ensemble coaches, teacher aides, coaches, and classroom teachers, (b) guided practice consultants who collaborate with teachers on curriculum development and assessment practices, (c) support for opera making as a year-long and multifaceted thematic interdisciplinary project;

- The design of sample Learning Through Music curricular interventions that address the challenges of students who are performing below grade level and having trouble with music reading skill development;

The post-test data display indicates that the relationship between string instrument and academic skills tests has grown stronger over a period of six months. This finding re-affirms findings in the previous case study and elsewhere in this Journal [Scripp & Reider 2007] which suggest that a growing positive correlation between music literacy skills and academic achievement becomes stronger over time. While general music literacy skills appear to be a major factor in earlier grades in the previous studies, it appears that the correlation between string instrument music reading and academic achievement explains twice the range of variance when compared to general music literacy skills at Grade 4.

POST-TEST General Linear Fit Between String Instrument Sight Reading Skills and Academic Achievement (Fall 2006)



This scatterplot reveals a positive linear fit between general music reading skills and Northwest Assessment Levels Test (NALT) academic achievement percentiles based on data collected by the LLSN project members at the Ramsey school. The correlation between these data is highly significant ($p < .0001$), and the Post-Test string instrument reading scores explain 44% of the variance in academic achievement ($n=55$; $r2 = .44$; F ratio = 40.73).

- Statistical analyses and findings that shed light on the relationships between music and academic learning in the context of music integration practices that can guide further development of Learning Through Music practices and interventions; and

- the tracking of action research processes and their impact on eight key program outcomes, which is assured by employing the MIENC Digital Portfolio system based on the RUBRICS CUBE Framework as a professional development tool for teachers.

Data processed from music instruction in general and string instrument instruction in particular already demonstrates music's deep and generative relationship to learning across the curriculum. From the LTMCG perspective, evidence gathered from the Ramsey Learning Laboratory Program is showing how music can function as a 'language of learning' that connects with math and language achievement through deeply interconnected symbolic literacy and metacognitive processes embodied, for example, in the Music Matrix exhibit, the opera making projects, literacy interventions, or the artifacts from the Conservatory Lab Charter School Case Study presented earlier.

In the future, the LTMCG intends to sponsor (a) cultural and therapeutic drum circles to explore social-emotional understandings of music, (b) interdisciplinary assessment methods to detect connections between musical analysis and math, (c) songwriting to enhance creative writing skills, and (d) digital composing to facilitate systems thinking in science in the upper elementary and middle school grades.

PLANS FOR THE DISSEMINATION OF LEARNING LABORATORY SCHOOL PRACTICES

The scaling out of Learning Through Music has already begun. In a research plan already approved by the University of Minnesota (UMN) Internal Review Board and the Minneapolis School District (MPSD), the Ramsey-LTMCG program will serve as the basis for an Arts Learning Leadership (ALL) Program beginning in the fall of 2007. This ALL Program will establish:

- a reliable means of assessment that will allow objective evaluation of learning outcomes as a result of the Learning Through Music program;

- a Guided Intern Program, in collaboration with the University of Minnesota (UMN) School of Music, that will place qualified Music Education students as 'guided interns' at Ramsey IFAC and will facilitate the dissemination of this program to other MPS sites in the later stages of this research project; and

- an Arts Learning Leadership Teacher Research Advisory Team, consisting of both MPS teachers and UMN students

DATA DISPLAY GALLERY EXHIBIT 6
Music Reading and Academic Achievement Intercorrelation Table

FINDING: There are significant, positive correlations among almost all pairwise comparison between academic and music literacy skill development. The single exception occurs with general music literacy skills and word fluency (CBM tests described in the intervention study above). This exception suggests that more sophisticated forms of intervention may be necessary to strengthen the relationship between music reading and language word fluency.

Nonparametric Spearman's Rho (rank order correlations)

Variable	by Variable	Spearman Rho	Prob value
CBM Measure	Avg NALT Percentiles	0.6818	<.0001
General Music Literacy Test Avg	Avg NALT Percentiles	0.4794	0.0004
General Music Literacy Test Avg	CBM Measure	0.2537	0.0786
String Instrument SightRead Avg	Avg NALT Percentiles	0.6604	<.0001
String Instrument SightRead Avg	CBM Measure	0.4502	0.0008
String Instrument SightRead Avg	General Music Literacy Test Avg	0.4993	0.0002

The correlation table lists all pairwise tests of correlations among two academic and two music skill test results (n=55).

DATA DISPLAY GALLERY REGRESSION EXHIBITS 7-10

What are the most salient predictors of academic achievement among music reading variables?

Estimating the relationships among many predictor variables for academic achievement (the dependent variable) can be achieved to some degree through regression analysis techniques (Singer & Willett 2003; Snijers 2004). In the RUBRICS CUBE System, regression techniques can be used to tease out the relative predictive strengths of program outcomes on overall indicators of school achievement. In the CLCS Case Study, regression analyses were used to distinguish among independent sources of data (such as SES, ELL designations, etc.).

In this case study, regression is used to analyze as best we can the relatively interdependent aspects of music learning to academics without claiming evidence of one-way causality. Thus, the four regression analysis exhibits below provide the best evidence available for determining the strands of music skill development most highly predictive of academic achievement.

who have experience with the Learning Through Music program, to further facilitate dissemination of this integrative learning experience to other MPS sites.

Research Questions to be investigated by this new partnership are framed as follows:

Using music and music-integrated learning as a model,

- What are curriculum design features and documentation processes that make possible the evaluation of arts learning in relation to various indicators of academic excellence, social-personal development, and positive school culture?
- What instruments will best measure arts learning?
- What are appropriate measures of the relationship between arts learning and desired academic outcomes, social-personal development, and school culture outcomes?
- How do attitudes shift in arts teachers when assessment of arts learning becomes central to their teaching practices?
- What do they learn from the results of these assessments?
- What do pre-professional students learn as a result of observing and participating in the Ramsey IFAC and the UMN Guided Internship Program?

As with the origins of the Ramsey-LTMCG partnership, the Arts Learning Leadership project will attempt to create new learning laboratory school partnerships with Minneapolis schools, so that rather than having to try to expand programs through rote replication, music and classroom teachers will benefit from district scale-out planning based on new questions, contexts, and circumstances.

The LTMCG also plans to stimulate scale-out programs in greater Minneapolis area school communities that choose to invest in the development of model Learning Through Music

DATA DISPLAY GALLERY EXHIBIT 7
Music Reading Factors and CBM Word Fluency Test Results (2006) Regression Table

FINDING: Regression modeling suggests that integrated (rhythm and pitch accuracy on a string instrument) music reading skills most strongly predict word fluency skill development in reading assessments.

Parameter	Estimate	F Ratio	Prob>F
Intercept	40.85	0.000	1.0000
String Post Rhythm Avg	0	0.601	0.4424
String Post Pitch Avg	0	0.121	0.7296
String Post Rhythm-Pitch Avg	8.66	4.963	0.0308
Gen Music Literacy Skill Rhythm Avg	11.35	1.437	0.2366
Gen Music Literacy Skill Pitch Avg	0	0.002	0.9610
Gen Music Literacy Skill Rhythm-Pitch Avg	0	0.002	0.9610

Regression statistics examining the predictive relationship of various music skills to word fluency on the CBM tests administered at the Ramsey School (n= 55; overall r2 = .1704; adjusted r2 = .1343).

Overall string instrument literacy skills and general music rhythm skills best predict word fluency and general academic achievement scores at Ramsey.

The first regression exhibit [Data Display Gallery Exhibit 7] examining the relationship between musical literacy and word fluency is relatively weak because it only explains roughly 17% of the variance between the two skill sets (r2 = .1704). However, the data suggest that, among all factors of music skill achievement, the averaged string instrument sight reading rating (String Post-Test Rhythm and Pitch Averaged Ratings highlighted in yellow) is the best predictor of CBM word fluency results at the Ramsey School. It appears that the rhythm skills developed in the general Music Literacy Skills test may have some influence on the CBM measures.

DATA DISPLAY GALLERY EXHIBIT 8
Music Reading Factors and NALT Averaged Academic Rating Regression Table

FINDING: Regression modeling suggests that integrated (rhythm and pitch accuracy on a string instrument) music reading skills coupled with clapping rhythm more strongly predict general academic achievement than word fluency skill development. This finding provides evidence that, as music skills become more sophisticated, they are more likely to be associated with overarching language arts skills (oral reading or math problem solving) than with more narrowly defined subskills (word or computation fluency skills).

Parameter	Estimate	F Ratio	Prob>F
Intercept	-3.47	0.000	1.0000
String Post Rhythm Avg	0	0.036	0.8510
String Post Pitch Avg	0	0.156	0.6949
String Post Rhythm-Pitch Avg	9.39	25.538	0.0000
Gen Music Literacy Skill Rhythm Avg	7.82	2.979	0.0909
Gen Music Literacy Skill Pitch Avg	0	0.040	0.8418
Gen Music Literacy Skill Rhythm-Pitch Avg	0	0.040	0.8418

Regression statistics examining the predictive relationship of various music skills to academic achievement on the NALT tests of math and reading achievement. (n=55; overall r2 = .4678; adjusted r2 = .4452)

The second regression exhibit above demonstrates a similar but more statistically significant pattern of prediction. With respect to averaged academic scores drawn from the NALT tests, string rhythm reading emerges as a very strong predictor of overall academic achievement; in fact, string rhythm reading is as predictive of NALT scores as the CBM tests. Here, the regression model explains 47% of the variance in the NALT test scores.

DATA DISPLAY GALLERY EXHIBIT 9

Music Reading Factors and NALT Reading Scores Regression Table

FINDING: This more fine-grained regression modeling procedure suggests that rhythm reading on string instruments best predicts standardized reading scores on reading tests (and not on math tests as we shall see below). This finding is consistent with results from past reports (Scripp 2002) that connect rhythm reading with more syntactical and word segmentation aspects of language reading (Scripp & Reider 2007).

Parameter	Estimate	F Ratio	Prob>F
Intercept	-3.86	0.000	1.0000
String Post Rhythm Avg	9.78	25.857	0.0000
String Post Pitch Avg	0	0.185	0.6694
String Post Rhythm-Pitch Avg	0	0.017	0.8968
Gen Music Literacy Skill Rhythm Avg	7.78	2.562	0.1162
Gen Music Literacy Skill Pitch Avg	0	0.051	0.8223
Gen Music Literacy Skill Rhythm-Pitch Avg	0	0.051	0.8223

Regression statistics examining the predictive relationship of various music skills to NALT reading. (n=55; overall r2 = .4690; adjusted r2 = .4464).

Rhythm literacy skills best predict NALT reading scores in the fourth grade

The music teachers and consultants at Ramsey are interested in differences between rhythm and pitch skills and their possible influence on academic achievement. Previous research at the Conservatory Lab Charter School suggested that rhythm skills were more related to language test scores, and pitch skills more associated with math [Scripp 2003].

In Data Display Gallery Exhibit 9, rhythm development, particularly with regard to instrumental rhythm reading, is more closely aligned with reading skill achievement. The overall model explains nearly 47% of the variance in reading scores.

DATA DISPLAY GALLERY EXHIBIT 10

Music Reading Factors and NALT Math Scores Regression Table

FINDING: More fine-grained regression modeling suggests that, in contrast to the previous results, pitch reading on string instruments best predicts standardized math scores by far. This finding is again consistent with results from previous studies (Scripp 2002) and is aligned with curriculum practices at Ramsey that investigate the connection between melody reading and an understanding of coordinate systems as described in the earlier section focused on the Pachelbel's Canon Musical Matrix model unit.

Parameter	Estimate	F Ratio	Prob>F
Intercept	-3.47	0.000	1.0000
String Post Rhythm Avg	0	0.036	0.8510
String Post Pitch Avg	0	0.156	0.6949
String Post Rhythm-Pitch Avg	9.39	25.538	0.0000
Gen Music Literacy Skill Rhythm Avg	7.82	2.979	0.0909
Gen Music Literacy Skill Pitch Avg	0	0.040	0.8418
Gen Music Literacy Skill Rhythm-Pitch Avg	0	0.040	0.8418

Regression statistics examining the predictive relationship of various music skills to NALT reading. (n=55; overall r2 = .3808; adjusted r2 = .3544).

Pitch accuracy scores on string instrument sight reading tests best predict NALT math achievement scores in the fourth grade.

In Data Display Gallery Exhibit 10, pitch reading skills, particularly with regard to string instruments, is more closely aligned with math achievement. The overall model explains roughly 38% of the variance in math scores.

programs in conjunction with community orchestras or other music and arts organizations that understand the necessity to break down barriers and create shared spaces in order to advance music's essential and evolving role in education. With guidance from the MIE Consortium, the scale-out process will begin with a national conference in Minneapolis in June 2007 that will celebrate the accomplishments of 15 Music-in-Education Learning Laboratory Schools, to be reported in the next issue of the *Journal for Music-in-Education*. ¶

[1] Incorporated as a Minnesota-based non-profit organization in 2004.

[2] Based on article posted on polyphonic.org by Larry Scripp (Director of the Center for Music-in-Education at New England Conservatory) describing the creation of the Learning Through Music program and partnerships in Minneapolis.

[3] Based on an article posted on polyphonic.org by Kenneth Freed (violist with the Minnesota Orchestra, conductor of the Mankato Symphony Orchestra, and President of the Learning Through Music Consulting Group) describing the creation of the Learning Through Music program and partnerships in Minneapolis.

[4] Interview with Larry Scripp in Spring 2006, transcribed and later revised by Dee Lundell for this case study report.

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Research Design and Background Test Information (from the LTM Intervention Exhibit)

Fluid reading groups were established to begin the 2004-05 school year. Based on second grade NALT (Northwest Assessment Levels Test) and the district's fall CBMs (*Curriculum Based Measures*), the four third grade teachers and the ELL teacher divided the students into five reading groups: above grade level, at grade level, below grade level (BGL), those needing direct instruction in phonemic awareness and phonics, and English Language Learners. The NALT measures student achievement and growth in reading and math. It is set up to measure student academic growth from spring to spring.

Curriculum Based Measures as developed by Stan Deno are a performance-based alternative to other standard tests. Curriculum-Based Measurement is a performance assessment system that focuses on teacher observation of student academic behaviors in a naturalistic setting. Research and Evaluation of Minneapolis Schools has identified the grade level goal score that correlates with passing the Minnesota Basic Skills Test (MBST) at eighth grade. The teachers have the students do one-minute cold oral readings of three third grade passages from Houghton Mifflin. The total number of words read minus the words read incorrectly yields the correct words per minute score. The median measure is used as the identified score for that point in time.

Creating OPERA in Schools: Music as a Model for Integrated Learning

BY CARROLL RINEHART

The guided creation and presentation of opera programs in schools has become a valuable resource for schools that prioritize music and music-integrated learning as part of their mission for learning in and through the arts. These programs—championed by organizations such as the Metropolitan Opera Guild, the OMA project and several members of the Consortium's Learning Laboratory School Network—now bring new opportunities and approaches for Music-in-Education research in schools. The inherently rich and complex nature of these programs are compatible with the RUBRICS CUBE methodology that focuses on the interrelationships among factors of music-integrated curriculum design, collaborative teaching, and teacher professional development. The collaboration among residency arts specialists, researchers, and music and classrooms teachers in opera projects promises to provide valuable occasions for the new forms of documentation and assessment of young students' interdisciplinary, cognitive, and aesthetic experiences in public schools.

ALTHOUGH THERE ARE MANY FACTORS THAT CAN CONTRIBUTE TO ACADEMIC ACHIEVEMENT, THE TEACHING ARTISTS BEGAN TO WONDER WHAT PARTS OF THE OPERA PROCESS COULD CONTRIBUTE TO ACADEMIC GROWTH INDICATED BY IMPROVEMENT IN STANDARDIZED TESTS.

The study, creation, and production of original opera in schools is by definition a highly integrated learning process, bringing together multiple arts domains as well as the humanities and sciences. Typically, more than one-half of the opera-making process is in the area of language arts aligned with social studies and history curriculum objectives, with special emphasis on the development of writing skills. Each 'create and produce' work is created from original stories written individually or collaboratively by students with guidance from artists and teachers. One kindergarten class opera dealt with social issues of inner city communities; a fourth grade opera was about a Native American adopted by an Anglo family; and a fifth grade opera was based on a social studies topic about Washington crossing the Delaware during the Revolutionary War.

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Once the stories are written, students create their script or libretto, compose all melodies with their texts, and make choices of major or minor modalities, rhythmic accompaniment, and harmonies facilitated by the musical artist. Furthermore, they establish criteria for casting and make choices about who will play the individual parts. Students design and create sets (e.g., an invented spelling sandwich board was part of the set for the first kindergarten opera entitled "Something's Fishy at the Restaurant"). After the production is presented and documented, the students write their own critiques, allowing time for reflection on all creative processes from the inception of the idea to the final critical reviews (see *JLTM* volume II pages 42-49 for examples of student documentation created in the Metropolitan Opera Guild's Creating Original Opera in Schools program).

After having facilitated more than 1600 student-created works, I became aware that teachers and artists detected substantial student growth in language arts development subsequent to an opera residency. Although there are many factors that can contribute to academic achievement, the teaching artists began to wonder what parts of the opera process could contribute to academic growth indicated by improvement in standardized tests.

A doctoral student from the University of Arizona College of Education assisted us in forming researchable questions concerning the relationship between learning through the opera process and