Museum Visitor Studies, Evaluation and Audience Research

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Educational Research: The Art of Problem Solving

VOLUME 1: REPORT

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EXECUTIVE SUMMARY

INTRODUCTION

The Solomon R. Guggenheim Museum contracted with Randi Korn & Associates, Inc. (RK&A) for the 2007-2009 study *The Art of Problem Solving* (*APS*). The research study examined the Guggenheim's long-standing teaching artist in residency program *Learning Through Art* (*LTA*); specifically, the study was designed to explore *LTA*'s pedagogical model of building problem-solving skills using art and to determine the effectiveness of the *LTA* program in teaching problem-solving skills. This study was made possible through a three-year Arts in Education Model Development and Dissemination (AEMDD) grant from the U.S. Department of Education. The major findings from the study are presented below by methodology.

The findings presented here are among the most salient. Please read the body of the report for a more comprehensive presentation of findings.

STUDENT QUESTIONNAIRES

A total of 418 fifth-grade students from six schools completed a questionnaire at the start of the school year (pre-test) and again at the conclusion of the school year (post-test); one-half of students received the *LTA* program (treatment student $n = 209$), while one-half did not (control student $n = 209$). Questionnaire findings describe students' attitudes about school and art, schoolwork and art work practices, and perceptions of a good artist. For treatment group students, findings also describe students' evaluations of various aspects of *LTA*. Findings are as follows:

BASELINE FINDINGS

- At baseline, control and treatment students expressed positive attitudes about school, art, and art museums. They also responded positively to questions about art work practices and their ideas about artists as well as about solving math problems, puzzles, and difficulties with art projects.
- Of all the responses, there was only one significant difference between control and treatment students; when asked about art project work practices, treatment group students were more likely than were control group students to say they would keep working on an art project at school even if they made mistakes.

PRE-TEST TO POST-TEST CHANGES

- Control and treatment students expressed less positive attitudes about school at the end of the school year (ratings on four of the seven statements about school decreased significantly from pre-test to post-test).
- Control and treatment students' attitudes about art remained about the same over the year (treatment students' ratings for all six statements about art did not differ, while control students' ratings for one of the six statements improved significantly).

- Control and treatment students' attitudes about art museums remained the same over the year (students' ratings of the five statements about art museums did not change significantly from pre-test to post-test).
- Control and treatment students' strategies for solving a math problem and puzzle remained about the same from pre-to post-test. However, more control and treatment students reported asking another student or family member for help when encountering difficulties solving a math problem or a puzzle (as well as an art project) on post-test than pre-test.
- Control and treatment students' strategies for solving a problem with an art project stayed about the same during the year. However, treatment students' responses for two of the 12 statements—"do you feel mad?" and "do you try to fix it by using different materials?"—improved.
- Control and treatments students reported more favorable art work practices at post-test than pre-test (students' responses for five of the 12 statements improved significantly from pre- to post-test; additionally, more control students reported that they wouldn't use the materials with which they are most comfortable on post-test than pre-test, while treatment students' responses to this item remained the same; finally, more treatment students reported planning for their art project on post-test than pre-test while control students' responses remained the same).
- Control and treatment students' ideas about the qualities of a good artist improved over the year (responses for three of the eight sentence completions about the qualities of a good artist improved significantly from pre- to post-test while their other responses stayed the same).

DESIGN-A-CHAIR STUDENT INTERVIEWS AND OBSERVATIONS

A total of 447 fifth-grade students from six schools completed the Design-a-Chair activity; one-half of students received the *LTA* program (treatment student $n = 218$), while one-half did not (control student $n = 229$). As part of the activity, students were presented with a bag of art materials and asked to design a chair using at least three different materials in 15 minutes. Specially-trained data collectors observed students as they did the activity and interviewed them immediately after. The Design-a-Chair activity was administered at the end of each school year in May (May 2008 and May 2009). Findings are as follows:

- Treatment students scored higher than control students on Connection of Ends and Aims I, a measure that explored the extent to which students make intentional decisions and choices when working on art projects.
- Treatment students scored higher than control students on Flexibility, a measure that explored the extent to which students approach accidents, difficulties, and frustration with focus, patience, and further exploration.
- Treatment students scored higher than control students for Resource Recognition III; that is, when asked what other materials they would have liked to use, treatment students named materials other than those already available.
- Treatment students scored lower than control students on Experimentation II, a measure that explored the extent to which students tested the properties of the materials when working on art projects.

- In all other areas—Imagining, Experimentation I, Resource Recognition I & II, Connection of Ends and Aims II & III—there was no statistically significant difference between treatment and control students.

STUDENT CASE STUDIES

RK&A conducted 25 case studies over the 2007-2008 and 2008-2009 school years. Through case studies, RK&A looked at how students responded to *LTA*—particularly in relation to five problem-solving criteria—as well as investigated students' performance outside *LTA*. As part of each case study, RK&A observed the student during two or three *LTA* lessons between December and April, interviewed the student about an artwork s/he created during *LTA*, and interviewed the student's classroom teacher. Findings are as follows:

- Some case study students struggled in class but excelled in *LTA*; the converse is also true.
- About one-half of case study students achieved low levels of Experimentation, which explores the extent to which students try a number of materials, tools, techniques, or ideas.
- More than one-half of case study students achieved high levels of Connection of Ends and Aims, which explores the extent to which students make intentional decisions and choices in when working on their art project.
- Case study students' achievement of Imagining, Flexibility, and Resource Recognition ranged approximately evenly along a continuum from high to low achievement.

TEACHING ARTIST OBSERVATIONS

RK&A observed each of the three teaching artists during the 2007-2008 school year and each of the three teaching artists—two of whom also taught during the 2007-2008 school year—during the 2008-2009 school year. Each teaching artist was observed nine times between December and April in each school year (e.g., each teaching artist was observed three times while teaching to three classrooms). Observations explore the extent to which teaching artists employ general *LTA* teaching strategies—considered best practice by the Guggenheim—as well as strategies for cultivating students' problem-solving skills. Findings are as follows:

- Of the four general *LTA* teaching strategies, teaching artists least frequently referred to students as artists; this occurred in less than two-thirds of observations
- Of the four lessons that cultivate students' problem-solving abilities, teaching artists most frequently taught students to think intentionally and make deliberate choices; they did so in all observations
- Of the four lessons that cultivate students' problem-solving abilities, teaching artists least frequently taught students to see problems/mistakes/challenges as opportunities; this occurred in slightly more than one-half of observations.

TEACHING ARTIST INTERVIEWS

In June following the 2007-2008 school year and the 2008-2009 school year, RK&A conducted telephone interviews with the three participating teaching artists from each school year. Two of the teaching artists who participated in the study during the 2007-2008 school year also participated in the

study during the 2008-2009 school year; thus, six interviews were conducted with four teaching artists. Findings are as follows:

- Teaching artists described their relationship with classroom teachers as one of the greatest challenges of *LTA*. Teaching artists had trouble communicating with teachers and gaining their support.
- Teaching artists described positive experiences with the students. They said that students thrived in the program and felt that they enjoyed it and were even empowered by it.
- Teaching artists valued the professional development the Guggenheim provided, specifically the teaching strategies they acquired.
- Teaching artists said that their experiences with *LTA* made them more reflective teachers.

DISCUSSION

INTRODUCTION

Over the years, the Solomon R. Guggenheim Museum's *LTA* has used evaluation for institutional learning and program improvement. Evaluation and self assessment are embedded in the program, and used successfully among the teaching artists. As a result of this iterative cycle of continual improvement, *LTA* has developed into a highly effective program. In a previous study, titled *Teaching Literacy Through Art* (TLTA), funded by the U.S. Department of Education's Arts in Education Model Development and Dissemination (AEMDD) grant, participation in *LTA* was shown to have a positive impact on students' literacy and critical thinking skills (RK&A, 2007). This follow-up study, also funded by the AEMDD grant, sought to examine another area important to *LTA*—problem solving. Findings of this important study, titled *The Art of Problem Solving*, are discussed below.

ATTITUDES TOWARD SCHOOL, ART, AND ART MUSEUMS

The research study hypothesized that students who participate in *LTA* would have more positive attitudes toward school, art, and art museums than those who do not participate in *LTA*. Similar to the 2007 *TLTA* study, findings demonstrate that *LTA* did not have a significant impact on students' attitudes toward school, art or art museums—there were no statistically significant differences between the treatment and control students. Generally, students in both groups had positive attitudes in these three areas at the beginning of the school year, while students' (in both groups) attitudes toward school were significantly less positive at the end of the school year than at the beginning (attitudes toward art and art museums remained unchanged). Such a finding is not surprising, considering that other studies have shown that negative attitudes toward school begin to develop around middle school (Anderman & Midgley, 1998; Eccles & Midgley, 1989; Hogsten & Peregoy, 1999). The students in this study were fifth graders, and thus, on the cusp of middle school by the end of the school year.

PROBLEM-SOLVING BELIEFS AND ABILITIES

While this study examined attitudes as described above, the primary focus of the research was the hypothesis that students who participate in *LTA* will develop greater problem-solving skills than those who do not participate in *LTA*. Problem solving has long been an important objective for *LTA*, but its relevance to today's world has been heightened in the current global economy, which demands that our workforce develop higher-order thinking skills like critical thinking and problem solving. These kinds of skills have been coined "21st Century Skills" and embraced by educators, policy makers, and business leaders as essential to success in today's society. The premise is that *thinking* skills are far more valuable than encyclopedic knowledge of content. "21st Century Skills" have also taken hold in the museum field. A 2009 publication by the Institute of Museum and Library Services (IMLS) emphasizes that museums have an important role in helping citizens build thinking skills, listing problem solving among the top of its learning and innovation skills, along with critical thinking and creativity (IMLS, 2009).

This notion of "21st Century Skills" is not new to art museums. For decades, many art museums have sought to translate the power of art (looking at, thinking about, and making art) into programs meant to

develop participants' thinking skills through such means as inquiry, experimentation, and observation. Small-scale studies, evaluations, and arts education advocates have argued that the methods of instruction typically delivered in arts-based programming has a high probability of cultivating higher-order habits of mind and thinking skills (Constantino, 2002; Perkins & Jay 1995; Pitri, 2003; Tishman, 2002; Kowalchuk, 1999). However, few art programs have had the resources to conduct rigorous studies to attempt to demonstrate the positive effects of arts programming on student learning (McCarthy, Ondaatje, Zakaras, & Brooks, 2004). A couple of large-scale, quantitative studies have examined the impact of multi-arts programming on student learning, and findings were promising. For example, Burton et al. (1999) showed that students attending arts-rich schools outscored students in arts-poor schools in measures of creative thinking. Catterall and Waldorf (1999) found that students who were highly involved in the arts outperformed students who had low arts involvement on a variety of academic measures. But these examples are few and far between.

It is within this context that *LTA* sought to show a link between its programming and problem solving skills. *LTA* hypothesized that the program would give students the skills necessary to persistently and adaptively work through problems. However, before moving forward on this research, *LTA* had to first clearly define what it meant by problem solving, given that there is little available consensus on the meaning of the term. While problem solving may be simply defined as "the analysis and transformation of information toward a goal" (Lovett, 2002), a review of literature quickly reveals that no standard set of behaviors is associated with problem solving. Rather, many skills and behaviors are associated with problem solving—including exploration, analysis, synthesis, curiosity, persistence, planning, risk taking, and elaboration (Costa & Kallick, 2000; IMLS, 2009; Weisburg, 2006). Moreover, there is much overlap among definitions of problem solving, creativity, and critical thinking. Thus, the first step in the research study was to identify the exact characteristics of "problem solving" as manifested in the *LTA* program. In the project's first year, *LTA* staff assembled the *Art of Problem Solving* (*APS*) advisory team (see Appendix U) to develop a rubric to define the behaviors associated with problem solving in *LTA*. This process was long, arduous, and exhilarating. In the end, the *APS* advisory team created a list of six skills to most accurately define problem solving in *LTA*. They are listed and described, in brief, below (for the complete rubric, see Appendix L).

1. Imagining – Students place themselves within the task to the extent that he/she can envision the problem beyond the assignment given, including opportunities and constraints.

2. Experimentation – Students try a number of materials and/or tools as they create their art project.

3. Flexibility – Students approach accidents, difficulties, and frustration with focus, patience, and further exploration.

4. Resource Recognition – Students pay attention to the resources provided and seek out resources appropriate for the task.

5. Connection of Ends and Aims – Students describe intentional and deliberate decisions and choices they made in creating art.

6. Self-reflection – Students express explicit and thoughtful opinions or critiques of their art project and/or identify problems/difficulties.

In the end, the study provides strong evidence that *LTA* enhanced students' abilities in three of the six areas of the problem-solving rubric: 1) Flexibility, 2) Connections of Ends to Aims, and 3) Resource

Recognition[1]. *LTA* students scored significantly higher than non-*LTA* students in these three areas on the problem-solving activity (see page 8 for a full description of the Design-a-Chair activity). Furthermore, questionnaire findings also show that participation in *LTA* is correlated with more positive attitudes in the areas of Flexibility (i.e., not giving up when encountering problems) and Connections of Ends and Aims (i.e., planning). Moreover, case study findings show that students participating in *LTA* exhibited Connections of Ends and Aims more often than the other problem-solving skills during LTA sessions, and deliberate decision-making was a strategy that the teaching artists used consistently and frequently. On the other hand, evidence indicates that *LTA* did not affect students' abilities in the other areas of the rubric, including: Imagining, Experimentation, and Self-reflection. In each of these areas, treatment students did not score significantly higher than control students on the problem-solving activity. In fact, in one area—Experimentation—control students scored higher than treatment students. Notably, case study findings provide support for this last finding, in that *LTA* case study students infrequently experimented during *LTA* sessions.

CONCLUSION

What do these findings tell us? In plain language, the findings indicate that students who participate in *LTA* are more likely to plan, persist, be deliberate and thoughtful, approach difficulties with focus, and have greater knowledge of art materials. On the other hand, students who participate in *LTA* are no more likely to imagine beyond the task at hand or self critique, and they are less likely to try a number of materials. Though these findings are not entirely positive, they are encouraging and have positive implications, especially when considered in the context of "21st Century Skills." For instance, though the study did not test for transfer, one could hypothesize that Connections of Ends to Aims and Flexibility, in particular, are skills with wide application across students' academic careers and highly relevant to "21st Century Skills" described earlier. Planning, intentionality, adaptability, and persistence are all skills that will benefit students in school and as they move into the workforce.

Ultimately, the study raises important questions about what problem solving is, especially in the context of arts programming. This study took preliminary steps in defining and measuring problem solving—a complex thinking skill—and raised interesting questions for further research. These questions include: How can teachers cultivate students' abilities to experiment, imagine, and self-reflect? Is the ability to experiment, imagine, and self-reflect linked to developmental stages, and if so, at what age is it appropriate to expect children to experiment, imagine, and self-reflect? How does achievement of Flexibility and Connection of Ends and Aims transfer to other subjects or real world experiences? Are there stages to problem solving in the way there are stages to one's aesthetic development? How does Resource Recognition relate to Experimentation (e.g., does achievement of resource recognition help or hinder students' achievement of Experimentation)?

Ultimately, these findings beg the question: If *LTA* affects half of the six problem-solving skills defined by the *APS* advisory team, does that mean *LTA* does not affect students' problem-solving skills? As discussed previously, problem solving is a somewhat nebulous term without a standard list of behaviors to use as a barometer of its accomplishment. Its definition is at least somewhat dependent on the context in which it is used, and it is often referred to interchangeably with other higher-order skills, like creativity and critical thinking. While the *APS* advisory team set out to capture problem solving in terms accepted in the field *and* most consistent with what one would expect from *LTA*, the definition of problem solving must be further refined as researchers and practitioners continue to explore what problem solving is, particularly given its prominence in literature about "21st Century Skills."

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[1] Resource Recognition was broken into three categories and treatment students scored significantly higher on Resource Recognition III, which assessed whether students asked for materials not provided.

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INTRODUCTION

This report presents findings from the 2007-2009 *The Art of Problem-solving* (*APS*) research study of the *Learning Through Art* (*LTA*) program conducted by Randi Korn & Associates, Inc. (RK&A) for the Solomon R. Guggenheim Museum in New York. The research study was designed to examine *LTA*'s pedagogical model of building problem-solving skills using art and determine the effectiveness of the *LTA* program in teaching problem-solving skills. This study was made possible through a three-year Arts in Education Model Development and Dissemination (AEMDD) grant from the U.S. Department of Education.

PROJECT HISTORY

For nearly 40 years, *LTA* has brought together teaching artists, students, and teachers to work on curriculum-based art projects. Through the program, teaching artists employed by the Guggenheim are placed in New York City schools to facilitate art making and art inquiry lessons with students. Over a 20-week period teaching artists work weekly with students in the classroom and take them on field trips to the Guggenheim. To make *LTA* as meaningful and relevant as possible, the teaching artists work with the classroom teacher to ensure that curriculum connections are being made in the art lessons and that the students' final project reflects a content area relevant to the classroom teachers' lessons.

In 2004, the Guggenheim Museum received its first AEMDD grant to document and examine *LTA*'s impact on participating students and teachers. RK&A partnered with the Guggenheim for this first research study, entitled *Teaching Literacy Through Art* (*TLTA*). In the *TLTA* study, RK&A examined the impact of *LTA* on third-graders' literacy skills and found statistically significant differences among the control group and treatment group students. Treatment group students demonstrated higher literacy skills across most characteristics measured.

In 2006 the Guggenheim Museum received a second grant from the AEMDD program for the *APS* study, which is the focus of this report.

RESEARCH DESIGN

OBJECTIVES OF THE STUDY

The *APS* research plan was designed to measure teaching artist and student outcomes related to problem solving. Specifically, the study measured:

- Whether *LTA* is meeting student outcomes related to problem-solving skills;
- What correlation exists between participation in *LTA* and students' scores on the New York City Mathematics standardized tests; and
- Whether *LTA* is meeting teaching artist objectives related to problem-solving skills.

See Appendix A for the goals and objectives of *LTA*.

RESEARCH HYPOTHESES

While the *APS* study is predicated on the idea that multiple factors impact students' attitudes and abilities, the research hypotheses focus on how one variable—students' participation in the *LTA* program—affected students. Specifically, the hypotheses are:

- Students who participate in *LTA* will have more positive attitudes towards school, art, and art museums than those who do not participate in *LTA*.
- Students who participate in *LTA* will report greater problem-solving abilities when encountering art-related problems, math problems, and puzzles.
- Students who participate in *LTA* will demonstrate greater problem-solving abilities in the art-related Design-a-Chair activity (i.e., will have higher interview and observation scores) than those who do not participate in *LTA*.

LITERATURE REVIEW

The Solomon R. Guggenheim Museum prepared a literature review in preparation for the study (see Appendix B).

OVERVIEW OF THE STUDY

RK&A employed a modified pre-/post-test control-group design to investigate student-related objectives. That is, RK&A designated a treatment group—students who receive *LTA*—and control group—students who do not receive *LTA*. Measures included student questionnaires, Design-a-Chair student interviews and observations, test scores from the New York State Mathematics Test, and case studies (that include student observations, a student interview, and a teacher interview). To investigate teaching artist-related objectives, RK&A employed observations and interviews. All measures are discussed in detail in the "Methodology and Analysis" section on page 5.

Data were collected over two school years to ensure a large sample size. The general plan is outlined in Tables 1 and 2.

TABLE 1

***LTA* RESEARCH PLAN – 2007-2008 SCHOOL YEAR[1]**

SAMPLE	PRE-TEST MEASURE	20-WEEK *LTA* PROGRAM	PROGRAM MEASURE	POST-TEST MEASURE	FOLLOW-UP MEASURE
1. Control group	Student questionnaires	—	—	Student questionnaires Design-a-Chair student interviews and observations	Student test scores on the New York State Mathematics Test
2. Treatment group	Student questionnaires	⊕	Teaching artist observations Student case studies (interview and observations)	Student questionnaires Design-a-Chair student interviews and observations	Student test scores on the New York State Mathematics Test Teaching artist interviews Student case studies (teacher interviews)

[1]A "—" in a cell signifies that the respective group did not experience the particular element. A "⊕" in a cell indicates that the respective group experiences the particular element.

TABLE 2

***LTA* RESEARCH PLAN – 2008-2009 SCHOOL YEAR[1]**

SAMPLE	PRE-TEST MEASURE	20-WEEK *LTA* PROGRAM	PROGRAM MEASURE	POST-TEST MEASURE	FOLLOW-UP MEASURE
1. Control group	Student questionnaires	—	—	Student questionnaires Design-a-Chair student interviews and observations	Student test scores on the New York State Mathematics Test
2. Treatment group	Student questionnaires	⊕	Teaching artist observations Student case studies (interview and observations)	Student questionnaires Design-a-Chair student interviews and observations	Student test scores on the New York State Mathematics Test Teaching artist interviews Student case studies (teacher interviews)

[1]A "—" in a cell signifies that the respective group did not experience the particular element. A "⊕" in a cell indicates that the respective group experiences the particular element.

SAMPLING

Based on the experiences of the previous study, developmental milestones, and literature about student attitudes, RK&A selected fifth-graders as the target population for the research. To limit the variability and strengthen the reliability of the research, the sample included:

- Only fifth-grade classes;
- Students from six schools similar in demographics and socioeconomic characteristics;[2]
- Students and teachers who have never participated in *LTA* prior to the grant; and
- Simultaneous data collection (e.g., questionnaires were administered to treatment group students and control group students within two weeks so as to mitigate differences in student learning throughout the course of the school year; that is, if treatment group students were tested one month after control group students, treatment group students would have an unfair advantage given the extra month of schooling).

To ensure a sample large enough for statistical analysis, three classes at six schools (18 classes total) participated in the study each year. One-half of the schools were randomly designated as the Treatment Group, and the other one-half were randomly designated as the Control Group. See the next section for more details.

SCHOOL SELECTION

During the 2006-07 planning year, the Guggenheim identified a number of potential schools using the following criteria:

- Title I schools in Regions 9 and 10 of New York City;
- Large student body with at least three fifth-grade classes to ensure an adequate sample size;
- Less than 50 percent English Language Learner population;
- No participation in the visual arts;
- Similar demographic and socioeconomic profile; and
- Similar test scores on the New York City English Language Arts and Mathematics tests.

Seventeen schools in Manhattan and the Bronx fit these criteria, and from this list, six schools were selected and randomly assigned to either treatment group (P.S. 153, P.S. 154, and P.S. 200) or control group (P.S. 28, P.S. 115, P.S. 152), and one school was selected for pre-testing the instruments (P.S. 9 in Brooklyn). If a selected school had more than three fifth-grade classes, three classes were selected at random to participate in the study. Additionally, the teaching artists were randomly assigned to the treatment group schools.

The Guggenheim secured permission from principals from each participating school. In doing so, participating schools agreed to the requirements of the research design, which include distributing and collecting parental permission forms and providing access to students to administer the instruments. Control group schools also agreed to prevent their students from participating in any visual arts programming at school. As a reward to both schools, the Guggenheim offered the *LTA* program at no

[2] Using data from the 2005-2006 Annual School Report, schools were examined by academic and extracurricular activities, parent/school support, gender, class size, ethnicity, languages spoken, free-lunch eligibility, teacher characteristics, test scores, and location.

cost. For treatment group schools, *LTA* was taught to the participating fifth-grade classes, while for control group schools, *LTA* was taught to second-grade students.[3]

HUMAN SUBJECT PROJECTION

As required by the U.S. Department of Education, RK&A secured Federalwide Assurance (FWA) to conduct research with human subjects from the U.S. Office for Human Research Protections. RK&A's FWA number is FWA00007535. Further, the research was reviewed and approved by the New York City Department of Education Internal Review Board

Parental consent was secured for all students participating in the study. Permission letters were sent home to the parents to be signed and returned to the teachers in a sealed envelope. The evaluator then retrieved the forms from the schools. Two copies of the letter were sent home with each child, so that the parent could retain one copy for their records. To encourage a high return rate, students received a Guggenheim t-shirt for returning the form—regardless of their participation in the study. Consent forms were provided in English and Spanish, based on advice from the schools (see Appendix C for the parent/guardian study consent forms, Appendix D for the case study consent form, and Appendix E for the pre-test consent form).

All data generated from the study are confidential. Students' names, teachers' names, and teaching artists' names were stricken from all data and replaced with identification numbers. RK&A generated and maintained the identification numbers.[4]

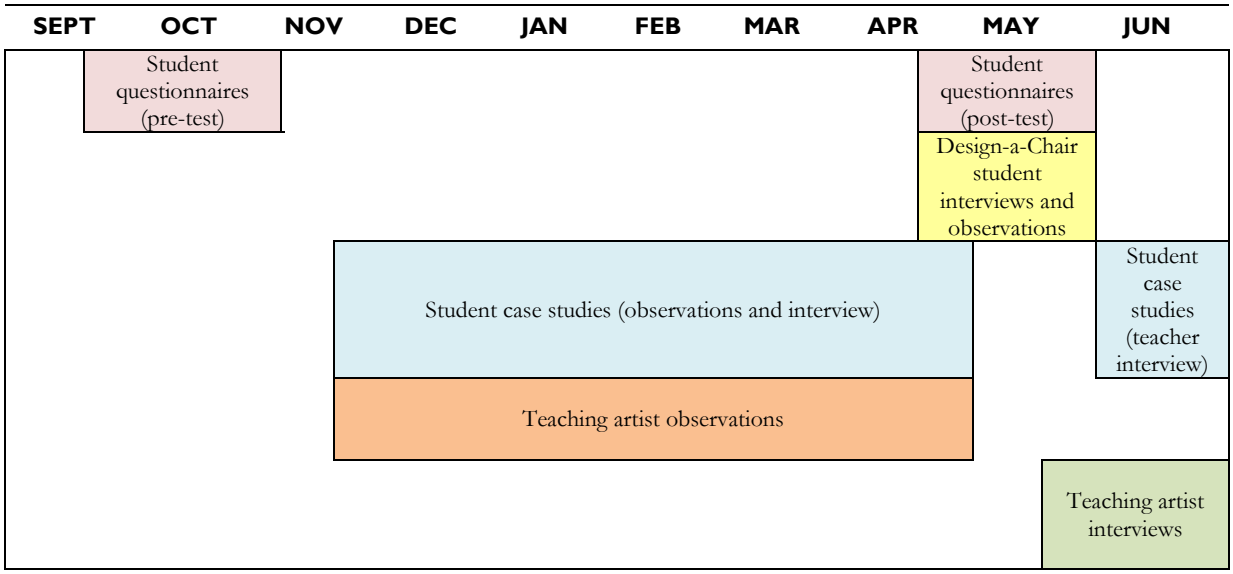
METHODOLOGY AND ANALYSIS

RK&A developed unique and specific instruments to gather data. Each methodology and the corresponding instruments are discussed below. See Figure 1 for an overview of how these methodologies were administered over the course of one school year.

[3] At control group schools, second-grade students were selected as recipients of the 20-week residency so as not to affect the fifth-grade control group students.
[4] RK&A purposefully did not use pre-existing student identification numbers to further ensure confidentiality.

FIGURE I

METHODOLOGICAL TIMELINE (ONE SCHOOL YEAR)[1]



[1]Test scores from the New York State Mathematics Test are not included in this diagram. The test is administered to fifth-graders in May, and scores are available during the summer following each school year.

STUDENT QUESTIONNAIRES

METHODOLOGY

Standardized questionnaires were used to measure performance in both treatment and control groups. Questionnaires were selected because standardized information can be easily collected from a large sample of students. Further, data collected through the questionnaire can be compared using various statistical analyses.

Standardized questionnaires were administered in October (pre-test) and then again in May[5] (post-test) by data collectors during school hours. Data collectors verbally administered the questionnaire to each class as a whole.[6] The data collector read aloud each question and potential responses, while students read along and completed their personal (hardcopy) questionnaire (see Appendix F). Students placed their name on the front page—cover page—of the questionnaire for identification purposes. After the questionnaires were collected, however, the data collector removed the cover page and identified the questionnaire with a pre-assigned student identification number.[7] Data collectors discarded any questionnaires completed by students whose parents did not grant parental permission.

[5] Questionnaires administered in May were administered at the same time as the Design-a-Chair interviews and observations.

[6] RK&A administered the questionnaire to all students—those with and without parental consent—but disposed of data collected from students without consent.

[7] Before data collection, RK&A obtained a class list for each participating classroom. Each student was assigned an identification number by which all data was associated. Students' names and the identification numbers are kept in a secure file. Students' names are kept confidential; their names do not appear in association with the data.

ANALYSIS

The data were analyzed using SPSS 12.0.1 for Windows, a statistical package for personal computers. Analyses included both descriptive and inferential methods. A 0.01 level of significance was used to preclude findings of little practical significance.[8] See Appendix G for a listing of all statistical analyses that were run.

Descriptive Statistics

Frequency distributions were calculated for all categorical variables (e.g., gender, use of a specific problem-solving strategy when working on an art project, treatment/control group). Summary statistics, including the median (50th percentile), mean (average) and standard deviation (spread of scores: "±" in tables), were calculated for variables measured at an interval level or higher (e.g., ratings of attitudes about school).

Inferential Statistics

Baseline Comparisons – To examine the relationship between two categorical variables, cross-tabulation tables were computed to show the joint frequency distribution of the variables, and the chi-square statistic (X^2) was used to test the significance of the relationship. For example, use of a specific problem-solving strategy when working on an art project was compared according to control and treatment group to determine if the two groups differ with respect to use of that strategy.

To test for differences in the means of two or more groups, an analysis of variance (ANOVA) was performed and the F-statistic was used to test the significance of the difference. For example, ratings of attitudes about school were compared by gender to determine if attitudes about school differ in boys and girls.

Pre- post-test Comparisons (Repeated Measures) – To test for across-the-board changes from pre-test to post-test in categorical variables, the McNemar Test evaluated if there was a significant change from pre-test to post-test among students overall. For example, students' reported use of problem-solving strategies when working on an art project was compared at pre-test and post-test to determine if students' strategies changed.

To test whether changes from pre-test to post-test in categorical variables differ according to control and treatment group or gender, students' results on the categorical variable were classified as one of three specific, mutually exclusive "types of change": 1) no change from pre-test to post-test, 2) an unfavorable change from pre-test to post-test, or 3) a favorable change from pre-test to post-test. "Type of change" was then cross-tabulated with treatment/control group and gender, and the chi-square statistic (X^2) was used to test the significance of the relationship. For example, "type of change" in a problem-solving strategy when working on an art project was tested against treatment/control group to determine if type of change differed in treatment and control students.

To test for changes from pre-test to post-test in mean scores of interval level variables according to control and treatment group and gender, a repeated measures analysis of variance (ANOVA) was performed and F-statistics were calculated to test for: 1) a change in mean scores from pre-test to post-test within students overall (within subjects effect); 2) a change in mean scores from pre-test to post-test associated with control and treatment group (interaction effect); and 3) a change in mean scores from

[8] When the level of significance is set to $p = 0.01$, any finding that exists at a probability (p-value) ≤ 0.01 is "significant." When a finding (such as a relationship between two variables or a difference in rating scores) has a p-value of 0.01, there is a 99 percent probability that the finding exists; that is, 99 out of 100 times, the finding is correct. Conversely, there is a 1 percent probability that the finding would not exist; in other words, 1out of 100 times, the finding appears by chance.

pre-test to post-test associated with gender (interaction effect); a difference in pre-test and post-test mean scores according to gender (main effect); and a difference in mean scores at both pre-test and post-test according to control and treatment group (main effect).

DESIGN-A-CHAIR STUDENT INTERVIEWS AND OBSERVATIONS

METHODOLOGY

RK&A observed students completing the "Design-a-Chair" activity and interviewed each student following the activity (see Appendix H and I for the interview guide and Appendix J and K for the observation guide)[9]; both treatment and control group students participated. The Design-a-Chair activity was designed to test students' art-making and problem-solving abilities. As part of the activity students received a bag containing certain art supplies (see Appendix H and I; supplies are listed at the top of the interview guide). Data collectors instructed students by saying:

> What I'd like you to do is "Design-a-Chair." You have 15 minutes to design a chair. There is a small clock here so you can keep track of time. If you finish before 15 minutes, just let me know. I will be sitting right over here. Please use at least 3 different materials from the bag; you can use more than that if you want. Use any combination of materials, as long as there are at least three. These are your materials to use in any way you want. You can cut, glue, bend, tear, tape, do anything you'd like.

Data collectors then moved away from the table allowing the student to work with the materials. Data collectors observed the student while s/he worked and took notes on the materials the student used as well as how the materials were manipulated. When the student was finished or when 15 minutes had passed, the data collector proceeded to interview the student; interviews were audio recorded to facilitate analysis.

For this activity, students were pulled from class two to three at a time; one student was assigned to each data collector at any given time. Only students with parental permission participated in the activity. All data were collected during school hours; each school helped arrange a semi-private space for the data collectors to work. Data collection at each school took place over two or three consecutive days.

RUBRIC

RK&A developed a scoring rubric—a set of criteria linked to learning objectives that is used to assess performance of knowledge, skills, etc. on a continuum—to measure the interviews and observations. Scoring rubrics are useful because they allow qualitative data to be measured in a quantitative way, thus allowing outcomes to be measured. For this study, a rubric was used to measure students' problem-solving ability; the problem-solving items measured are Imagining, Experimentation, Flexibility, Resource Recognition, Connection of Ends and Aims, and Self-Reflection. These items were defined by RK&A, Guggenheim staff, and an advisory board. For each problem-solving item, interviews and observations were scored on the scale from 1, "Below Beginning," to 4, "Accomplished." The scoring rubric was developed based on the patterns and trends that emerged from the interview data, along with feedback from Guggenheim staff and the advisory team.

The scoring rubric underwent several revisions. See Appendix L for the final scoring rubric that was used to score all student interviews and observations

[9] Between the two study years, the interview and observation guide were modified slightly. Guides from both years are included in the appendix.

ANALYSIS

Two trained data collectors who did not collect the data and who were not privy to the research hypotheses scored the interviews and observations. One data collector scored all of the data, while the other data collector scored 25 percent of the data. RK&A tested the inter-rater reliability of the scores (i.e., compared the data collectors scores) to ensure the reliability of the scoring. Data were entered into a computer and analyzed statistically using SPSS 12.0.1. A standard 0.05 level of significance was used to preclude relationships bearing little or no practical significance. See Appendix M for a listing of all statistical analyses that were run.

Descriptive Statistics

Frequency distributions were calculated for all categorical variables (e.g., Connection of Ends and Aims II). Summary statistics, including the mean (average) and standard deviation (spread of scores: "±" in tables), were calculated for variables measured at an interval level or higher (e.g., Imagining).

Inferential Statistics

Baseline Comparisons – To examine the relationship between two categorical variables, cross-tabulation tables were computed to show the joint frequency distribution of the variables, and the chi-square statistic (X^2) was used to test the significance of the relationship. For example, Connection of Ends and Aims II was compared by control and treatment group to determine if the two groups differ with respect to this problem-solving item.

To test for differences in the means of two or more groups, an analysis of variance (ANOVA) was performed and the F-statistic was used to test the significance of the difference. For example, Imagining was compared by control and treatment group to determine if the two groups differ with respect to this problem-solving item.

STUDENT MATH SCORES

METHODOLOGY

At the end of the fifth-grade year, each student completed the New York State Mathematics Test. RK&A collected math scores—scaled score and performance level—as one measure of students' problem-solving ability.

ANALYSIS

Math scores—scaled score and performance level—were entered into a computer and analyzed statistically using SPSS 12.0.1. A standard 0.05 level of significance was used to preclude relationships bearing little or no practical significance. See Appendix N for a listing of all statistical analyses that were run.

Descriptive Statistics

Frequency distributions were calculated for all categorical variables (e.g., Performance Level). Summary statistics, including the mean (average) and standard deviation (spread of scores: "±" in tables), were calculated for variables measured at an interval level or higher (e.g., Scaled Scores).

Inferential Statistics

Baseline Comparisons – To test for differences in the means of two or more groups, an analysis of variance (ANOVA) was performed and the F-statistic was used to test the significance of the difference. For example, Scaled Scores were compared by control and treatment group to determine if the two groups differ with respect to math ability.

STUDENT CASE STUDIES

METHODOLOGY

Case studies were used to examine the program at the micro level. Case studies typically examine the interplay of variables to provide as complete an understanding of one event or situation as possible. Case studies do not produce generalizable information.

For this study, one case study was defined as one student. Two case studies from each treatment classroom were randomly selected from among students with parental permission.[10] Data were collected using student observations and interviews between December and April of each school year.[11] Three observations were conducted—one in the beginning weeks of *LTA*, one during the middle of *LTA*, and one at the end of *LTA*. The student interview—which concentrated on students' experiences with an art project on which they worked/were working—was conducted on the final observation day; interviews were not audio recorded, but rather, data collectors took notes. Additionally, an audio recorded teacher interview was conducted in June following the school year (see Appendix O and P for the guides). The teacher interview was conducted via telephone; teachers spoke specifically about the one or two case study students in their classroom.

ANALYSIS

RK&A analyzed the data qualitatively, looking for patterns and trends in the student observations, student interviews, and teacher interviews.

TEACHING ARTIST OBSERVATIONS

METHODOLOGY

Teaching artists were observed between December and April of each school year. Observations investigated the way in which teaching artists teach *LTA*. A standardized guide was used to focus observations and look for particular behaviors (see Appendix Q for the guide and Appendix R for the guidelines). Data collectors were required to identify whether a specific behavior happened and provide corresponding examples. Two data collectors observed each teaching artist so as to ensure inter-rater reliability.

ANALYSIS

Evaluators reviewed the observations forms and verified or rejected the examples provided. Data were then entered into SPSS 12.0.1 and analyzed statistically. A standard 0.05 level of significance was used to preclude relationships bearing little or no practical significance. See Appendix S for a listing of all statistical analyses that were run.

Descriptive Statistics

Calculations performed include frequency distributions calculated for all categorical variables (e.g., frequency that teaching artists refer to students as artists).

Inferential Statistics

Baseline Comparisons – To examine the relationship between two categorical variables, cross-tabulation tables were computed to show the joint frequency distribution of the variables, and the chi-square statistic (X^2) was used to test the significance of the relationship. For example, whether teaching artists referred to the students as artists was compared by teaching artists.

[10] A total of 35 case study students were observed and interviewed during the two school years. However, because of student absences, there was only enough data for 25 case studies in the end.

[11] Data for the case studies were collected at the same time as the teaching artist observations.

TEACHING ARTIST INTERVIEWS

METHODOLOGY

Teaching artists were interviewed in June about their experiences with *LTA* over the past school year. Interviews were conducted via telephone; they were audio recorded to facilitate analysis (see Appendix T for the interview guide).

ANALYSIS

RK&A analyzed the data qualitatively, looking for patterns and trends within the verbatim transcripts. As trends were identified, responses were grouped.

REPORTING METHOD

This volume—*Volume I: Report*—describes the research design of the study and presents major findings from all methodologies. Quantitative data are reported in tables and figures along with explanatory text. Qualitative data are reported in narrative and, when applicable, with exemplary quotations.

Volume 2: Appendix contains all of the instruments used in the study, a descriptive list of statistical analyses conducted, additional data not included in the report, as well as other miscellaneous information that explains the nuances and finer details of the study.

RELIABILITY AND VALIDITY OF THE STUDY

In designing the study and conducting the research, RK&A has been very mindful of the importance of reliable and valid data and analysis. Some precautions taken to ensure the quality of the data are discussed below.

RESEARCH DESIGN

RK&A understands that examining students' experiences of a particular program is complex. Many factors in a students' life can impact their behavior. To account for the multiple variables that influence student experiences, RK&A carefully structured the instruments and analyses to test for the multiple variables that may account for differences in students' problem-solving abilities.

INSTRUMENT RELIABILITY AND VALIDITY

RK&A developed all instruments according to stringent construction techniques, assuring appropriate item wording, order, format, and internal consistency. All instruments were reviewed and approved by the Guggenheim staff, project advisors, and an independent statistician (see Appendix U for a list of advisors).

The pre-test of the student questionnaires and interviews ensured the readability and coherence of the instruments. Outcomes of the pre-test were used to further refine the instruments. Additionally, the interview pre-test produced data that were used to refine the development of the scoring rubric.

DATA COLLECTION AND RESPONSE SCORING

Quality data collection is as important as quality research design. To ensure that data collection occurred in an unbiased manner, RK&A hired data collectors who do not know the research hypotheses. RK&A sought data collectors who are graduate students with educational research experiences or individuals with comparable research experiences. RK&A extensively trained data collectors and carefully monitored data collection. Additionally, data collectors were hired to help with

specific methodologies so as not to compromise the data. That is, data collectors hired to conduct teaching artist observations as well as case study observations and interviews were not eligible to conduct Design-a-Chair student interviews and observations.

Additionally, RK&A ensured inter-rater reliability for two methodologies: Design-a-Chair student interviews and observations as well as teaching artist observations. That is, for the Design-a-Chair student interviews and observations, two experienced data collectors—who did not conduct the interviews and who do not know the research hypotheses—were hired to conduct the scoring of student interview responses. For the teaching artist observations, two data collectors observed each teacher and their observations were compared during analysis.

SECTIONS OF THE REPORT:

1. Principal Findings: Student Questionnaires
2. Principal Findings: Design-a-Chair Student Interviews and Observations
3. Principal Findings: Student Math Scores
4. Principal Findings: Student Case Studies
5. Principal Findings: Teaching Artist Observations
6. Principal Findings: Teaching Artist Interviews

INTRODUCTION

A total of 418 fifth-grade students from six schools completed a questionnaire (see Appendix F) at the start of the school year (pre-test) and again at the conclusion of the school year (post-test). Questionnaire findings describe students' attitudes about school and art, schoolwork and art work practices, and perceptions of a good artist. For treatment group students, findings also describe students' evaluation of various aspects of *LTA*.

CONTROL AND TREATMENT GROUPS

Table 3 gives the breakdown for the number of students by school year and school. Control and treatment schools are identified. A total of 209 students from control schools and 209 students from treatment schools completed a pre-test and post-test questionnaire.

TABLE 3

STUDENTS AND SCHOOLS BY YEAR

	SCHOOL YEAR		
	2007 - 2008	2008 - 2009	TOTAL
SCHOOL (GROUP)	STUDENT *n*[1]	STUDENT *n*[1]	STUDENT *n*[1]
PS 28 (Control)	41	32	73
PS 115 (Control)	31	30	61
PS 152 (Control)	35	40	75
Total (Control)	107	102	209
PS 153 (Treatment)	36	41	77
PS 154 (Treatment)	52	30	82
PS 200 (Treatment)	28	22	50
Total (Treatment)	116	93	209
Grand Total	223	195	418

[1]Number of students who completed the pre-test *and* post-test questionnaire.

STUDENT CHARACTERISTICS

This section of the report describes student demographics, including gender, age, and language(s) spoken at home.

AGE AND GENDER

Table 4 shows students' age at the start of the program. Almost all students were either 10 years (68 percent) or 11 years of age (21 percent). Control and treatment students do not differ by age.

TABLE 4

AGE BY GROUP (AT START OF SCHOOL YEAR)

	GROUP		
	CONTROL	TREATMENT	TOTAL
AGE (*n* = 416)	%	%	%
9 years	8	10	9
10 years	68	68	68
11 years	23	19	21
12 years	1	3	2
SUMMARY STATISTICS			
Median age	10	10	10
Mean age	10.18	10.15	10.17
Standard deviation	± .578	± .618	± .597

As Table 5 shows, girls outnumbered boys (55 percent vs. 45 percent). Control and treatment students do not differ by gender.

TABLE 5

GENDER BY GROUP

	GROUP		
	CONTROL	TREATMENT	TOTAL
GENDER (*n* = 417)	%	%	%
Boy	47	43	45
Girl	53	57	55

LANGUAGES SPOKEN AT HOME

The questionnaire asked students to identify the language(s) spoken at home (see Table 6). Almost all students said they speak English at home (92 percent). Control and treatment group students differed by language in two ways:

- More control group students than treatment group students said they speak Spanish at home (88 percent vs. 47 percent).
- More treatment group students than control group students said they speak an "other" language at home (20 percent vs. 10 percent).

TABLE 6

LANGUAGE(S) SPOKEN AT HOME BY GROUP

LANGUAGE(S) SPOKEN AT HOME (*n* = 418)	GROUP		
	CONTROL	TREATMENT	TOTAL
	%[1]	%[1]	%[1]
English	91	93	92
Spanish[2,3]	88	47	68
Other language[2,4]	10	20	15

[1] Column totals exceed 100 percent because students may speak more than one language at home, and thus, some identified more than one language.

[2] Of the students who said they do not speak English at home (*n* = 34), 27 students speak Spanish at home and 7 students speak another language at home.

[3] $\chi^2 = 79.049$; $df = 1$; $p = .000$

[4] $\chi^2 = 8.242$; $df = 1$; $p = .006$

Table 7 presents the "other" languages listed by students. Of the many languages listed, French (n = 18), Mandingo (n = 8) and Creole (n = 7) are most prevalent.

TABLE 7

"OTHER" LANGUAGES SPOKEN AT HOME BY GROUP

"OTHER" LANGUAGE(S) (n = 63 STUDENTS)	GROUP		
	CONTROL	TREATMENT	TOTAL[1]
	FREQUENCY	FREQUENCY	FREQUENCY
French	9	9	18
Mandingo	1	7	8
Creole	2	5	7
African	1	4	5
Bangla	0	2	2
Chinese	1	1	2
Italian	2	0	2
Jamaican	0	2	2
Portuguese	1	1	2
Phulani	0	2	2
Sign language	0	2	2
Sonike	0	2	2
Wolof	0	2	2
Albanian	1	0	1
Arabic	1	0	1
Asian	0	1	1
Ga	0	1	1
Garifuna	0	1	1
Greek	1	0	1
Hebrew	0	1	1
Jula	1	0	1
Serbian	0	1	1
Yoruba	0	1	1
Not reported	2	1	3

[1]Some students reported more than one "other" language spoken at home.

BASELINE COMPARISON OF TREATMENT AND CONTROL STUDENTS

This section of the report presents pre-test findings, which are baseline findings about students. Baseline findings describe students at the beginning of the school year and before the treatment students receive *LTA*. Any differences associated with control and treatment groups or gender are identified.

GUGGENHEIM MUSEUM VISITS

At baseline, 4 percent of students had visited the Guggenheim Museum as part of a family group, and 4 percent of students had visited the Guggenheim Museum as part of a school group (see Table 8). These results did not differ by control and treatment groups or gender.

TABLE 8

GUGGENHEIM MUSEUM VISITS (PRIOR TO PROGRAM) BY GROUP

GUGGENHEIM MUSEUM VISITS PRIOR TO PROGRAM		GROUP		
		CONTROL	TREATMENT	TOTAL
	n	%	%	%
Has visited with school	414	5	3	4
Has visited with family	415	5	3	4

ATTITUDES ABOUT SCHOOL

Students responded to seven statements about school on the scale "Strongly disagree – Somewhat disagree – Somewhat agree – Strongly agree." Depending on the statement, the most favorable response was either "Strongly disagree" or "Strongly agree." Therefore, to analyze the statements all together, each statement was scored from 1 – 4 points with 1 point given to the least favorable response and 4 points given to the most favorable response. The scores of the seven statements were added together to create a total score that represents the student's overall attitude about school (with a possible range of 7 – 28 points).[12]

Table 9 shows the results by control and treatment groups. Overall, students' attitudes about school were quite positive; students' total scores, representing overall attitudes about school, ranged from 10 to 28 points with a median score of 22 and mean score of 21.9. At baseline, there were no significant differences in scores between control and treatment group students' responses.

[12] The total score representing "attitudes-about-school" has a scale reliability = .824 (Chronbach's Alpha).

TABLE 9

ATTITUDES ABOUT SCHOOL BY GROUP

SCALE: STRONGLY DISAGREE (1) / STRONGLY AGREE (4)	*n*	GROUP CONTROL MEAN	TREATMENT MEAN	TOTAL MEAN
I learn a lot in school.	412	3.8	3.7	3.8
I enjoy working on my school assignments.	417	3.2	3.1	3.1
I like school.	417	3.1	3.0	3.1
I like going to school.	412	3.0	2.8	2.9
SCALE: STRONGLY AGREE (1) / STRONGLY DISAGREE (4)	***n***	**MEAN**	**MEAN**	**MEAN**
I hate doing schoolwork.	412	3.1	3.0	3.1
I don't like to go to school.	416	3.1	2.9	3.0
School is boring.	413	2.9	2.8	2.8
TOTAL SCORE[1] SUMMARY STATISTICS (*n* = 397)		**CONTROL**	**TREATMENT**	**TOTAL**
Range		10 – 28	10 – 28	10 – 28
Median		22.0	22.0	22.0
Mean		22.2	21.5	21.9
Standard Deviation		± 4.34	± 4.47	± 4.42

[1]Total score can range from 7 – 28 points.

At baseline, girls and boys differed on two statements about school (see Table 10). On the scale 1 ("Strongly disagree") to 4 ("Strongly agree"):

- Girls responded more favorably than boys to the statement "I enjoy working on my school assignments" (mean = 3.3 vs. mean = 3.0).
- Girls responded more favorably than boys to the statement "I like school" (mean = 3.2 vs. mean = 2.9)

TABLE 10

ATTITUDES ABOUT SCHOOL BY GENDER

SCALE: STRONGLY DISAGREE (1) / STRONGLY AGREE (4)	*n*	GENDER BOY MEAN	GIRL MEAN	TOTAL MEAN
I enjoy working on my school assignments.[1]	416	3.0	3.3	3.2
I like school.[2]	416	2.9	3.2	3.1

[1]F = 7.940; p = .005
[2]F = 10.693; p = .001

ATTITUDES ABOUT ART

Students responded to six statements about art on the scale "Strongly disagree – Somewhat disagree – Somewhat agree – Strongly agree." Depending on the statement, the most favorable response was either "Strongly disagree" or "Strongly agree." Therefore, to analyze the statements all together, each statement was scored from 1 – 4 points with 1 point given to the least favorable response and 4 points given to the most favorable response. The scores of the six statements were added together to create a total score that represents the student's overall attitude about art (with a possible range of 6 – 24 points).[13]

Table 11 shows the results by control and treatment group. Students' attitudes about art were highly favorable, with one exception: students tended to agree with the statement "Having a good final artwork is the most important thing about art."[14] Students' total scores, representing overall attitudes about art, were very positive, ranging from 8 to 24 points with a median score of 20 and mean score of 19.2. At baseline, there were no significant differences between control and treatment group students' responses.

TABLE 11

ATTITUDES ABOUT ART BY GROUP

SCALE: STRONGLY DISAGREE (1) / STRONGLY AGREE (4)	*n*	GROUP CONTROL MEAN	GROUP TREATMENT MEAN	TOTAL MEAN
I like making artwork in class.	417	3.6	3.6	3.6
I concentrate when I'm doing an art project.	414	3.5	3.5	3.5
Doing art projects makes me happy	414	3.4	3.4	3.4
The process of making art is the most important thing about art.	416	3.1	3.3	3.2
SCALE: STRONGLY AGREE (1) / STRONGLY DISAGREE (4)	***n***	**MEAN**	**MEAN**	**MEAN**
I do not like making artwork in class.	415	3.5	3.5	3.5
Having a good final artwork is the most important thing about art.	416	1.7	1.9	1.8
TOTAL SCORE[1] SUMMARY STATISTICS (*n* = 407)		**CONTROL**	**TREATMENT**	**TOTAL**
Range		8 – 24	10 – 24	8 – 24
Median		20.0	20.0	20.0
Mean		19.0	19.3	19.2
Standard Deviation		± 2.95	± 2.79	± 2.87

[1]Total score can range from 6 – 24 points.

[13] The total score representing "attitudes-about-art projects" has a scale reliability = .549 (Chronbach's Alpha). The particular item that lowers the internal consistency of the six items is "Having a good final artwork is the most important thing about art." If this item were deleted from the group, the reliability score = .756. This statement was scored so that "strongly agree" received the *lowest* score, yet students with high scores on the other five items rarely disagreed with this statement, so it lowers the internal consistency of the group of items.

[14] Note that students who strongly disagreed with this statement received the most favorable score (4 points).

At baseline, there were a number of gender differences. Scores differed on three statements as well as the overall total score (see Table 12).

On the scale 1 ("Strongly disagree") to 4 ("Strongly agree"):

- Girls agreed more strongly than boys to the statement "I like making artwork in class" (mean = 3.8 vs. mean = 3.4).
- Girls agreed more strongly than boys to the statement "Doing art projects makes me happy" (mean = 3.6 vs. mean = 3.2)

On the scale 1 ("Strongly agree") to 4 ("Strongly disagree"):

- Girls disagreed more strongly than boys with the statement "I do not like making artwork in class" (mean = 3.7 vs. mean = 3.3).

For total score, ranging from 6 (unfavorable) to 24 (favorable):

- Girls had a more favorable overall attitude about art than boys (mean total score = 19.7 vs. mean total score = 18.5).

TABLE 12

ATTITUDES ABOUT ART BY GENDER

SCALE: STRONGLY DISAGREE (1) / STRONGLY AGREE (4)	*n*	GENDER BOY MEAN	GIRL MEAN	TOTAL MEAN
I like making artwork in class.[1]	416	3.4	3.8	3.6
Doing art projects makes me happy.[2]	413	3.2	3.6	3.4
SCALE: STRONGLY AGREE (1) / STRONGLY DISAGREE (4)	***n***	**MEAN**	**MEAN**	**MEAN**
I do not like making artwork in class.[3]	414	3.3	3.7	3.5
TOTAL SCORE[4] SUMMARY STATISTICS (*n* = 407)		**BOY**	**GIRL**	**TOTAL**
Range		8 – 24	10 – 24	8 – 24
Median		19.5	20.0	20.0
Mean[4]		18.5	19.7	19.2
Standard Deviation		± 3.35	± 2.78	± 2.87

[1] $F = 27.796$; $p = .000$
[2] $F = 23.447$; $p = .000$
[3] $F = 24.245$; $p = .000$
[4] $F = 19.012$; $p = .000$

ATTITUDES ABOUT ART MUSEUMS

Students responded to five statements about art museums on the scale "Strongly disagree – Somewhat disagree – Somewhat agree – Strongly agree." Depending on the statement, the most favorable response was either "Strongly disagree" or "Strongly agree." Therefore, to analyze the statements all together, each statement was scored from 1 – 4 points with 1 point given to the least favorable response and 4 points given to the most favorable response. The scores of the five statements were added

together to create a total score that represents the student's overall attitude about art museums (with a possible range of 5 – 20 points).[15]

Table 13 shows the results by control and treatment group. Overall, students' attitudes about art museums were very positive. Students' total scores, representing overall attitude about art museums, ranged from 5 to 20 points with a median score of 19 and mean score of 17.6. At baseline, there were no significant differences between control and treatment group students' responses.

TABLE 13

ATTITUDES ABOUT ART MUSEUMS BY GROUP

SCALE: STRONGLY DISAGREE (1) / STRONGLY AGREE (4)	*n*	GROUP CONTROL MEAN	GROUP TREATMENT MEAN	TOTAL MEAN
I would like my class to visit an art museum.	417	3.6	3.6	3.6
I like art museums.	417	3.5	3.5	3.5
I would bring my family to visit an art museum.	416	3.3	3.3	3.3
SCALE: STRONGLY AGREE (1) / STRONGLY DISAGREE (4)	***n***	**MEAN**	**MEAN**	**MEAN**
I feel uncomfortable in art museums.	415	3.6	3.5	3.6
I think art museums are boring.	417	3.6	3.5	3.6
TOTAL SCORE[1] SUMMARY STATISTICS (*n* = 415)		**CONTROL**	**TREATMENT**	**TOTAL**
Range		5 – 20	5 – 20	5 – 20
Median		19.0	19.0	19.0
Mean		17.7	17.6	17.6
Standard Deviation		± 3.01	± 3.11	± 3.06

[1] Total score can range from 5 – 20 points.

At baseline, boys and girls differed on one statement about art museums (see Table 14). On the scale 1 ("Strongly disagree") to 4 ("Strongly agree"):

- Girls agreed more strongly than boys with the statement "I would bring my family to an art museum" (mean = 3.4 vs. mean = 3.2).

TABLE 14

ATTITUDES ABOUT ART MUSEUMS BY GENDER

SCALE: STRONGLY DISAGREE (1) / STRONGLY AGREE (4)	*n*	GENDER BOY MEAN	GENDER GIRL MEAN	TOTAL MEAN
I would bring my family to an art museum.[1]	415	3.2	3.4	3.3

[1] $F = 6.832$; $p = .009$

[15] The total score representing "attitudes-about-art museums" has a scale reliability = .804 (Chronbach's Alpha).

PROBLEM-SOLVING STRATEGIES

Students answered questions about how they would approach three particular problems: solving a math problem at school, solving a puzzle at home, and fixing a mistake on an art project at school. The results for the three types of problems are presented separately. A summary measure of overall problem-solving ability, calculated by adding the item scores of all problem-solving items, is also presented.

SOLVING A MATH PROBLEM AT SCHOOL

Students answered eight questions about how they would solve a math problem at school with a "yes" or "no" response. Depending on the question, the most favorable response was either "yes" or "no." Therefore, to analyze the questions all together, each answer was scored so that 1 point was given to the more favorable response and 0 points were given to the less favorable response.

Table 15 shows the results by control and treatment group. Overall, the overwhelming majority of students (80 percent or more) reported good problem-solving strategies on all questions but one; only 54 percent of students said they would "ask another student for help" when solving a math problem at school. At baseline, there were no significant differences between control and treatment group students' responses.

TABLE 15

STRATEGIES FOR SOLVING A MATH PROBLEM AT SCHOOL BY GROUP

WHEN WORKING ON A MATH PROBLEM AT SCHOOL AND YOU MAKE A MISTAKE, DO YOU ...		GROUP		
		CONTROL	TREATMENT	TOTAL
YES = FAVORABLE RESPONSE NO = UNFAVORABLE RESPONSE	*n*	FAVORABLE RESPONSE %	FAVORABLE RESPONSE %	FAVORABLE RESPONSE %
Keep working on the math problem and try to solve it?	418	93	93	93
Ask the teacher for help?	418	86	88	87
Talk about how to solve it with your teacher or other students?	418	82	86	84
Ask another student for help?	417	51	56	54
NO = FAVORABLE RESPONSE YES = UNFAVORABLE RESPONSE	***n***	**FAVORABLE RESPONSE %**	**FAVORABLE RESPONSE %**	**FAVORABLE RESPONSE %**
Give up and do something else?	417	96	94	95
Throw away your work and start over?	417	81	81	81
Feel sad?	417	84	87	86
Feel mad?	415	78	81	80

At baseline, boys and girls responded differently to one of the questions about solving a math problem (see Table 16, next page).

- Girls were more likely than boys to respond "yes" to the question "When working on a math problem and you make a mistake, do you ask another student for help?" (60 percent vs. 46 percent).

TABLE 16

STRATEGIES FOR SOLVING A MATH PROBLEM AT SCHOOL BY GENDER

WHEN WORKING ON A MATH PROBLEM AT SCHOOL AND YOU MAKE A MISTAKE, DO YOU ... YES = FAVORABLE RESPONSE NO = UNFAVORABLE RESPONSE	*n*	GENDER BOY FAVORABLE RESPONSE %	GENDER GIRL FAVORABLE RESPONSE %	TOTAL FAVORABLE RESPONSE %
Ask another student for help?[1]	416	46	60	54

[1] $\chi^2 = 7.346$; $df = 1$; $p = .008$

SOLVING A PUZZLE AT HOME

Students answered seven questions about solving a puzzle at home with a "yes" or "no" response. Depending on the question, the most favorable response was either "yes" or "no." Therefore, to analyze the questions all together, each answer was scored so that 1 point was given to the more favorable response and 0 points were given to the less favorable response.

Table 17 shows the results by control and treatment group. Overall, the majority of students (65 percent or more) reported favorable problem-solving strategies on all questions. At baseline, there were no significant differences in control and treatment group students' responses, and there were also no gender differences in students' responses.

TABLE 17

STRATEGIES FOR SOLVING A PUZZLE AT HOME BY GROUP

WHEN YOU ARE TRYING TO SOLVE A PUZZLE AT HOME AND YOU CANNOT FIGURE OUT HOW TO DO IT, DO YOU... YES = FAVORABLE RESPONSE NO = UNFAVORABLE RESPONSE	*n*	GROUP CONTROL FAVORABLE RESPONSE %	GROUP TREATMENT FAVORABLE RESPONSE %	TOTAL FAVORABLE RESPONSE %
Keep working on the puzzle and try to solve it?	416	85	89	87
Ask a family member for help?	418	85	87	86
Talk about how to solve it with your family or friends?	417	74	77	75
Ask a friend for help?	417	69	60	65
NO = FAVORABLE RESPONSE YES = UNFAVORABLE RESPONSE	***n***	**FAVORABLE RESPONSE %**	**FAVORABLE RESPONSE %**	**FAVORABLE RESPONSE %**
Feel sad?	418	90	91	90
Give up and do something else?	416	78	80	79
Feel mad?	418	78	77	78

SOLVING A PROBLEM WITH AN ART PROJECT

Students answered nine questions about fixing a mistake when working on an art project at school with a "yes" or "no" response. Depending on the question, the most favorable response was either "yes" or "no." Therefore, to analyze the questions all together, each answer was scored so that 1 point was given to the more favorable response and 0 points were given to the less favorable response.

Table 18 shows the results by control and treatment group. Most students (72 percent or more) reported favorable problem-solving strategies on all questions except one; only 51 percent of students said they would "ask another student for help" when solving a problem with an art project. At baseline, there were no significant differences in control and treatment group students' responses.

TABLE 18

STRATEGIES FOR SOLVING A PROBLEM WITH AN ART PROJECT BY GROUP

WHEN YOU ARE WORKING ON AN ART PROJECT AT SCHOOL AND YOU MAKE A MISTAKE, DO YOU ...		GROUP		
		CONTROL	TREATMENT	TOTAL
YES = FAVORABLE RESPONSE NO = UNFAVORABLE RESPONSE	*n*	FAVORABLE RESPONSE %	FAVORABLE RESPONSE %	FAVORABLE RESPONSE %
Keep working on your project and try to fix it?	417	88	89	89
Try to fix the project by using different materials?	416	89	84	87
Ask the teacher for help?	416	71	74	72
Talk about how to fix it with your teacher or other students?	417	68	76	72
Ask another student for help?	415	52	49	51
NO = FAVORABLE RESPONSE YES = UNFAVORABLE RESPONSE	*n*	FAVORABLE RESPONSE %	FAVORABLE RESPONSE %	FAVORABLE RESPONSE %
Give up and do something else?	416	93	92	93
Feel sad?	417	89	90	90
Feel mad?	417	82	82	82
Throw away your project and start over?	417	77	78	78

At baseline, boys and girls differed in response to two questions about fixing a mistake on an art project (see Table 19, next page).

- Girls were more likely than boys to respond favorably (yes) to the question "When you are working on an art project at school and you make a mistake, do you try to fix the project by using different materials?" (91 percent vs. 82 percent).
- Girls were more likely than boys to respond favorably (no) to the question "When you are working on an art project at school and you make a mistake, do you give up and do something else?" (97 percent vs. 87 percent).

TABLE 19

STRATEGIES FOR SOLVING A PROBLEM WITH AN ART PROJECT BY GENDER

WHEN YOU ARE WORKING ON AN ART PROJECT AT SCHOOL AND YOU MAKE A MISTAKE, DO YOU ...		GENDER		
		BOY	GIRL	TOTAL
YES = FAVORABLE RESPONSE NO = UNFAVORABLE RESPONSE	*n*	FAVORABLE RESPONSE %	FAVORABLE RESPONSE %	FAVORABLE RESPONSE %
Try to fix the project by using different materials?[1]	415	82	91	87
NO = FAVORABLE RESPONSE YES = UNFAVORABLE RESPONSE	*n*	FAVORABLE RESPONSE %	FAVORABLE RESPONSE %	FAVORABLE RESPONSE %
Give up and do something else?[2]	416	87	97	93

[1] $\chi^2 = 7.408$; $df = 1$; $p = .008$
[2] $\chi^2 = 14.269$; $df = 1$; $p = .000$

OVERALL PROBLEM-SOLVING SKILLS

The scores of the answers to the 24 problem-solving questions were added together to create a total score that represents the student's overall problem-solving skill (with a possible range of 0 – 24 points).[16]

Table 20 shows the results by control and treatment group. Students' total scores ranged from 6 to 24 points with a median score = 20 and mean score = 19.3. At baseline, there were no significant differences in control and treatment group students' responses, and there were no significant gender differences in students' total scores.[17]

TABLE 20

OVERALL PROBLEM-SOLVING SKILL BY GROUP

TOTAL PROBLEM-SOLVING SCORE[1] SUMMARY STATISTICS (*n* = 402)	GROUP		
	CONTROL	TREATMENT	TOTAL
Range	9 – 24	6 – 24	6 – 24
Median	19.0	20.0	20.0
Mean	19.2	19.4	19.3
Standard Deviation	± 3.63	± 3.48	± 3.55

[1] Total score can range from 0 – 24 points.

ART PROJECT WORK PRACTICES

Students answered 12 questions about how they work on art projects at school with a "yes" or "no" response. Depending on the question, the most favorable response was either "yes" or "no." Therefore, to analyze the questions all together, each answer was scored so that 1 point was given to the more favorable response and 0 points were given to the less favorable response.

Table 21 (next page) shows the results by control and treatment group. A majority of students responded favorably to all but three questions. First, 44 percent of students responded favorably (yes)

[16] The total score representing "overall problem-solving skill" has a scale reliability = .755 (Chronbach's Alpha).
[17] While the total score representing overall problem-solving skill did not differ by gender using the significance level of $p = .01$, girls scored higher than boys (mean score = 19.7 vs. mean score = 18.8; F = 6.219; $p = .013$.)

to the question "Do you change your mind about how you want your art project to turn out and go in a different direction?" Second, 40 percent of students responded favorably (no) to the question "Do you choose materials that are your favorite color?" Lastly, 25 percent of students responded favorably (no) to the question "Do you make sure you do not make any mistakes?"

At baseline, control and treatment group students responded differently to one question about working on an art project:

- Treatment group were more likely than control group students to respond favorably (yes) to the question "When you are working on an art project at school, do you keep working on your project even if you make mistakes?" (82 percent vs. 70 percent).

TABLE 21

ART PROJECT WORK PRACTICES BY GROUP

WHEN YOU ARE WORKING ON AN ART PROJECT AT SCHOOL, DO YOU ...		GROUP		
		CONTROL	TREATMENT	TOTAL
YES = FAVORABLE RESPONSE NO = UNFAVORABLE RESPONSE	*n*	FAVORABLE RESPONSE %	FAVORABLE RESPONSE %	FAVORABLE RESPONSE %
Make a plan for creating your art project?	414	92	88	90
Imagine several different ways your art project might turn out?	417	90	84	87
Search for and try a variety of art materials until your project looks how you want it to look?	416	85	81	83
Stop working on your art project for a few minutes to think about it?	417	83	83	83
Keep working on your project even if you make mistakes?[1]	416	70	82	76
Search for information to help you with your art project?	416	62	68	65
Play with the art materials in lots of ways to see what happens?	416	58	53	55
Change your mind about how you want your art project to turn out and go in a different direction?	417	48	41	44
NO = FAVORABLE RESPONSE YES = UNFAVORABLE RESPONSE	***n***	**FAVORABLE RESPONSE %**	**FAVORABLE RESPONSE %**	**FAVORABLE RESPONSE %**
Use the art materials you're most comfortable with?	417	80	77	78
Try to make your art project look exactly like something else you've seen?	417	53	54	54
Choose materials that are your favorite color?	417	37	42	40
Make sure you do not make any mistakes?	417	23	26	25

[1] $\chi^2 = 8.603$; $df = 1$; $p = .004$

At baseline, boys and girls differed in their response to one question about working on art project (see Table 22).

- Girls were more likely than boys to respond favorably (no) to the question "When you are working on an art project at school do you try to make your art project look exactly like something else you've seen?" (60 percent vs. 46 percent).

TABLE 22

ART PROJECT WORK PRACTICES BY GENDER

WHEN YOU ARE WORKING ON AN ART PROJECT AT SCHOOL DO YOU ... NO = FAVORABLE RESPONSE YES = UNFAVORABLE RESPONSE	*n*	GENDER BOY FAVORABLE RESPONSE %	GENDER GIRL FAVORABLE RESPONSE %	TOTAL FAVORABLE RESPONSE %
Try to make your art project look exactly like something else you've seen?[1]	416	46	60	54

[1] $\chi^2 = 7.924$; $df = 1$; $p = .006$

QUALITIES OF A GOOD ARTIST

Students did a sentence completion exercise in which they selected two statements from among eight to complete the sentence, "A good artist is somebody who _____."

Table 23 shows control and treatment students' responses. The top two selections were: "A good artist is somebody who draws really well" (49 percent) and "A good artist is somebody who works hard and practices" (47 percent). The bottom two selections were: "A good artist is someone who calls himself/herself an artist" (5 percent) and "A good artist is someone who is famous" (3 percent). At baseline, there were no significant differences in control and treatment groups' selections as well as no differences in selections by gender.

TABLE 23

OPINION OF THE QUALITIES OF A GOOD ARTIST BY GROUP

A GOOD ARTIST IS SOMEBODY WHO ... (*n* = 417)	GROUP CONTROL %[1]	GROUP TREATMENT %[1]	TOTAL %[1]
Draws really well	49	50	49
Works hard and practices	41	53	47
Has good ideas	33	34	33
Makes beautiful things	26	18	22
Has their artwork displayed in a museum	23	20	21
Experiments with different materials	20	14	17
Calls himself/herself an artist	5	6	5
Is famous	3	4	3

[1] Column totals exceed 100 percent because students selected two responses.

SUMMARY OF BASELINE FINDINGS

To summarize, baseline findings indicate:

CONTROL AND TREATMENT STUDENTS STARTED WITH VERY POSITIVE RESPONSES.

- Students (both control and treatment) already had very positive attitudes about school, art, and art museums.
- Students (both control and treatment) reported relatively good problem-solving skills when encountering a math problem at school, a puzzle at home, or a mistake with an art project.
- Most of students' work practices when doing an art project were also favorable.

THERE IS ONE DIFFERENCE IN CONTROL AND TREATMENT GROUP STUDENTS' RESPONSES.

- Treatment group students were more likely than control group students to say they would keep working on an art project at school even if they made mistakes.

THERE WERE A NUMBER OF GENDER DIFFERENCES IN RESPONSES.

- There were differences in boys' and girls' problem-solving strategies for math problems and art projects at school.
- On all of the questionnaire items that differed according to gender, girls gave more favorable responses than boys.

PRE-TEST TO POST-TEST CHANGES

The next section of the report explores how students' responses on the questionnaire changed from pre-test to post-test, and tests whether changes occurred across the board, or if they were associated with control and treatment group or gender. Of particular interest is whether treatment group students showed more improvement than control group students.

Since baseline pre-test questionnaire results have been thoroughly described, this section of the report only presents items with significant changes from pre-test-to post-test.

GUGGENHEIM MUSEUM VISITS

At the end of the school year, most treatment group students had visited the Guggenheim as part of a school group (92 percent), as expected. However, few control and treatment students had visited the Guggenheim as part of a family group by the end of the school year (8 percent of treatment group students and 6 percent of control group students) (see Table 24).

TABLE 24

GUGGENHEIM MUSEUM VISITS (AT CONCLUSION OF PROGRAM) BY GROUP

GUGGENHEIM MUSEUM VISITS AT CONCLUSION OF PROGRAM		GROUP		
		CONTROL	TREATMENT	TOTAL
	n	%	%	%
Has visited with school[1]	417	9	92	51
Has visited with family	418	6	8	7

[1] $\chi^2 = 290.115$; $df = 2$; $p = .000$

CHANGES IN ATTITUDES ABOUT SCHOOL

Scores on four of the seven statements about school and the total score, representing students' overall attitudes about school, declined from pre-test to post-test across the board (they did not differ by control and treatment group or gender) (see Table 25).

- On the scale 1 ("Strongly disagree") to 4 ("Strongly agree"), students' scores declined for the statements "I like school" and "I enjoy working on my school assignments" (both pre-test means = 3.1 vs. both post-test means = 2.9).
- On the scale 1 ("Strongly agree") to 4 ("Strongly disagree"), students' scores declined for the statements "I hate doing schoolwork" and "I don't like going to school" (pre-test mean = 3.1 vs. post-test mean = 2.9 and pre-test mean = 3.0 vs. post-test mean = 2.8).
- Students' total scores declined from pre-test to post-test (pre-test mean = 21.9 vs. post-test mean = 20.9).

TABLE 25

OVERALL CHANGES IN ATTITUDES ABOUT SCHOOL

SCALE: STRONGLY DISAGREE (1) / STRONGLY AGREE (4)	*n*	PRE-TEST MEAN	POST-TEST MEAN	CHANGE
I like school.[1]	416	3.1	2.9	- 0.2
I enjoy working on my school assignments.[2]	415	3.1	2.9	- 0.2
SCALE: STRONGLY AGREE (1) / STRONGLY DISAGREE (4)	***n***	**PRE-TEST MEAN**	**POST-TEST MEAN**	**CHANGE**
I hate doing schoolwork.[3]	406	3.1	2.9	- 0.2
I don't like going to school.[4]	414	3.0	2.8	- 0.2
TOTAL SCORE (POSSIBLE RANGE 7 – 28)	***n***	**PRE-TEST MEAN**	**POST-TEST MEAN**	**CHANGE**
Overall attitude[5]	382	21.9	20.9	- 1.0

[1] $F = 14.588$; $p = .000$ (within subjects change)
[2] $F = 19.100$; $p = .000$ (within subjects change)
[3] $F = 11.535$; $p = .001$ (within subjects change)
[4] $F = 8.462$; $p = .004$ (within subjects change)
[5] $F = 21.417$; $p = .000$ (within subjects change)

CHANGES IN ATTITUDES ABOUT ART

Scores on one of the six statements about art changed from pre-test to post-test by control and treatment group:

- On the scale 1 ("Strongly agree") to 4 ("Strongly disagree"), control group students' scores improved from pre-test to post-test for the statement "Having a good final artwork is the most important thing about art" (pre-test mean = 1.7 vs. post-test mean = 2.0), while treatment group students' scores did not change at all (both pre-test and post-test means = 1.9) (see Table 26, next page).

TABLE 26

CHANGES IN ATTITUDES ABOUT ART BY GROUP

HAVING A GOOD FINAL ARTWORK IS THE MOST IMPORTANT THING ABOUT ART.[1] SCALE: STRONGLY AGREE (1) / STRONGLY DISAGREE (4)	*n*	PRE-TEST MEAN	POST-TEST MEAN	CHANGE
Control group	206	1.7	2.0	+ 0.3
Treatment group	208	1.9	1.9	0.0

[1]F = 6.823; p = .009 (interaction effect between group and pre-test-post-test scores.)

Scores on one of the six statements about art changed from pre-test to post-test by gender:

- On the scale 1 ("Strongly agree") to 4 ("Strongly disagree"), boys' scores improved from pre-test to post-test for the statement "I do not like making artwork in class" (pre-test mean = 3.3 vs. post-test mean = 3.5), while girls' scores did not change at all (both pre-test and post-test means = 3.7) (see Table 27).

TABLE 27

CHANGES IN ATTITUDES ABOUT ART BY GENDER

I DO NOT LIKE MAKING ARTWORK IN CLASS.[1] SCALE: STRONGLY AGREE (1) / STRONGLY DISAGREE (4)	*n*	PRE-TEST MEAN	POST-TEST MEAN	CHANGE
Boys	186	3.3	3.5	+ 0.2
Girls	225	3.7	3.7	0.0

[1]F = 8.509; p = .004 (interaction effect between gender and pre-/post-test scores.)

CHANGES IN ATTITUDES ABOUT ART MUSEUMS

Scores for the five statements about art museums did not change significantly from pre-test to post-test, nor did the total score that represents students' overall attitudes about art museums. None of the five items has a significant pre-test to post-test change associated with treatment/control group or gender.

CHANGES IN PROBLEM-SOLVING SKILLS

CHANGES IN SOLVING A MATH PROBLEM AT SCHOOL

Responses for one of the eight questions about solving a math problem at school improved from pre-test to post-test across the board (they did not differ according to control and treatment group or gender) (see Table 28, next page):

- More students responded favorably (yes) on post-test than pre-test to the question "When you are working on a math problem at school and you make a mistake, do you ask another student for help?" (68 percent on post-test vs. 54 percent on pre-test).

TABLE 28

OVERALL CHANGES IN STRATEGIES FOR SOLVING A MATH PROBLEM AT SCHOOL

WHEN YOU ARE WORKING ON A MATH PROBLEM AT SCHOOL AND YOU MAKE A MISTAKE, DO YOU ... (*n* = 417)	PRE-TEST FAVORABLE RESPONSE (YES) %	POST-TEST FAVORABLE RESPONSE (YES) %	CHANGE %
Ask another student for help?	54	68	+ 14

$\chi^2 = 27.068$; $p = .000$ (McNemar Test)

CHANGES IN SOLVING A PUZZLE AT HOME

Responses for one of the seven questions about solving a puzzle at home changed from pre-test to post-test across the board (they did not differ by control and treatment group and gender) (see Table 29):

- Fewer students responded favorably (yes) on post-test than pre-test to the question "When you are working on a puzzle at home and you cannot figure out how to do it, do you ask a family member for help?" (79 percent on post-test vs. 86 percent on pre-test).

TABLE 29

OVERALL CHANGES IN STRATEGIES FOR SOLVING A PUZZLE AT HOME

WHEN YOU ARE WORKING ON A PUZZLE AT HOME AND YOU CANNOT FIGURE OUT HOW TO DO IT, DO YOU ... (*n* = 417)	PRE-TEST FAVORABLE RESPONSE (YES) %	POST-TEST FAVORABLE RESPONSE (YES) %	CHANGE %
Ask a family member for help?	86	79	- 7

$\chi^2 = 7.934$; $p = .005$ (McNemar Test)

CHANGES IN SOLVING A PROBLEM WITH AN ART PROJECT

Responses for one of the nine questions about solving a problem with an art project changed from pre-test to post-test across the board (they did not differ by control and treatment group and gender) (see Table 30):

- More students responded favorably (yes) on post-test than pre-test to the question "When you are working on an art project at school and you make a mistake, do you ask another student for help?" (64 percent on post-test vs. 51 percent on pre-test).

TABLE 30

OVERALL CHANGES IN STRATEGIES FOR SOLVING A PROBLEM WITH AN ART PROJECT

WHEN YOU ARE WORKING ON AN ART PROJECT AT SCHOOL AND YOU MAKE A MISTAKE, DO YOU ... (*n* = 415)	PRE-TEST FAVORABLE RESPONSE (YES) %	POST-TEST FAVORABLE RESPONSE (YES) %	CHANGE %
Ask another student for help?	51	64	+ 13

$\chi^2 = 19.723$; $p = .000$ (McNemar Test)

Responses for two of the nine questions about solving a problem with an art project changed from pre-test to post-test by control and treatment group (see Table 31; Appendix V shows the full cross-tabulation table of pre-test to post-test changes for these questions):

- More treatment group students responded favorably (no) on post-test than pre-test to the question "When you are working on an art project at school and you make a mistake, do you feel mad?" (92 percent on post-test vs. 82 percent on pre-test), while control group students did not change at all (82 percent on both post-test and pre-test).
- More treatment group students responded favorably (yes) on post-test than pre-test to the question "When you are working on an art project at school and you make a mistake, do you try to fix the project by using different materials?" (92 percent on post-test vs. 84 percent on pre-test), while fewer control group students responded favorably (yes) on post-test than pre-test (82 percent on post-test vs. 89 percent on pre-test).

TABLE 31

CHANGES IN STRATEGIES FOR SOLVING A PROJECT WITH AN ART PROJECT BY GROUP

WHEN YOU ARE WORKING ON AN ART PROJECT AT SCHOOL AND YOU MAKE A MISTAKE, DO YOU ... FEEL MAD?	*n*	PRE-TEST FAVORABLE RESPONSE (NO) %	POST-TEST FAVORABLE RESPONSE (NO) %	CHANGE %
Control group	208	82	82	0
Treatment group	209	82	92	+ 10
TRY TO FIX IT BY USING DIFFERENT MATERIALS?	***n***	**PRE-TEST FAVORABLE RESPONSE (YES) %**	**POST-TEST FAVORABLE RESPONSE (YES) %**	**CHANGE %**
Control group	208	89	82	- 7
Treatment group	208	84	92	+ 8

Responses for one of nine questions about solving a problem with an art project changed from pre-test to post-test by gender (see Table 32; Appendix V shows the full cross-tabulation table of pre-test to post-test changes for this question):

- More boys responded favorably (no) on post-test than pre-test to the statement "When you are working on an art project at school and you make a mistake, do you give up and do something else?" (93 percent on post-test vs. 87 percent on pre-test), while fewer girls responded favorably (no) on post-test than pre-test (94 percent on post-test vs. 97 percent on pre-test) (see Table x). Although boys showed substantial improvement from pre-test to post-test, note that a higher percentage of girls responded favorably on *both* pre-test and post-test.

TABLE 32

CHANGES IN STRATEGIES FOR SOLVING A PROBLEM WITH AN ART PROJECT BY GENDER

WHEN YOU ARE WORKING ON AN ART PROJECT AT SCHOOL AND YOU MAKE A MISTAKE, DO YOU ... GIVE UP AND DO SOMETHING ELSE?	*n*	PRE-TEST FAVORABLE RESPONSE (NO) %	POST-TEST FAVORABLE RESPONSE (NO) %	CHANGE %
Boys	186	87	93	+ 5
Girls	229	97	94	- 3

CHANGES IN OVERALL PROBLEM-SOLVING SKILL

The responses to the 24 questions about solving problems were added together to create a total score that represents the student's overall problem-solving skill (with a possible range of 0 – 24 points). Total scores representing students' overall problem-solving skill did not change significantly from pre-test to post-test across the board. Also, there were no changes from pre-test to post-test associated with control and treatment group or gender.

CHANGES IN ART PROJECT WORK PRACTICES

Responses to five of twelve questions about how they work on art projects at school changed from pre-test to post-test across the board (they did not differ by control and treatment group or gender) (see Table 33, next page):

- More students responded favorably (yes) on post-test than pre-test to the question "When you are working on an art project at school, do you play with materials in lots of ways to see what happens?" (76 percent on post-test vs. 55 percent on pre-test).
- More students responded favorably (no) on post-test than pre-test to the question "When you are working on an art project at school, do you try to make your project look exactly like something else you've seen?" (64 percent on post-test vs. 54 percent on pre-test).
- More students responded favorably (no) on post-test than pre-test to the question "When you are working on an art project at school, do you choose materials that are your favorite color?" (50 percent on post-test vs. 39 percent on pre-test).
- More students responded favorably (no) on post-test than pre-test to the question "When you are working on an art project at school, do you make sure you do not make any mistakes?" (32 percent on post-test vs. 25 percent on pre-test). Note that a minority of students responded favorably to this question on both pre-test and post-test.
- Fewer students responded favorably (yes) on post-test than pre-test (to the question "When you are working on an art project at school, do you search for and try a variety of art materials until your project looks how you want it to look?" 73 percent on post-test vs. 83 percent on pre-test).

TABLE 33

OVERALL CHANGES IN ART PROJECT WORK PRACTICES

WHEN YOU ARE WORKING ON AN ART PROJECT AT SCHOOL, DO YOU ...	*n*	PRE-TEST FAVORABLE RESPONSE (YES) %	POST-TEST FAVORABLE RESPONSE (YES) %	CHANGE %
Play with materials in lots of ways to see what happens?[1]	416	55	76	+ 21
Search for and try a variety of art materials until your project looks how you want it to look? [2]	416	83	73	- 10
WHEN YOU ARE WORKING ON AN ART PROJECT AT SCHOOL, DO YOU ...	***n***	**FAVORABLE RESPONSE (NO) %**	**FAVORABLE RESPONSE (NO) %**	**CHANGE %**
Try to make your project look exactly like something else you've seen? [3]	417	54	64	+ 10
Choose materials that are your favorite color? [4]	416	39	50	+ 11
Make sure you do not make any mistakes?[5]	417	25	32	+ 7

[1] $\chi^2 = 42.251$; $p = .000$ (McNemar Test)
[2] $\chi^2 = 69.497$; $p = .000$ (McNemar Test)
[3] $\chi^2 = 11.529$; $p = .001$ (McNemar Test)
[4] $\chi^2 = 10.127$; $p = .001$ (McNemar Test)
[5] $\chi^2 = 6.977$; $p = .001$ (McNemar Test)

Responses to two of the 12 questions about working on an art project changed from pre-test to post-test by treatment or control group (see Table 34, next page; Appendix V shows the full cross-tabulation table of pre-test to post-test changes for these questions):

- More treatment group students responded favorably (yes) on post-test than pre-test to the statement "When you are working on an art project at school, do you make a plan for creating your art project?" (94 percent on post-test vs. 88 percent on pre-test), while fewer control group students responded favorably (yes) on post-test than pre-test (86 percent on post-test vs. 92 percent on pre-test).
- More control group students responded favorably (no) on post-test than pre-test (84 percent on post-test vs. 80 percent on pre-test), while fewer treatment group students responded favorably (no) on post-test than pre-test to the statement "When you are working on an art project at school, do you use the materials you're most comfortable with?" (17 percent on post-test vs. 76 percent on pre-test).

TABLE 34

CHANGES IN ART PROJECT WORK PRACTICES BY GROUP

WHEN YOU ARE WORKING ON AN ART PROJECT AT SCHOOL, DO YOU ... MAKE A PLAN FOR CREATING YOUR ART PROJECT?	*n*	PRE-TEST FAVORABLE RESPONSE (YES) %	POST-TEST FAVORABLE RESPONSE (YES) %	CHANGE %
Control group	206	92	86	- 6
Treatment group	206	88	94	+ 6
USE THE MATERIALS YOU'RE MOST COMFORTABLE WITH?	***n***	**PRE-TEST FAVORABLE RESPONSE (NO) %**	**POST-TEST FAVORABLE RESPONSE (NO) %**	**CHANGE %**
Control group	208	80	84	+ 4
Treatment group	208	76	17	- 59

Responses to one of the 12 questions about work practices changed from pre-test to post-test by gender (see Table 35; Appendix V shows the full cross-tabulation table of pre-test to post-test changes for this question):

- More girls responded favorably (yes) on post-test than pre-test to the statement "When you are working on an art project at school, do you imagine several different ways your art project might turn out?" (96 percent on post-test vs. 90 percent on pre-test), while fewer boys responded favorably (yes) on post-test than pre-test (79 percent on post-test vs. 83 percent on pre-test).

TABLE 35

CHANGES IN ART PROJECT WORK PRACTICES BY GENDER

WHEN YOU ARE WORKING ON AN ART PROJECT AT SCHOOL, DO YOU ... IMAGINE SEVERAL DIFFERENT WAYS YOUR ART PROJECT MIGHT TURN OUT?	*n*	PRE-TEST FAVORABLE RESPONSE (YES) %	POST-TEST FAVORABLE RESPONSE (YES) %	CHANGE %
Boys	187	83	79	- 4
Girls	229	90	96	+ 6

CHANGES IN OPINION ABOUT THE QUALITIES OF A GOOD ARTIST

Three of eight selections to complete the sentence "A good artist is someone who..." changed from pre-test to post-test across the board (they did not differ by control and treatment group or gender) (see Table 36, next page):

- Fewer students selected the statement "A good artist is someone who has their artwork displayed in a museum" on post-test than pre-test (15 percent vs. 21 percent).
- More students selected the statement "A good artist is someone who works hard and practices" on post-test than pre-test (56 percent vs. 47 percent).
- More students selected the statement "A good artist is someone who experiments with different materials" on post-test than pre-test (30 percent vs. 17 percent).

TABLE 36

OVERALL CHANGES IN OPINION ABOUT THE QUALITIES OF A GOOD ARTIST

A GOOD ARTIST IS SOMEONE WHO ...	*n*	PRE-TEST SELECTION %	POST-TEST SELECTION %	CHANGE %
Has their artwork displayed in a museum[1]	416	21	15	- 6
Works hard and practices [2]	416	47	56	+ 9
Experiments with different materials[5]	416	17	30	+ 13

[1] $\chi^2 = 7.596$; $p = .006$ (McNemar Test)
[2] $\chi^2 = 7.206$; $p = .007$ (McNemar Test)
[3] $\chi^2 = 22.042$; $p = .000$ (McNemar Test)

One selection changed from pre-test to post-test by treatment or control group (see Table 37; Appendix V shows the full cross-tabulation table of pre-test to post-test changes for this item):

- Fewer treatment group students selected the statement "A good artist is someone who draws really well" on post-test than pre-test (24 percent on post-test vs. 50 percent on pre-test), while slightly fewer control group students selected this statement on post-test than pre-test (43 percent on post-test vs. 49 percent on pre-test).

TABLE 37

CHANGES IN OPINION ABOUT THE QUALITIES OF A GOOD ARTIST BY GROUP

A GOOD ARTIST IS SOMEBODY WHO... DRAWS REALLY WELL (*n* = 415)	*n*	PRE-TEST SELECTION %	POST-TEST SELECTION %	CHANGE %
Control group	206	49	43	- 6
Treatment group	209	50	24	- 26

EVALUATION OF THE GUGGENHEIM PROGRAM

On the post-test questionnaire, treatment group students evaluated various aspects of the Guggenheim program. This section describes these findings.

FAVORITE PARTS OF THE GUGGENHEIM PROGRAM

From a list of 10 items, students identified their two favorite parts of the Guggenheim program (see Table 38, next page). At the top of the list is "taking a field trip to the Museum" (42 percent). In the second tier are "learning how artists use different materials" (33 percent), "getting to use different materials" (31 percent), and "thinking up my own ideas for my artwork" (28 percent). At the bottom of the list are "talking about my and my classmates' artwork" (7 percent) and "keeping a sketchbook" (6 percent).

TABLE 38

FAVORITE PARTS OF THE GUGGENHEIM PROGRAM

TWO FAVORITE PARTS OF THE PROGRAM (*n* = 208)	%[1]
Taking a field trip to the Museum	42
Learning how artists use different art materials	33
Getting to use different materials	31
Thinking up my own ideas for my artwork	28
Working with a real artist	19
Looking at and talking about art by well-known artists	16
Having others look at my artwork	10
Working with my classmates	10
Talking about my and my classmates' artwork	7
Keeping a sketchbook	6

[1]Column totals exceed 100 percent because students selected two responses.

While there are no gender differences in students' selections of their two favorite parts of the Guggenheim program, selections differed by school (see Table 39):

- Students in PS 153 were more likely to select "getting to use different materials" (45 percent) than students' in PS 154 (23 percent) or PS 200 (22 percent).

TABLE 39

FAVORITE PARTS OF THE GUGGENHEIM PROGRAM

TWO FAVORITE PARTS OF THE PROGRAM (*n* = 208)	SCHOOL			
	PS 153	PS 154	PS 200	TOTAL
	%	%	%	%
Getting to use different materials[1]	45	23	22	31

[1]$\chi^2 = 10.988$; $df = 2$; $p = .004$

EVALUATION OF THE GUGGENHEIM PROGRAM

Students responded to eight statements about the Guggenheim program on the scale "Strongly disagree – Somewhat disagree – Somewhat agree – Strongly agree." Depending on the statement, the most favorable response was either "strongly disagree" or "strongly agree." Therefore, to analyze the statement all together, each statement was scored from 1 – 4 points with 1 point given to the least favorable response and 4 points given to the most favorable response.

The evaluations are positive for all of the statements (see Table 40, next page). On the scale 1 "Strongly disagree" to 4 "Strongly agree," students agreed most strongly with the statements "The art projects we did in the Guggenheim program were fun" (mean = 3.8) and "I enjoyed learning different ways of making artwork" (mean = 3.7). On the scale 1 ("Strongly agree") to 4 ("Strongly disagree"), students disagreed most strongly with the statement "I do not like the Guggenheim program" (mean = 3.7).

There were some statements for which there was much diversity of opinion. For instance, while students mostly disagreed with the statement "The Guggenheim projects were too easy" (mean = 2.9),

the standard deviation for this statement is the highest of all of the statements (standard deviation = .969), indicating that students had the most diversity of opinion about whether the projects were too easy. Additionally, while students mostly agreed with the statement "The Guggenheim projects challenged me just the right amount" (mean = 3.2), the standard deviation for this item is also fairly high (standard deviation = .908).

TABLE 40

EVALUATION OF THE GUGGENHEIM PROGRAM

SCALE: STRONGLY DISAGREE (1) / STRONGLY AGREE (4)	*n*	MEAN	±
The art projects we did in the Guggenheim program were fun.	208	3.8	.562
I enjoyed learning different ways of making artwork.	206	3.7	.622
I enjoyed working with the teaching artist.	209	3.6	.639
In the Guggenheim program, I tried many things I had never done before.	209	3.6	.743
The Guggenheim projects challenged me just the right amount.	207	3.2	.908
SCALE: STRONGLY AGREE (1) / STRONGLY DISAGREE (4)	***n***	**MEAN**	**±**
I do not like the Guggenheim program.	209	3.7	.681
The Guggenheim projects were too difficult.	206	3.4	.809
The Guggenheim projects were too easy.	209	2.9	.969

There are no differences in the ratings of the 10 statements according to school, although the rating of one statement differs by gender (see Table 41):

- On the scale 1 ("Strongly agree") to 4 ("Strongly disagree"), girls disagreed more strongly than boys with the statement "I do not like the Guggenheim program" (mean = 3.8 vs. mean = 3.5).

TABLE 41

PROGRAM EVALUATION ITEM BY GENDER

		GENDER		
SCALE: STRONGLY AGREE (1) / STRONGLY DISAGREE (4)	*n*	BOY MEAN	GIRL MEAN	TOTAL MEAN
I do not like the Guggenheim program[1]	209	3.5	3.8	3.7

[1]F= 7.060; p = .008

PRINCIPAL FINDINGS: DESIGN-A-CHAIR STUDENT INTERVIEWS AND OBSERVATIONS

INTRODUCTION

A total of 447 fifth-grade students from six schools completed the Design-a-Chair activity. As such, students were presented with a bag of art materials and asked to design a chair using at least three different materials (see Appendix H or I; supplies are listed at the top of the interview guide). Students were given 15 minutes to complete the activity. Specially-trained data collectors observed the students as they did the activity and interviewed students immediately after. The Design-a-Chair activity was administered in May, at the end of each school year (May 2008 and May 2009).

TREATMENT AND CONTROL GROUPS

Table 42 gives the breakdown of participating students by school year, school, and treatment/control group. A total of 218 students participated in the *LTA* program, and 229 students did not participate in the program.

TABLE 42

STUDENTS AND SCHOOLS BY YEAR

	SCHOOL YEAR		
	2007 – 2008	2008 - 2009	TOTAL
SCHOOL (GROUP)	STUDENT *n*	STUDENT *n*	STUDENT *n*
PS 28 (Control)	41	35	76
PS 115 (Control)	29	31	60
PS 152 (Control)	51	42	93
Total (Control)	121	108	229
PS 153 (Treatment)	44	45	89
PS 154 (Treatment)	46	31	77
PS 200 (Treatment)	27	25	52
Total (Treatment)	117	101	218
Grand Total	238	209	447

PROBLEM-SOLVING SCORES

Design-a-Chair interviews and observations were analyzed in relation to problem-solving items defined by the Guggenheim in partnership with the advisory board members and facilitated by RK&A: Imagining, Experimentation, Flexibility, Resource Recognition, Connection of Ends and Aims, and Self-reflection. Measures for most problem-solving items employed use of a scoring rubric; in doing so, RK&A scored students for various problem-solving items along a 4-level continuum: "below beginning" (level 1), "beginning" (level 2), "developing" (level 3), and "accomplished" (level 4). Measures for a few items did not use a rubric but were categorical measures, such as whether it was a

goal of the students to make the chair stand. Findings are presented below by each problem-solving item.

Rubrics scores were tested by control and treatment group, school, school year, and gender. Differences in control and treatment groups are presented in this section of the report.[18] Differences by school, school year, and gender are reported in Appendix X since instances are sporadic and do not lend themselves to understanding the larger trends.

IMAGINING

In measuring Imagining, RK&A explored the extent to which students are able to place themselves within the task (enter the problem space) and can envision the problem beyond the given assignment, including opportunities and constraints. Scores are based on student interview data from both the 2007-2008 school year and the 2008-2009 school year.

Overall, most students scored at the middle of the continuum—41 percent scored at the "beginning" level and 48 percent scored at the "developing" level (see Table 43). Scores did not differ by control and treatment group.

TABLE 43

ACHIEVEMENT OF IMAGINING BY GROUP

IMAGINING RUBRIC LEVELS (*n* = 447)	GROUP		
	CONTROL	TREATMENT	TOTAL
	%	%	%
1 – Below Beginning	3	2	2
2 – Beginning	41	42	41
3 – Developing	51	45	48
4 – Accomplished	5	11	8
SUMMARY STATISTICS (*n* = 447)	**CONTROL**	**TREATMENT**	**TOTAL**
Mean	2.59	2.66	2.62
Standard Deviation	± .633	± .703	± .668

EXPERIMENTATION

There are two measures that constitute Experimentation.

EXPERIMENTATION I

In measuring Experimentation I, RK&A explored the extent to which students try a number of materials, tools, approaches, techniques, and/or ideas as they create their art project. Scores are based on observation data from the 2008-2009 school year.

Overall, students' scores were distributed approximately evenly across the four levels with 27 percent scoring at the "below beginning" level, 30 percent scoring at the "beginning" level, 14 percent scoring at the "developing" level, and 29 percent scoring at the "accomplished" level (see Table 44, next page). Scores did not differ by control and treatment group.

[18] Appendix W shows rubric scored by control and treatment group in figures.

TABLE 44

ACHIEVEMENT OF EXPERIMENTATION I BY GROUP

EXPERIMENTATION I RUBRIC LEVELS (*n* = 207)	GROUP CONTROL %	TREATMENT %	TOTAL %
1 – Below Beginning	28	26	27
2 – Beginning	23	38	30
3 – Developing	18	11	14
4 – Accomplished	31	26	29
SUMMARY STATISTICS (*n* = 207)	**CONTROL**	**TREATMENT**	**TOTAL**
Mean	2.52	2.37	2.44
Standard Deviation	± 1.205	± 1.129	± 1.168

EXPERIMENTATION II

In measuring Experimentation II, RK&A explored the extent to which students tested the properties of the materials as they create their art project. Scores are based on observation data from the 2008-2009 school year.

Overall, two-thirds of students scored at the two ends of the continuum—33 percent scored at the "accomplished" level and 32 percent scored at the "below beginning" level (see Table 45). Scores differed significantly by control and treatment group:

- Control students scored higher than treatment students for Experimentation II (mean = 2.74 vs. mean = 2.27).

TABLE 45

ACHIEVEMENT OF EXPERIMENTATION II BY GROUP

EXPERIMENTATION II RUBRIC LEVELS[1] (*n* = 209)	GROUP CONTROL %	TREATMENT %	TOTAL %
1 – Below Beginning	28	36	32
2 – Beginning	12	26	19
3 – Developing	18	15	17
4 – Accomplished	42	24	33
SUMMARY STATISTICS (*n* = 209)	**CONTROL**	**TREATMENT**	**TOTAL**
Mean[2]	2.74	2.27	2.51
Standard Deviation	± 1.263	± 1.182	± 1.245

[1] $\chi^2 = 11.763$; $df = 3$; $p = .008$

[2] $F = 7.798$; $p = .006$

FLEXIBILITY

In measuring Flexibility, RK&A explored the extent to which students approach accidents, difficulties, and frustration with focus, patience, and further exploration. Scores are based on student interview data from both the 2007-2008 school year and the 2008-2009 school year.

Overall, most students scored at the middle of the continuum—50 percent scored at the "developing" level and 36 percent scored at the "beginning" level (see Table 46). Scores differed by treatment and control group:

- While mean scores did not differ, more treatment students than control students scored at the "developing" level (55 percent vs. 45 percent), while more control students than treatment students scored at the "below beginning" and "beginning" levels (5 percent and 39 percent, respectively, vs. 1 percent and 33 percent, respectively).

TABLE 46

ACHIEVEMENT OF FLEXIBILITY BY GROUP

	GROUP		
FLEXIBILITY RUBRIC LEVELS[1] (*n* = 447)	**CONTROL**	**TREATMENT**	**TOTAL**
	%	**%**	**%**
1 – Below Beginning	5	1	3
2 – Beginning	39	33	36
3 – Developing	45	55	50
4 – Accomplished	11	11	11
SUMMARY STATISTICS (*n* = 447)	**CONTROL**	**TREATMENT**	**TOTAL**
Mean[2]	2.62	2.75	2.69
Standard Deviation	± .748	± .653	± .706

[1] $\chi^2 = 8.351$; $df = 3$; $p = .039$

[2] $F = 3.686$; $p = 0.55$ (not significant)

RESOURCE RECOGNITION

There are three measures that constitute Resource Recognition.

RESOURCE RECOGNITION I

In measuring Resource Recognition I, RK&A explored the extent to which students pay attention to the resources provided (materials, tools, information, and time) and seek out resources appropriate for the task. Scores are based on student interview data from the 2007-2008 school year and the 2008-2009 school year.

Overall, more than three-quarters of students scored at the middle of the continuum—43 percent scored at the "developing" level and 38 percent scored at the "beginning" level (see Table 47, next page). Scores did not differ by control and treatment group.

TABLE 47

ACHIEVEMENT OF RESOURCE RECOGNITION I BY GROUP

RESOURCE RECOGNITION I RUBRIC LEVELS (*n* = 447)	GROUP		
	CONTROL	TREATMENT	TOTAL
	%	%	%
1 – Below Beginning	10	7	9
2 – Beginning	41	36	38
3 – Developing	41	46	43
4 – Accomplished	9	11	10
SUMMARY STATISTICS (*n* = 447)	**CONTROL**	**TREATMENT**	**TOTAL**
Mean	2.48	2.60	2.54
Standard Deviation	± .792	± .775	± .785

RESOURCE RECOGNITION II

In measuring Resource Recognition II, RK&A explored the extent to which students pay attention to the resources provided (materials, tools, information and time) and have ideas about how *else* they would have used the materials available or other materials that are unavailable. Scores are based on student interview data from the 2007-2008 school year and the 2008-2009 school year.

Overall, most students scored at the middle of the continuum, but with more students scoring at the "developing" level (61 percent) than the "beginning" level (26 percent) (see Table 48). Scores did not differ by control and treatment groups.

TABLE 48

ACHIEVEMENT OF RESOURCE RECOGNITION II BY GROUP

RESOURCE RECOGNITION II RUBRIC LEVELS (*n* = 446)	GROUP		
	CONTROL	TREATMENT	TOTAL
	%	%	%
1 – Below Beginning	7	2	5
2 – Beginning	57	65	61
3 – Developing	27	26	26
4 – Accomplished	9	7	8
SUMMARY STATISTICS (*n* = 446)	**CONTROL**	**TREATMENT**	**TOTAL**
Mean	2.39	2.38	2.39
Standard Deviation	± .745	± .657	± .703

RESOURCE RECOGNITION III

In measuring Resource Recognition III, RK&A identified which materials—either those available to the student during the Design-a-Chair activity or those not available to the student during the activity—the students would have liked to use ("What other materials or tools would you have liked to have been able to use?"). Scores are based on student interview data from the 2007-2008 school year and the 2008-2009 school year.

Overall, more than two-thirds of students said they would like to use more of the materials available to them when working on their chair (see Table 49). Scores differed significantly by control and treatment group:

- More treatment group students than control group students would have liked to use materials different than those available (34 percent vs. 25 percent).

TABLE 49

ACHIEVEMENT OF RESOURCE RECOGNITION III BY GROUP

RESOURCE RECOGNITION III RESPONSES (*n* = 426)	GROUP		
	CONTROL	TREATMENT	TOTAL
	%[1]	%[1]	%[1]
Materials from among those available[2]	86	74	80
Materials different from those available[3]	25	34	30

[1]Some students would like to use materials from among those available as well as materials different from among those available.
[2]$\chi^2 = 8.677$; $df = 1$; $p = .003$
[3]$\chi^2 = 3.895$; $df = 1$; $p = .048$

CONNECTION OF ENDS AND AIMS

There are three measures that constitute Connection of Ends and Aims.

CONNECTION OF ENDS AND AIMS I

In measuring Connection of Ends and Aims I, RK&A explored the extent to which students make intentional decisions and choices in the creation of their art projects. Scores are based on student interview data from both the 2007-2008 school year and the 2008-2009 school year.

Overall, more than three-quarters of students scored at the middle of the continuum—43 percent of students scored at the "beginning" level and 37 percent scored at the "developing" level (see Table 50, next page). Scores differed significantly by treatment and control group:

- Treatment group students scored higher than control group students (mean = 2.57 vs. mean = 2.38).

TABLE 50

ACHIEVEMENT OF CONNECTION OF ENDS AND AIMS I BY GROUP

CONNECTION OF ENDS AND AIMS I RUBRIC LEVELS[1] (*n* = 447)	GROUP		
	CONTROL	TREATMENT	TOTAL
	%	%	%
1 – Below Beginning	14	6	10
2 – Beginning	42	43	43
3 – Developing	35	39	37
4 – Accomplished	8	12	10
SUMMARY STATISTICS (*n* = 447)	**CONTROL**	**TREATMENT**	**TOTAL**
Mean[2]	2.38	2.57	2.47
Standard Deviation	± .827	± .790	± .814

[1] $\chi^2 = 8.308$; $df = 3$; $p = .040$
[2] $F = 6.085$; $p = .014$

CONNECTION OF ENDS AND AIMS II

In measuring Connection of Ends and Aims II, RK&A identified whether it was a goal of students to make the chair stand. Scores are based on student interview data from the 2008-2009 school year.

Overall, most students said it was a goal of theirs to make the chair stand (90 percent) (see Table 51). Scores did not differ by control and treatment group.

TABLE 51

ACHIEVEMENT OF CONNECTION OF ENDS AND AIMS II BY GROUP

CONNECTION OF ENDS AND AIMS II RESPONSES (*n* = 209)	GROUP		
	CONTROL	TREATMENT	TOTAL
	%	%	%
No	9	11	10
Yes	91	89	90

CONNECTION OF ENDS AND AIMS III

In measuring Connection of Ends and Aims III, RK&A explored the extent to which students planned or could plan to make a chair stand. For students who said it was a goal of theirs to make the chair stand, RK&A asked, "How did you figure out how to make it stand?"; for students who said it was not a goal of theirs to make the chair stand, RK&A asked, "If I had asked you to make your chair stand up, what would you have done?" Scores are based on student interview data from the 2008-2009 school year.

Overall, one-half of students scored at the middle of the continuum—51 percent scored at the "beginning" level and 31 percent scored at the "developing" level (see Table 52, next page). Scores differed significantly by control and treatment group:

- Control group students scored higher than treatment group students (mean = 2.42 vs. mean = 2.16).

TABLE 52

ACHIEVEMENT OF CONNECTION OF ENDS AND AIMS III BY GROUP

CONNECTION OF ENDS AND AIMS III RUBRIC LEVELS[1] (*n* = 209)	GROUP		
	CONTROL	TREATMENT	TOTAL
	%	%	%
1 – Below Beginning	8	18	13
2 – Beginning	50	51	51
3 – Developing	33	28	31
4 – Accomplished	8	3	6
SUMMARY STATISTICS (*n* = 209)	**CONTROL**	**TREATMENT**	**TOTAL**
Mean[2]	2.42	2.16	2.29
Standard Deviation	± .763	± .745	± .763

[1] $\chi^2 = 6.811$; $df = 3$; $p = .078$ (not significant)
[2] $F = 6.121$; $p = .014$

SELF-REFLECTION

In measuring Self-reflection, RK&A explored the extent to which students are self-reflective, assess their work, and pose new problems. Scores are based on student interview data from the 2008-2009 school year.

Overall, almost three-quarters of students scored at the bottom of the continnum—41 percent at the "beginning" level and 31 percent at the "below beginning" level (see Table 53). Scores did not differ by control and treatment group.

TABLE 53

ACHIEVEMENT OF SELF-REFLECTION BY GROUP

SELF-REFLECTION RUBRIC LEVELS (*n* = 209)	GROUP		
	CONTROL	TREATMENT	TOTAL
	%	%	%
1 – Below Beginning	30	32	31
2 – Beginning	39	43	41
3 – Developing	25	22	23
4 – Accomplished	6	4	5
SUMMARY STATISTICS (*n* = 209)	**CONTROL**	**TREATMENT**	**TOTAL**
Mean	2.08	1.98	2.03
Standard Deviation	± .898	± .836	± .868

SUMMARY OF RUBRIC SCORES

Table 54 (next page) shows students' mean scores for each problem-solving item that was scored on a 4-point scale from 1, "below beginning," to 4, "accomplished." Overall, students scored highest on Flexibility—the extent to which students approach accidents, difficulties, and frustration with focus, patience, and further exploration—and Imagining—the extent to which students are able to place

themselves within the task (enter the problem space) and can envision the problem beyond the given assignment, including opportunities and constraints. Students scored the lowest on Connection of Ends and Aims III—the extent to which students planned or could plan to make a chair stand—and Self-reflection—the extent to which students are self-reflective, assess work, and pose new problems.

TABLE 54

SUMMARY OF STUDENTS' ACHIEVEMENT

SCORES ON 4-POINT RUBRIC: 1- BELOW BEGINNING; 2 - BEGINNING; 3 - DEVELOPING; 4 - ACCOMPLISHED	GROUP		
	CONTROL	TREATMENT	TOTAL
PROBLEM-SOLVING ITEMS	MEAN	MEAN	MEAN
Flexibility	2.62	2.75	2.69
Imagining	2.59	2.66	2.62
Resource Recognition I	2.48	2.60	2.54
Experimentation II[1]	2.74	2.27	2.51
Connection of Ends and Aims I[2]	2.38	2.57	2.47
Experimentation I	2.52	2.37	2.44
Resource Recognition II	2.39	2.38	2.39
Connection of Ends and Aims III[3]	2.42	2.16	2.29
Self-reflection	2.08	1.98	2.03

[1] $F = 7.798$, $p = .006$
[2] $F = 6.085$, $p = .014$
[3] $F = 6.121$, $p = .014$

INTERVIEW WORD COUNT AND READING LEVEL

Given that most data relied on student interviews, RK&A explored any differences in students' ability to respond to the interview. RK&A used the interview transcripts to calculate the word count and grade level for each student interview.[19]

Overall, the mean word count is 753 words and the mean reading level is 5th grade (see Table 55, next page). Word count and grade level did not differ by control and treatment group.

[19] Microsoft Word provides both word count and the Flesch-Kincaid Grade Level score functions. Verbatim transcripts of students' interviews, minus the interviewers' questions and comments, were used to ascertain the word count and grade level. The formula for the Flesch-Kincaid Grade Level score is: [(.39 x ASL) + (11.8 x ASW) – 15.59]. ASL is the average sentence length (the number of words divided by the number of sentences), and ASW is the average number of syllables per word (the number of syllables divided by the number of words).

TABLE 55

TEST SCORES AND OTHER MEASURES

WORD COUNT SUMMARY STATISTICS (2008-09 ONLY) (*n* = 209)	CONTROL	TREATMENT	TOTAL
Range	157 – 2212	177 – 2916	157 – 2916
Median	630.5	638.0	633.0
Mean	737.31	769.48	752.85
Standard Deviation	± 403.965	± 484.053	± 443.684
READING LEVEL SUMMARY STATISTICS (2008-09 ONLY) (*n* = 209)	**CONTROL**	**TREATMENT**	**TOTAL**
Range	0 – 12	1 – 12	0 – 12
Median	4.1	4.6	4.4
Mean	4.68	5.06	4.86
Standard Deviation	± 2.392	± 2.486	± 2.439

INTRODUCTION

RK&A collected participating students' math scores from the New York State Mathematics test, which is administered to fifth-graders in May. Scores are reported as both scaled scores (ranging from 0 to 800) and performance level (1-4).[20]

SCALED SCORES AND PERFORMANCE LEVEL

Table 56 shows students' scaled scores on the New York State Mathematics Test, and Table X shows students' performance level. Control students scored significantly higher than treatment students on both scaled scores and performance level (mean = 680.65 and mean = 3.12, respectively, vs. mean = 669.86 and mean = 2.88, respectively).

TABLE 56

SCALED SCORES BY GROUP

SCALED SCORES SUMMARY STATISTICS (*n* = 441)	GROUP		
	CONTROL	TREATMENT	TOTAL
Mean[1]	680.65	669.86	675.44
Standard Deviation	± 29.153	± 26.192	± 28.252

[1]F= 16.648; p = .000

TABLE 57

PERFORMANCE LEVELS BY GROUP

PERFORMANCE LEVELS[1] (*n* = 441)	GROUP		
	CONTROL	TREATMENT	TOTAL
	%	%	%
1	< 1	4	2
2	12	17	15
3	62	67	64
4	25	13	19
SUMMARY STATISTICS (*n* = 441)	**CONTROL**	**TREATMENT**	**TOTAL**
Mean[2]	3.12	2.88	3.01
Standard Deviation	± .618	± .659	± .648

[1]χ^2 = 17.264; df = 3; p = .001
[2]F= 15.612; p = .000

[20] Performance level is based on the scaled scores. For fifth-grade students, students with scaled scores 495-618 achieve performance level 1, students with scaled scores 6189-649 achieve performance level 2, students with scaled scores 650-698 achieve performance level 3, and students with scaled scores 699-780 achieve performance level 4.

INTRODUCTION

RK&A conducted 25 case studies over the 2007-2008 and 2008-2009 school years.[21,22] Through case studies, RK&A looked at how students responded to *LTA*—particularly in relation to five problem-solving criteria[23]—as well as investigated students' performance outside *LTA*. As part of each case study, RK&A observed the student during two or three *LTA* lessons between December and April, interviewed the student about an artwork s/he created during *LTA*, and interviewed the student's classroom teacher.[24] See page 10 for a detailed description of the methodology and Appendix O and P for the observation and interview guides.

The following section presents a summary of findings from the case studies. We encourage the reader to see the 25 case study write-ups (see Appendix Y) since they present rich data that best reflects the nuances of each case study student.

BACKGROUND INFORMATION ABOUT THE CASE STUDY STUDENTS

Background information on each of the 25 case studies provides a description of the student overall, including how they behave and perform in class and in *LTA,* as well as personal history. This information is important because it provides context for students' achievement of the five problem-solving criteria. Interestingly, the background information sometimes confirms students' behavior in *LTA* and sometimes refutes it; that is, students' classroom behavior does not dictate how they will perform in *LTA*. Findings are as follows (reported in descending order from most frequent to least frequent):

- More than one-third of case studies were described by their classroom teachers as being generally strong or good students, for reasons including eagerness to learn, participation, focus, and attentiveness. Of these case studies, the *LTA* experiences varied widely. Some of the case studies exhibited increased participation, while others exhibited decreased participation. In a few cases, participation seemed related to attention or lack of attention from individual classroom teachers or peer dynamics.
- About one-third of case studies were described by their classroom teachers as struggling or having challenges with school on a day-to-day basis, for reasons ranging from behavioral problems, to learning English as a second language, to not being supported at home. Of these case studies, more than one-half exhibited behaviors that suggest the *LTA* experience helped improve their overall school experience by encouraging increased engagement, articulation, confidence, or leadership skills.
- A few case studies were described as highly focused or task-oriented students, and of these, a few exhibited behaviors suggesting the *LTA* experience was frustrating for them. Frustrations

[21] Case Study 1 to 13 are from the 2007-2008 school year, and Case Study 14 to 25 are from the 2008-2009 school year.
[22] While 25 case studies were completed, 35 case study students were selected, and as expected, some studies were not completed as students were absent or moved mid-year.
[23] Self-Reflection was not measured in the case studies because it is a problem-solving criterion developed late in the study. At that point, case study instruments had been already been developed and utilized.
[24] We were unable to interview the teacher of Case Study 9 and Case Study 11.

arose from challenges related to collaborating with peers, the need for continual approval from teachers, or concerns about completing *LTA* assignments correctly.

- A few case studies were described as being shy or quiet in terms of their overall school experience. Of these, a few exhibited behaviors that suggest that the *LTA* experience encouraged these students to be more vocal or confident in the classroom. Others experienced no change in behavior or remained disengaged throughout the *LTA* experience.
- A few case studies showed inconsistent or primarily peer-motivated behavior in terms of both the overall school experience and the *LTA* experience.

ACHIEVEMENT OF IMAGINING

In looking at the case study data, RK&A sought to identify the extent to which students achieved Imagining—the extent to which students are able to place themselves within the task (enter the problem space) and can envision the problem beyond the given assignment, including opportunities and constraints. Overall, achievement of Imagining varied across achievement levels fairly equally (reported in descending order from highest achievement to lowest achievement):

- More than one-third of case studies showed high levels of Imagining. These students exhibited a clear vision for their work or provided detailed explanations of their work and its meaning. A few of these case studies also placed themselves fully within the task, personalized their choices, or brainstormed and made plans for their projects.
- About one-quarter of case studies showed moderate levels of Imagining. These students exhibited behaviors or described experiences that indicated they were fully absorbed in the task, had formed a vision for their project work, or applied personalization or previous experiences to their work. However, there were a few instances when some of these case studies also exhibited behaviors that indicated that they had copied peer choices or had failed to brainstorm or plan their projects.
- More than one-third of case studies showed low levels of Imagining. These students exhibited behaviors or described experiences that stayed within the confines of *LTA* assignments, showed evidence of having copied peers' work or teacher examples, or relied on familiar symbols or literal interpretations to complete the assignments.

ACHIEVEMENT OF EXPERIMENTATION

In looking at the case study data, RK&A sought to identify the extent to which students achieved Experimentation—the extent to which students try a number of materials, tools, approaches, techniques, and/or ideas as they create their art project. Overall, achievement of Experimentation was low-to-medium (reported in descending order from highest achievement to lowest achievement):

- About one-quarter of case studies showed high levels of Experimentation. These students were among the most risk-taking, exhibiting or describing enthusiastic experimentation with materials, colors, techniques, or sketching.
- Less than one-third of case studies showed medium levels of Experimentation. These students stayed mostly within the confines of the assignments but exhibited isolated or intermittent experimentation with peers, materials, colors, or sketches.
- About one-half of case studies showed low levels of Experimentation. These students exhibited behaviors or described experiences that indicated that they stayed within the safe

confines of the assignments, following instructions closely, or copying peer or teacher examples to make decisions. A few of these case studies also continually sought opinions or approval from others, failed to play or take risks, or acted bored or distracted by the assignment.

ACHIEVEMENT OF FLEXIBILITY

In looking at the case study data, RK&A sought to identify the extent to which students achieved Flexibility—the extent to which students approach accidents, difficulties, and frustration with focus, patience, and further exploration. Overall, achievement of Flexibility varied fairly equally among achievement levels (reported in descending order from highest achievement to lowest achievement):

- More than one-third of case studies showed high levels of Flexibility. Many of these students encountered few problems, but their behaviors indicated an ability to alter materials and approaches as needed. Students with high levels of flexibility were prompt, calm, and patient in terms of problem-solving. Some explicitly recognized the role of "happy mistakes" in the art-making process—that is, mistakes that ended up having positive results.
- More than one-quarter of case studies showed medium levels of Flexibility. These students showed basic problem-solving skills and Flexibility, most often with materials (e.g., students were most flexible when handling materials). Students with medium levels of flexibility did not get frustrated with the assignment and were primarily goal-oriented in regard to their projects.
- More than one-third of case studies showed low levels of Flexibility. These students exhibited behaviors or described experiences that indicated that they were too focused on the end result, avoided problems, or approached the assignment by rigorously following directions. Data collectors described some as simply not putting enough effort into the assignment. More than one-half of these case studies exhibited frustration towards the assignment or towards others, and about one-half gave up or said the assignment was too hard to complete or problem-solve. A few students changed their overall goal to avoid challenges.

ACHIEVEMENT OF RESOURCE RECOGNITION

In looking at the case study data, RK&A sought to identify the extent to which students achieved Resource Recognition—the extent to which students pay attention to the resources provided (materials, tools, information, and time) and seek out resources appropriate for the task. Overall, achievement of Resource Recognition was mostly low-to-medium (reported in descending order from highest achievement to lowest achievement):

- About one-quarter of case studies showed high levels of Resource Recognition. These students were highly comfortable and confident with materials or deliberate about color and material choices. A small number of these case studies described not only their material choices, but also why they were chosen or how they were used. One student used metaphor to describe how the materials and their application related to a real-world example.
- More than one-quarter of case studies showed moderate levels of Resource Recognition. These students spoke in greater depth about their selection of materials or exhibited behaviors that included testing materials or working confidently with materials. A small number of these case studies described details such as the order in which materials were used, while others struggled to articulate their experience with materials in greater detail.

- About one-third of case studies showed low levels of Resource Recognition. In some cases, behaviors related to Resource Recognition were not documented. Others exhibited behaviors or described experiences that indicated a struggle with materials or a lack of understanding of material properties. Some students listed materials in interviews but did not articulate how or why they were used.

ACHIEVEMENT OF CONNECTION OF ENDS AND AIMS

In looking at the case study data, RK&A sought to identify the extent to which students achieved Connection of Ends and Aims—whether students made intentional decisions and choices when creating their art projects. Overall, achievement of Connection of Ends and Aims was mostly medium-to-high (reported in descending order from highest achievement to lowest achievement):

- More than one-half of case studies showed high levels of Connection of Ends to Aims. These students exhibited behaviors or described experiences that indicated intentional and deliberate decision-making throughout assignments, considerable attention to sketching and brainstorming, or confidence and capability with the process overall. Some of these case studies were especially reflective, absorbed, or explanatory about meaning or approach, but all were actively engaged in the process and seemed aware of the connection of ends to aims.
- More than one-quarter of case studies showed moderate levels of Connection of Ends to Aims. These students exhibited behaviors or described experiences that indicated a more diligent or deliberate approach to the assignments but an inconsistent ability to connect ends to aims. Awareness of technique results and use of planning or brainstorming was intermittent.
- About one-fifth of case studies showed low levels of Connection of Ends to Aims. These students exhibited behaviors or described experiences that indicated a cursory selection of colors or materials, directionless engagement in the process, or an overall apathy or objectivity in terms of completing the assignments.

INTRODUCTION

RK&A observed each of the three teaching artists during the 2007-2008 school year and each of the three teaching artists—two of whom also taught during the 2007-2008 school year—during the 2008-2009 school year. Each teaching artist was observed nine times between December and April in each school year (e.g., each teaching artist was observed three times while teaching to three classrooms).[25] This section explores the extent to which teaching artists employ general *LTA* teaching strategies, which the Guggenheim feel are best practice, as well as strategies for cultivating students' problem-solving skills.

GENERAL *LTA* TEACHING STRATEGIES

RK&A observed teaching artists to see whether they employed four general *LTA* teaching strategies: (1) refer to students as artists; (2) refer to the essential question[26]; (3) provide students enough time to explore materials; and (4) provide feedback to individual students as needed.

SUMMARY OF THE OCCURRENCE OF GENERAL *LTA* TEACHING STRATEGIES

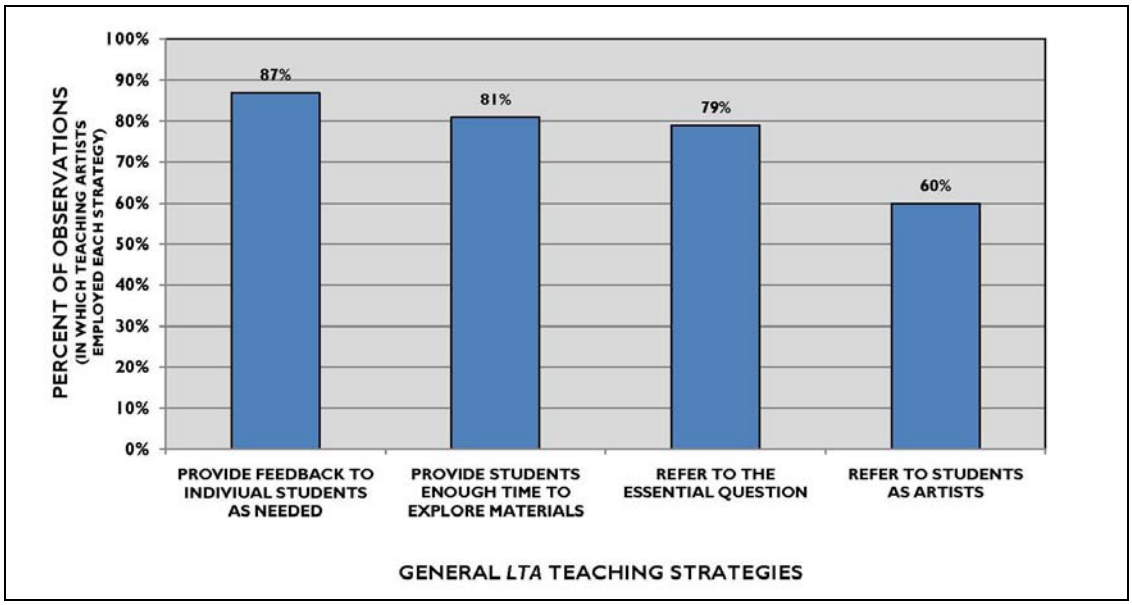
See Figure 2 (next page) for a summary of the extent to which teaching artists addressed the four general *LTA* teaching strategies. Considering the teaching artists all together, most teaching artists provided feedback to individual students as needed (teaching artists did so in 87 percent of observations), and many teaching artists provided enough time for students to explore the materials (teaching artists did so in 81 percent of observations) and referred to the essential questions (teaching artists did so in 79 percent of observations). Teaching artists were least successful at referring to the students as artists (teaching artists did so in 60 percent of observations).

[25] There is one exception; Teaching Artist 1 was observed eight times rather than nine times during the 2007-2008 school year because of scheduling issues.

[26] The essential question is a question around which the *LTA* program is constructed; prior to beginning *LTA*, teaching artists and teachers select an essential question with the guidance of Guggenheim staff.

FIGURE 2

OCCURRENCE OF GENERAL *LTA* TEACHING STRATEGIES



OCCURRENCE OF GENERAL *LTA* TEACHING STRATEGIES BY TEACHING ARTIST

Employment of the four general *LTA* teaching strategies was compared by teaching artist. There were several significant differences:

- Teaching Artist 1 and Teaching Artist 3 always referred to students as artists(each referred to students as artists in 100 percent of observations), while Teaching Artist 2 and Teaching Artist 4 did so infrequently (each referred to students as artists in 22 percent of observations) (see Table 58).
- Teaching Artist 4 referred to the essential question less frequently than all other teaching artists (referred to the essential question in 33 percent of observations vs. 100, 88, and 83 percent of observations) (see Table 59, next page).

TABLE 58

REFER TO STUDENTS AS ARTISTS BY TEACHING ARTIST

	TEACHING ARTIST				
	TEACHING ARTIST 1 (*n* = 17)	TEACHING ARTIST 2 (*n* = 18)	TEACHING ARTIST 3 (*n* = 9)	TEACHING ARTIST 4 (*n* = 9)	TOTAL (*n* = 53)
REFER TO STUDENTS AS ARTISTS	%	%	%	%	%
Yes	100	22	100	22	60

$\chi^2 = 33.493$; $df = 3$; $p = .000$

TABLE 59

REFER TO THE ESSENTIAL QUESTION BY TEACHING ARTIST

REFER TO THE ESSENTIAL QUESTION	TEACHING ARTIST				
	TEACHING ARTIST 1 (*n* = 17)	TEACHING ARTIST 2 (*n* = 18)	TEACHING ARTIST 3 (*n* = 9)	TEACHING ARTIST 4 (*n* = 9)	TOTAL (*n* = 53)
	%	%	%	%	%
Yes	88	83	100	33	79

$\chi^2 = 14.910$; $df = 3$; $p = .002$

LESSONS THAT CULTIVATE STUDENTS' PROBLEM-SOLVING ABILITIES

In the observations, RK&A looked at whether teaching artists employed four specific teaching strategies believed to cultivate students' problem-solving abilities: (1) acknowledge multiple approaches and individual solutions; (2) question assumptions and follow one's curiosity; (3) think intentionally and make deliberate choices; and (4) see mistakes/problems/challenges as solutions. Further, RK&A looked at the four ways in which teaching artists may convey these strategies: (1) recognizing; (2) challenging; (3) modeling; and (4) showing example. See Appendix R for a description of each lesson and method of teaching each lesson.

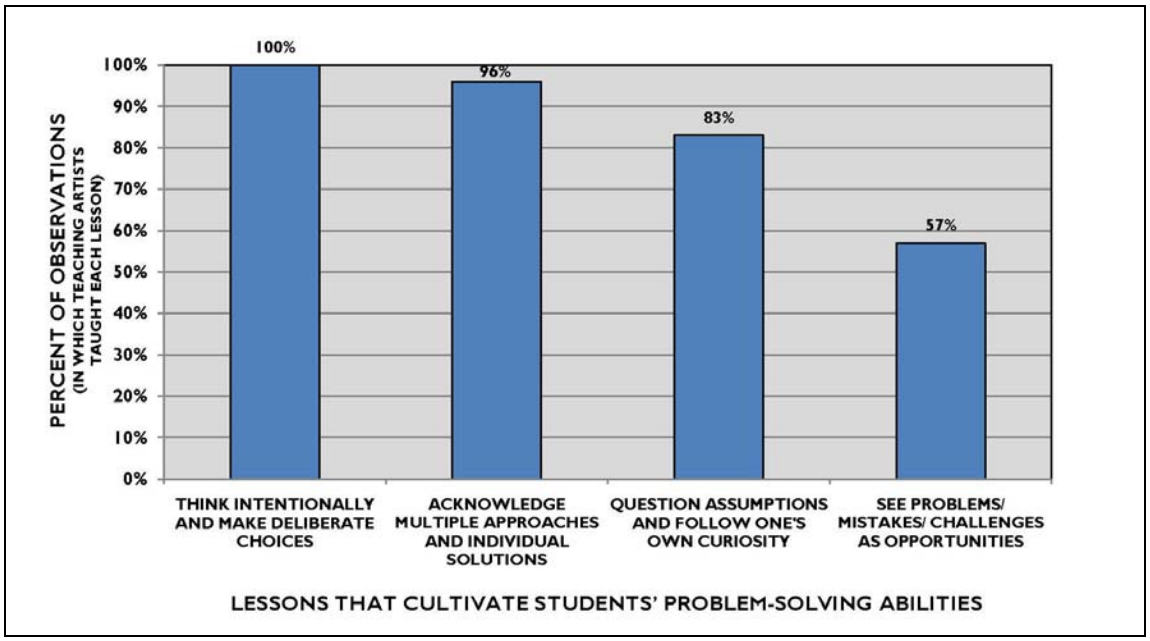
SUMMARY OF THE OCCURRENCE OF LESSONS THAT CULTIVATE STUDENTS' PROBLEM-SOLVING ABILITIES

See Figure 3 (next page) for a summary of the extent to which teaching artists' addressed four lessons that cultivate students' problem-solving abilities.[27] In all observations, teaching artists employed the strategy intended to help students think intentionally and make deliberate choices in every observation (teaching artists did so in 100 percent of observations), and in most observations, teaching artists employed the strategy intended to help students acknowledge multiple approaches and individual solutions (teaching artists did so in 96 percent of observations). Additionally, teaching artists frequently used the strategy aimed at helping students question assumptions and follow one's curiosity (teaching artists did so in 83 percent of observations). Less frequently, teaching artists employed the strategy intended to help students see problems/mistakes/challenges as opportunities (teaching artists did so in 57 percent of observations).

[27] For a teaching artist to get credit for teaching a specific lesson, they had to employ just one of the following methods: recognizing, challenging, modeling, or showing examples.

FIGURE 3

OCCURRENCE OF LESSONS THAT CULTIVATE STUDENTS' PROBLEM-SOLVING ABILITIES

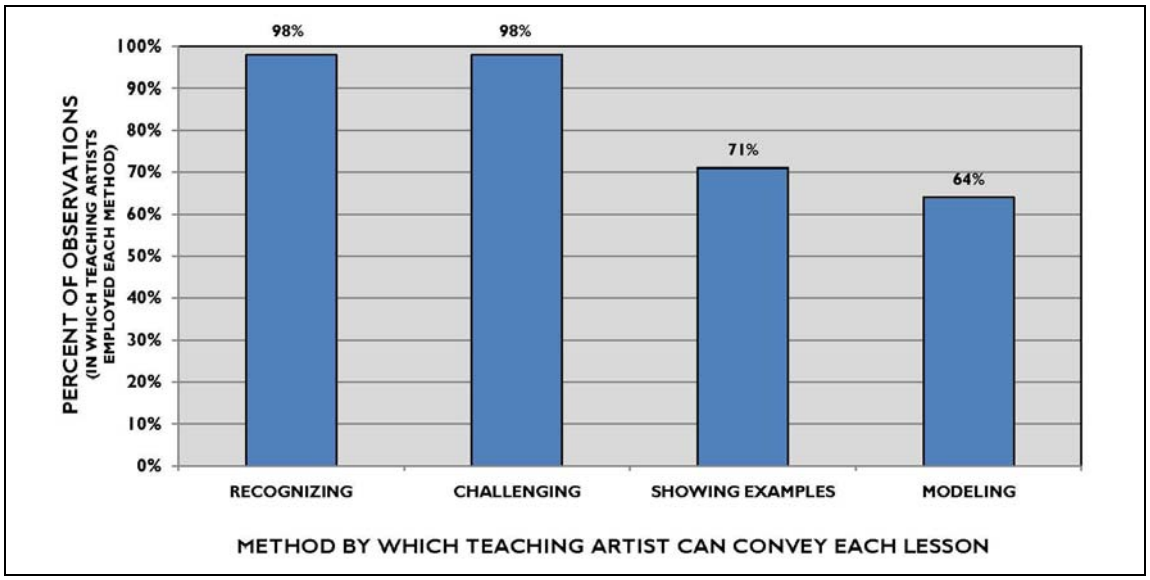


SUMMARY OF THE OCCURRENCE OF TEACHING METHODS

See Figure 4 for a summary of the occurrence of teaching methods used to convey the four lessons that cultivate students' problem-solving abilities. In most observations, teaching artists recognized students' employment of one of the lessons and challenged students to employ one of the lessons (teaching artists did each in 98 percent of observations). Less frequently, teaching artists showed examples to demonstrate the lesson or modeled employment of the lesson (teaching artists did so in 71 and 64 percent of observations, respectively).

FIGURE 4

OCCURRENCE OF TEACHING METHODS



OCCURRENCE OF LESSONS THAT CULTIVATE STUDENTS' PROBLEM-SOLVING ABILITIES BY TEACHING ARTIST

Occurrence of the four lessons was compared by teaching artist. There were several significant differences:

- Teaching Artist 1, Teaching Artist 2, and Teaching Artist 3 are more likely to challenge students to consider multiple approaches and individual solutions (100 percent, 78 percent, and 78 percent, respectively) than Teaching Artist 4 (33 percent) (see Table 60).
- Teaching Artist 1 is more likely to model the use of multiple approaches and individual solutions (59 percent) than the three other teaching artists (28 percent, 22 percent, and 11 percent) (see Table 60).
- Teaching Artist 1, Teaching Artist 2, and Teaching Artist 4 are more likely to challenge students to question assumptions and follow one's curiosity (88 percent, 56 percent, and 67 percent, respectively) than Teaching Artist 3 (22 percent) (see Table 61, next page).
- Teaching Artist 1 is more likely to model questioning assumptions and following one's curiosity (59 percent) than the three other teaching artists (28 percent, 11 percent, and 11 percent) (see Table 61, next page).

TABLE 60

ACKNOWLEDGE MULTIPLE APPROACHES AND INDIVIDUAL SOLUTIONS BY TEACHING ARTIST

ORIENTATIONS OF THE USE OF MULTIPLE APPROACHES AND INDIVIDUAL SOLUTIONS	TEACHING ARTIST				
	TEACHING ARTIST 1 (*n* = 17)	TEACHING ARTIST 2 (*n* = 18)	TEACHING ARTIST 3 (*n* = 9)	TEACHING ARTIST 4 (*n* = 9)	TOTAL (*n* = 53)
	%	%	%	%	%
Recognized	100	78	78	67	83
Challenged[1]	100	89	33	78	81
Modeled[2]	59	28	22	11	34
Showed example	71	67	44	44	60

[1] $\chi^2 = 18.160$; $df = 3$; $p = .000$

[2] $\chi^2 = 7.640$; $df = 3$; $p = .054$

TABLE 61

QUESTION ASSUMPTIONS AND FOLLOW ONES' CURIOSITY BY TEACHING ARTIST

QUESTION ASSUMPTIONS AND FOLLOW ONES' CURIOSITY	TEACHING ARTIST				
	TEACHING ARTIST 1 (*n* = 17)	TEACHING ARTIST 2 (*n* = 18)	TEACHING ARTIST 3 (*n* = 9)	TEACHING ARTIST 4 (*n* = 9)	TOTAL (*n* = 53)
	%	%	%	%	%
Recognized	71	50	56	67	60
Challenged[1]	88	56	22	67	62
Modeled[2]	59	28	11	11	32
Showed example	12	33	0	11	17

[1] $\chi^2 = 11.441$; $df = 3$; $p = .010$

[2] $\chi^2 = 9.366$; $df = 3$; $p = .025$

INTRODUCTION

In June following the 2007-2008 school year and 2008-2009 school year, RK&A conducted telephone interviews with the three participating teaching artists from each school year. Note that two of the teaching artist who participated in the study during the 2007-2008 school year also participated in the study during the 2008-2009 school year; thus, six interviews were conducted with four individuals.

During the interviews teaching artists talked about their experiences with the *LTA* program and opinions of the professional development Guggenheim staff provided. Additionally, interviews explored teaching artists' perceptions of *LTA*'s impact on their teaching practice, on classroom teachers, and on students.

EXPERIENCES WITH *LTA*

This section describes teaching artists' thoughts about their overall experiences with the program as well as their responses to questions about how they interacted with the classroom teachers over the course of the year and barriers they faced in implementing the program. The section is organized by experiences with classroom teachers, experiences with students, and experiences with Guggenheim staff.

EXPERIENCES WITH CLASSROOM TEACHERS

Teaching artists' relationship with classroom teachers was most top-of-mind as it was the aspect of *LTA* that teaching artists said they struggle with most. Discussion of their relationship with teachers revolved around four topics that are deeply intertwined: receiving support from the teachers, communication, teachers' understanding of their role in *LTA*, and teachers' motivations.

RECEIVING SUPPORT FROM TEACHERS

The main issue that teaching artists encountered was a lack of adequate support from the teachers with which they collaborated. Note that all teaching artists indicated that it was just one or two teachers that failed to supply adequate support and not all three collaborating teachers. Admittedly, "adequate support" is a vague term and teachers' definitions range from project planning and implementation to logistical matters, all of which are discussed below.

The issue of project support was addressed in most interviews. Most teaching artists said that the project planning was not as effective as it could be specifically in regard to selecting an essential question. The challenge most teaching artists faced was developing—with the classroom teachers—an interesting essential question that related to the curriculum, was feasible to explore over 20 weeks, and was appropriate and relevant for the age group (see the first quotation below). Additionally, a couple teaching artists found that, despite teachers' involvement in developing the essential question, classroom teachers were not as invested in the essential question as the teaching artists had perceived (see the second quotation).

> I think coming up with a good essential question is really hard for a lot of people, including me. And, I think that what seems to happen to a lot of teaching artists is that they start to test the essential question, and they realize four weeks into their residency that the essential question is

> terrible and that the kids are not interested in it. And yet, you're stuck with this essential question for 20 weeks. [Teaching Artist 4, 2008][28]

> We [the classroom teachers and I] did planning in the beginning together, which was not as productive as I would have liked it to have been. For instance, the specific things in the curriculum that they wanted to support weren't realistic, and the [classroom teachers] weren't as attached to the ideas as was my impression in the beginning anyway. [Teaching Artist 2, 2008]

In addition to project planning, most teaching artists were disappointed that teachers had not integrated more aspects of *LTA* into their curriculum. These teaching artists explained that the Guggenheim intended for *LTA* to be well integrated into the teachers' curriculum so that ideas students learned during regular classroom hours were reinforced in *LTA*, and vice versa, in order to optimize the program's impact. Thus, teaching artists felt that classroom teachers were not fulfilling their agreement, which was only to the detriment of the students (see the quotations below). One teaching artist suggested simple ways that teachers could have made connections between the curriculum and *LTA*, such as jogging students' memories by saying, "Remember the project we worked on in *LTA* last week; it relates to ____, which we are talking about today."[29]

> I felt with two teachers, it was a challenge to get the work that was needed to take place to sort of bridge my time in the class from [one week] with what I was going to do [in *LTA* the next week]. Ms. A did above and beyond every single week and would take it and run with it. Ms. B would start things, but she wouldn't necessarily finish them, and then Ms. C really wasn't participating in a way that I felt would have furthered what we were trying to do through *LTA*. [Teaching Artist 3, 2009]

> The way the *LTA* Program works is that we [the teaching artist and classroom teacher] plan the project together, and it's based on their curriculum. But, the teachers didn't really teach their curriculum. I mean there was one teacher—or actually two of the teachers—that did. I felt like I was coming in and teaching an art class, and I think I felt that way largely because of how the teachers were responding to what we were doing. I didn't really feel like they were ever incorporating anything that we did into their curriculum, which was kind of the point. [Teaching Artist 4, 2008]

> I find it [the essential question] really useful, and the teachers have it posted in the classroom with all the Guggenheim posters and so there was this nice back-and-forth conversation between what I was doing and then what the teacher was doing when we weren't there. And that was good. [Teaching Artist 1, 2008]

Teaching artists who taught during both school years of the study also acknowledged that they lacked some of the support that they would have liked in their second year teaching with the collaborating teachers, although the conversations indicate that they were not as burdened by it as they had been during the first year. For example, after her second year working with a collaborating school, one teaching artist said that planning, coordinating, and collaborating with teachers was "difficult," but commented positively on the overall partnership; she also deflected some blame on the structure of the school and lightly commented on the schools' "personality" (see the quotation below).

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[28] RK&A assigned each teaching artist a number between one and four for identification purposes. Each quotation is identified by teaching artist and the year in which the interview was conducted.

[29] This quotation is paraphrased in order to eliminate words that may compromise confidentiality.

> The teachers were generally very present and engaged during class time. They felt like their students were getting a lot out of it, and therefore, they were getting a lot out of it. They were a little bit more difficult outside of class time as far as planning, coordinating, and collaborating, but overall, I think the partnership with them was generally good. I mean, I think the other stuff . . . some of it has more to do with the structure of the school and the personality that goes along with each. [Teaching Artist 1, 2009]

COMMUNICATION BETWEEN TEACHING ARTISTS AND TEACHERS

All teaching artists said they had difficulty communicating with classroom teachers. Communication problems seemed to be pervasive as even the two teaching artists who previously taught with the same classroom teachers reported such issues; however, after their second year collaborating with a school, teaching artists seemed to more quickly look past the difficulties to the positive experiences.

The biggest communication problem that all teaching artists faced was contacting the collaborating classroom teachers. A couple teaching artists had particular difficulty getting in touch with teachers who did not use email. Another two teaching artists reported more widespread issues; these teaching artists said that they tried both emailing their collaborating teachers and calling them at the school to little avail. While all teaching artists came up with their own strategies to handle the problem (e.g., using one teacher as a liaison through which to communicate with the other teachers, making optimal use of face-to-face time with teachers, and being more explicit about teachers' roles), none of the teachers came up with ideal solutions (see the quotations below).

> The issue this year was that two out of three of the teachers don't have email. So then one of the classroom teachers became the kind of anchor and the communicator for all three classrooms, which I think was difficult. [Teaching Artist 1, 2008]

> E-mailing [teachers] didn't necessarily work, although it worked brilliantly with Ms. A. Calling didn't work either. I mean, I really was sort of struggling when I was asked a similar question at the Guggenheim because I thought that they [the teachers] were a little apathetic to the program. . . . I kept asking myself, 'What could I do differently?' And I felt part of it was maybe having kept them in the loop in a different way—tailored it to more to the teacher. [Teaching Artist 3, 2009]

Additional communication problems hinged on planning and implementing *LTA* and defining teachers' roles in *LTA*, although these matters are discussed in other sections.

TEACHERS' UNDERSTANDING OF THEIR ROLE IN LTA

All teaching artists recognized explicitly or implied in conversation that challenges arose due to a lack of clarity about teachers' role in *LTA*. In particular, teaching artists felt challenged by misunderstandings about what teachers were responsible for in terms of planning and integrating *LTA* into their curriculum (discussed previously) as well as how teachers were supposed to participate during the *LTA* session. For example, one teaching artist described a conversation in which the teacher expressed that, if she were to participate during the *LTA* program, she would have a negative influence on students, whereas the teaching artist actually wanted the teacher to be involved so as to impress a positive influence on students (see the quotation below). While challenged by the misunderstandings that existed, most teaching artists said it was *their* responsibility to better communicate with teachers about their role (see the second quotation).

> One of the teachers at the school said to me—and I don't know if this is an excuse in the end—but said, 'Oh, I don't want to get too involved in the sessions because I feel like my presence and my voice would influence the students too much.' And, I said, 'You know, I think the

> complete opposite; they'll see you making art, engaging, taking risks, and kind of stretching your abilities. And, I think that's a great role to take.' [Teaching Artist 1, 2009]
>
> They [the classroom teachers] are not sure of their role. So, I think what it comes down to is, [we need to be] really clear at the beginning of the residency about what role people play. I've got to step back and say like, 'No, this is a collaboration . . . this is not a prep for you. This is not a break for you. This is a time for you to really see your students in a different light.' [Teaching Artist 1, 2008]

TEACHERS' MOTIVATION

All teaching artists observed that each teacher's investment in the program and motivation fell across a spectrum, and in their view, often towards the lower end of the spectrum—the unmotivated end. Throughout the interview, teaching artists would compare teachers saying that *this* teacher was very involved while *those* two were not. Overall, teaching artists seemed saddened and sometimes frustrated by the idea that the teachers were not motivated to work with them, which in turn, affected the teaching artists' performance (see the quotation below).

> I felt that I didn't really have the time to communicate with them [the classroom teachers] better. And, I guess part of it was not really feeling like they were that interested or that, if we communicated, that it would even make a difference. The way that I tried to get them involved was to give them something to do while I was in there, which was, you know, sometimes successful and sometimes not. [Teaching Artist 4, 2008]

Some teaching artists had hypotheses about teachers' motivations. A couple attributed the low motivation to the contrasting teaching styles of teachers and teaching artists, explaining that while it is a learning experience for both parties, it is a shift that was sometimes uncomfortable for teachers as well as students (see the quotation below). Additionally, one teacher mentioned testing as a barrier for teachers (see the second quotation). Still another teacher, who has experience working with other *LTA* schools, assumed that it may be a result of their relationship with *LTA*. She said that teachers at the study schools may not be as involved because the Guggenheim asked them to participate in *LTA* whereas at other locations, schools request the program from the Guggenheim, indicating a motivation on the school's behalf.

> Honestly, the beginning of the year was very difficult because this was the first year that a program like this had come into [the school], and I think that for the teachers, it was a new experience having a teaching artist come into the classroom and teach in a very different way. And then for the students, there was a big shift in thinking and processing—being given the opportunity to really voice things out as individuals and work as individuals. . . . For the most part, these kids are being taught in a way that the teacher was looking for one answer and that's what they [the students] are used to. So it was a big shift for them [the teacher and students] having a teaching artist come in and say, 'We're all different; we're all coming from different perspectives and different experiences.' [Teaching Artist 1, 2008]
>
> I found the teachers to be completely supportive of the program, but also a bit removed at the same time. There were various issues like . . . they were fifth-grade teachers and very, very preoccupied with the testing and the pressures of that particular age group. [Teaching Artist 1, 2009]

EXPERIENCES WITH STUDENTS

Overall, all teaching artists spoke positively about their experiences with students in *LTA*. They felt that students were receptive to the program and one teaching artist went so far as to describe students as "hungry for the program" (see the first quotation below).

> The students were hungry for the program. There is an art teacher in the school, but my classes I don't think get art, so I noticed a huge transformation from the beginning of the residency to the end, just in terms of how they articulated themselves, how they felt confident with using new materials and overall interaction with me and the whole project in and of itself. [Teaching Artist 1, 2009]

However, note that in the interviews, teaching artists' experiences with classroom teachers were so much top-of-mind that they seemed to eclipse their experiences with students. Further, a couple teaching artists lamented that they could have created a better experiences for the students had the teachers been more involved (see the first and second quotations below).

> It was, overall, a pretty difficult experience. There were two teachers who were tolerable—one teacher who was a lot better than tolerable—and one teacher who was intolerable. The success of the students, I felt, was very related to the teachers' [behavior]. So, I mean I think the students overall had a very positive experience. . . . I liked working with them even though it was really hard a lot of the time. I liked what they had to say, and I liked how they said it, so I think the students definitely got something productive and empowering out of it, but it was really hard. [Teaching Artist 4, 2008]

> And the kids, I thought, were really very interested and highly engaged. And, I was really struggling today trying to figure out how to get the teachers [involved] because it was a challenge sometimes keeping the students engaged if the teacher wasn't setting that tone. [Teaching Artist 3, 2009]

A couple teaching artists mentioned other constraints that hindered their relationship with students including cultivating a good and sustainable relationship with the students when the program meets for just 90 minutes once a week, students' absences, and disciplinary issues (see the quotation below).

> And that's another thing, like the remembering students' names and really cultivating this relationship [with them] when you're only there once a week is hard, but I'm working on it. [Teaching Artist 1, 2008]

EXPERIENCES WITH THE GUGGENHEIM STAFF

While the bulk of discussion regarding teaching artists' interactions with the Guggenheim staff was prompted (e.g., in regard to professional development, discussed later), it is necessary to note that most teaching artists had positive interjections throughout the interview about their experiences with Guggenheim staff (see the quotation below).

> The one thing I would like to add as far as Rebecca and Marie and Amy and Miriam—I have never worked anywhere where . . . they are forever asking us what we think. 'How can the program be better? What can we do differently? What were our struggles? How can we improve upon those? What were our successes? How can we share those in different ways with other people? What are our strengths? How can we share those with other artists who are struggling in that area?' There's an ongoing dialogue about how to make this [*LTA*] be extraordinary at its worst, and I think that that's phenomenal and it's sincere and honest. . . .

> And I feel like we all [all the teaching artists] feel that way, and that's the energy that is brought to our positions—and the friendships that we cultivate as a result of being in this work environment together. [Teaching Artist 3, 2009]

SUGGESTIONS FOR THE PROGRAM

While not asked directly, all teaching artists had suggestions for improving *LTA*. All suggestions focused on improving relations between themselves and classroom teachers. Most teaching artists made suggestions about improving communication; a couple teaching artists suggested introducing a planning meeting halfway through the program instead of just at the beginning, so that teaching artists can adjust the program's lessons as necessary (see the first quotation below). Additionally, one teaching artist suggested starting the collaboration in the summer so that classroom teachers have additional time to reflect on the direction that they would like to take *LTA* (see the second quotation), and one teaching artist considered how to communicate better with teachers as individuals as opposed to a group of teachers (see the third quotation).

> Just for clarity and being realistic, another idea is that . . . it's[the program is] 20 weeks [long], so in the fall it's kind of difficult to think about the whole span of 20 weeks. Maybe we initially do a meeting before the first 10 weeks and then we have another planning meeting in the middle to be like, 'Okay, this is what happened; now, let's think about the last half of this residency.' That hasn't happened in the past. [Teaching Artist 1, 2008]

> I was thinking to myself that it would be great if the collaboration [between teaching artists and teachers] could even start in the summer time, once the teaching artists know who they're going to work with, which may be too difficult to organize. And then, some little percolation of ideas can come because [during] those planning days, there's a lot to sort of think about right from the get go, sort of on the spot. So, that's when it starts to happen, and we as teaching artists ask the teachers like 'What are you interested in expanding off of in the classroom with your students?' [Teaching Artist 1, 2009]

> I think I would try to build in some level of communication that would happen more frequently. . . I think at the beginning of the year I would sort of try to argue for the importance of that and try to get them excited about the need for collaboration and for more communication. And, I would try to meet with the teachers individually more often, not just as a group, because I felt like they were all working so independently and differently. To try to assume that they are going to function as a group is not something I would do again. [Teaching Artist 4, 2008]

Additionally, most teaching artists said that it would be useful if the classroom teachers were better introduced to *LTA* and the teaching strategies employed. To remedy this, teaching artists suggested greater communication with teachers as well as workshops or professional development for teachers, such as a lesson on inquiry (see the quotation below).

> Probably, it might be a good idea to have the classroom teachers who are involved in this program to do an inquiry workshop, so that they can instill this practice in their students even when the teaching artist isn't there. I think that's really important. [Teaching Artist 1, 2008]

OPINIONS OF THE *LTA* PROFESSIONAL DEVELOPMENT

All teaching artists valued *LTA*'s professional development and found it extremely useful. One teaching artists said, "It was the best program that I've ever worked at as far as [professional development] goes,"

while another said it provided the support that she needs to uphold the program's "rigorous standards"; both teaching artists noted that the Guggenheim's dedication to obtaining feedback from teaching artists was one reason that the professional development proved so useful (see the quotations below).

> (Can you talk about your experiences with *LTA*'s professional development?) They're great. It's the best program that I've ever worked for as far as that sort of thing [professional development] goes. Like, they're, for the most part, really relevant and useful, and if they're not, they want to hear about it. They want to understand how to make it be different next time. They're really receptive, and they try to not waste their time. [Teaching Artist 2, 2008]

> I think the professional development for the *LTA* Program is really high quality, and I very rarely feel like my time is being wasted, which is really kind of rare in professional development. So, I mean, I feel like they [the Guggenheim] have very rigorous standards [for *LTA*], and they give us a lot of support for meeting those standards. They are very committed to making it the best program they can possibly make it, and they do that by validating our experience, by always asking us how they can do it better. [Teaching Artist 4, 2008]

INFORMATION LEARNED

Teaching artists described a variety of things that they learned from the *LTA*'s professional development. Most often mentioned were lectures that pertained to understanding learners as well as provided strategies for reaching individual learners, such as Dr. Michael Hanson's talk on multi-modal thinking, Dr. Olga Hubard's talk on the philosophy of education and tailoring projects, and a workshop at the Metropolitan Museum of Art that touched on how to acknowledge different types of learners (see the first three quotation below). Additionally, one teaching artist mentioned an influential lecture on storytelling, while another teacher mentioned an unnamed Teachers College professor's talk about the differences between teaching art and teaching art about curriculum (see the fourth and fifth quotations).

> Russell came in—he was a teaching artist and now he's a consultant for teaching artists—and for his workshop, we all met at The Met, which was great. . . . He just did some simple kind of exercises—ways of organizing your classroom and ways of acknowledging different types of learners in the classroom—that was really incredible. And then, Dr. Michael Hanson did a lot of work with multimodal thinking, and so that, was such an important thing to acknowledge—all the different types of learners in your classroom.

> Well, the first thing that I learned was to really tailor what I was going to do from one class to the next as it pertained to inquiry and activity and reflections. Because even though it was three 5th grade classes, each class had a lot of separate concerns, and Olga Hubard actually came in to speak to us. She works over at the graduate program at Columbia. . . . She gave a lot of insight into really how to differentiate our project outline in a way so that we could really reach each student, each separate class. [Teaching Artist 3, 2009]

> We talked in the beginning—in the professional development—about how to structure lessons for students with like processing difficulties and with other learning issues. And those are things like how to break down direction and chunking, or whatever they call it—how to feed information to students, involving the students in a way that's manageable for all kinds of students and that sort of thing. It's not prescriptive—something that I've taken into the classroom and done, at least not be exactly how it was written—but it's something that's in my head now, in the way I approach talking to students. [Teaching Artist 2, 2008]

> We did this whole training on storytelling, and I love the idea of trying to incorporate storytelling both into how I'm presenting material, but also in terms of how the students are responding to material because kids are just natural storytellers. So, I love that idea. [Teaching Artist 4, 2008]

> They brought in someone from Teachers College to talk about the difference between teaching art and teaching art about curriculum and what the usefulness is in both of these things. And, I know that the *LTA* people know that this is something that we [teaching artists] felt strongly about, and they brought someone in with a background in studying this sort of thing to talk to us about it and about the implications for the program. [Teaching Artist 2, 2008]

Further, a few teaching artists explained that they valued the professional development because it caused them to reflect on their teaching and presented them with new ideas about teaching philosophy (see the first two quotations below). A couple teaching artists acknowledged how instrumental the Guggenheim staff were in making this kind of professional development happen (see the third quotation).

> Thinking about the ones this year, they're less about the pedagogy or teaching skills or things like that, and they were more about building philosophies and ideas, which is really, really stimulating intellectually. It affected my practice like on a different level. . . . Lots of things that I learned, things that were planted, like giving me new ways to think about what I was doing, which is important when you work with fifth-grade year after year after year. [Teaching Artist 2, 2009]

> I didn't go to school; I don't have a Masters in education, so to get sort of a tune-up with all of that and rethink your teaching practice constantly is important. So that's what the professional development really does for us, I think; it shakes us up a little bit and pushes our comfort zone a little bit and that's important. [Teaching Artist 1, 2009]

> I feel like the great things about it is in addition to giving us a lot of theoretical resources to pull from they allowed us to work together so that we would get different practicum that we would be able to apply. . . . I really think it was very thoughtful and well-planned. . . . The *LTA* staff—Rebecca, Amy, Marie, and Miriam—were really there to foster anything that we may not have gotten or [if we] needed something deeper than what we might have started in one of the professional developments. It really was something that was ongoing and not just sort of like a blip on a screen. [Teaching Artist 3, 2009]

SUGGESTIONS FOR IMPROVING THE PROFESSIONAL DEVELOPMENT

All teaching artists had just one suggestion for improving the *LTA* professional development: providing opportunities for teaching artists to share their experiences. Teaching artists thought that it may be useful to schedule more time in which teaching artists could share teaching strategies amongst themselves (see the quotations below). In prefacing this suggestion, a couple teaching artists indicated that they valued their requirement to observe other teaching artists, but they desired more conversation with teaching artists so they can dissect different teaching styles.

> (Do you have any ideas about how the professional development might be modified to improve it?) I actually already mentioned this to Rebecca, but to give us a little bit of forum time to talk to each other so that we can learn more from each other, from the teaching artists. They [professional development sessions] go really fast—and once a month is as much as anyone's schedule will allow—but just having all of our brains in one room is really good. [Teaching Artist 2, 2008]

> Gosh, I mean, the professional developments are really good, but how else could they be improved? Um, I think that sort of the biggest idea that I would throw out there is just getting the teaching artists even more involved because we learn so much from each other. Like for me, the best part of the professional development is just going and seeing other teaching artists teach, and I wish that there was sort of more time for experiencing other teachers, as opposed to just sort of getting professionals from other places to come in. [Teaching Artist 4, 2008]

IMPACT OF *LTA*

ON TEACHING ARTIST

All teaching artists felt that *LTA* had impacted their teaching tremendously. First and foremost, all teaching artists talked about how *LTA* imparted the importance of reflection in all their work and teaching. Some teaching artists referred to how they experienced the reflective process through the way that the *LTA* program was run (i.e., *LTA* staff's dedication to making constant improvements to the program) (see the first quotation below). Some teaching artists also mentioned that they were encouraged to reflect on their own teaching as well as introduce reflection to their students in *LTA*. As a result teachers felt motivated and able to explore since they were challenged to do things ever better (see the second and third quotations).

> I've learned much of what I know about teaching here and it has actually set like a pretty high standard for me going out and working at other places too. Just realizing how important it is to be reflective, to be in communication, and to be constantly thinking about what you're doing—looking backward and forward about what you're doing. That's something that I got from entering *LTA* at the Guggenheim because that's kind of the culture here. [Teaching Artist 2, 2008]

> [The Guggenheim staff] really encourage me to not do things the easy way necessarily—the way that I know that they'll be successful, to really be exploratory in my teaching. I think that's a unique thing in a job in general, you know, because clearly people want their own place to do their jobs correctly. But that inhibits risk-taking or trying new things or growth in a lot of ways. That I think is one of the inner strengths of *LTA*. [Teaching Artist 2, 2009]

> (What impact, if any, has the Guggenheim program had on your teaching?) Huge. . . . Every teaching session, I am challenged. Every teaching session, I am inspired. And, every teaching session, I am motivated to continue teaching. I think that as a teaching artist or as a teacher of any subject, just this dialogue [the dialogue with *LTA* staff] and interaction with people is such an honor. I think the biggest thing is that I continue to be challenged, like 'How can I make that better?' I'm constantly wondering how could I have modeled something better or explained something better? [Teaching Artist 1, 2009]

As a result of their reflective practice, most teaching artists mentioned something specific that they learned, such as the self-realization that teachers can become very isolated (see the first quotation below). Other things that teaching artists said they learned was the effectiveness of asking students what they think, new techniques for managing classrooms, ways to engage with different learners, and ways to communicate better with teachers (see the second quotation).

> I think, as a teacher, you can become really isolated in your teaching, in your classroom. I mean, you know, I noticed that with one of my collaborating teachers. I was really struck—I'm always struck—by different teaching styles. So, I [noticed that] she [a collaborating teacher] was

basically teaching from the chair and not moving around and interacting with the students. . . . It's just interesting. [Teaching Artist 1, 2008]

(What impact, if any, has the Guggenheim program had on your teaching?) Oh, tremendous . . . really asking students, 'What do you think?' is something that I have found strangely enough to be very foreign in this realm where test prep can so dominate a school's culture. Children are being asked questions where there are very specific answers, and I think to really consistently and sincerely ask them what they think about any of a number of things, whether it's the art work that we're looking at, in personal experiences that we're wanting them to infuse and have and form their process and final work is a tremendous thing. And I think it will completely—in time and if it's continually fostered—allow them to truly be thinking beings versus just on like some factory line and a widget. [Teaching Artist 3, 2009]

ON CLASSROOM TEACHERS

Teaching artists thought that *LTA* had an impact on teachers, although as one said "it was hard to know." Teaching artists speculated that teachers gained—through exposure in *LTA*—awareness, including awareness of different teaching styles, cultural institutions, ways to use materials, and the artistic process.

I think that by the end of the year, two of the teachers—two out of the three of the teachers—really recognized the importance of a program like this . . . and I think that these teachers learned a lot from my particular teaching style, and I learned a lot from their teaching style. [Teaching Artist 1, 2008]

(Can you think of any ways in which the Guggenheim program has impacted the classroom teachers you worked with?) Totally. I mean, well, just the exposure to a cultural institution in New York and just having their kids develop a relationship like that. . . . Also, the way that we get to talk about things, and the way that things are student-centered instead of information-centered. I don't know. I can't tell you if they carry this over into their teaching practice per se, but I know it's something that impressed them, that left an impression on them. [Teaching Artist 2, 2009]

It's so hard to know. . . . I mean I would like to think that it opened up the teachers to feeling more courageous with making art and materials and gave them some ideas for how they can do that even on their own. . . . So they certainly have that information. Whether or not they'll use it, I have no idea. But, sort of the learning by example; it's like here we were doing things every single week. We'd do things like incorporating reflection into an activity. [Teaching Artist 4, 2008]

The thing that I found because we just [completed] a sort of year in reflection . . . they [the teachers] really feel like, through the program, they had a better understanding of what artists go through. I think they were thinking that we were just going to come in and paint and, more or less, do crafts. And what Ms. A said in particular was that she really never realized . . . how much thinking goes into the creation of art. [Teaching Artist 3, 2009]

In addition, a couple teaching artists said they thought—or at least hoped—that teachers were able to see their students in a different light through *LTA*. Throughout the interviews, teaching artists expressed that teachers were not seeing all the capabilities of their students, but felt that teachers received this opportunity through *LTA* (see the quotations below).

> I think they [the teachers] were often surprised by the things their own children came up with—[things] that they really didn't think them capable of or that they didn't have the opportunity to think out loud in school, I guess. So, I guess it gives them [teachers] insight to their own kids. [Teaching Artist 2, 2008]

> I'm sure it's impacted their teaching; maybe to acknowledge the different learners in the classroom. The class sizes are big; they're like 30 kids, so again, I think *LTA* is this rich time for classroom teachers—if they take advantage of it—to step back, to not be so caught up in the moment of teaching and having to be on track and just step back and look at this wide range of individuals' and learners' minds and see this different side of their students. [Teaching Artist 1, 2009]

ON STUDENTS

When asked about what impact *LTA* had on students, most teaching artists said the program empowered students. They described a radical transformation in students resulting in confident and articulate students (see the first quotation below). Additionally, a couple teaching artists commented on the students' ability to make decisions, solve problems, and take control of a situation (see the second and third quotations).

> You have these discussions in the beginning of the year where the students are understandably quiet and then by the end of the residency, the students in all of my six classes are articulate, confident, and curious. . . . And then, just like during the art making sessions—going around and listening to the conversations and acknowledgement—[I see] that they're artists, or they're makers, or they have something significant to offer to a community or to the world. I think the program empowers kids. I think that there's so much freedom; I really try to give the students freedom with materials, freedom with the way they're thinking and try to acknowledge all the individual approaches. [Teaching Artist 1, 2009]

> I feel like the students definitely came away from the experience feeling empowered. And, I don't know if that's a kind of empowerment that they'd experienced before, but I definitely felt like from the beginning to the end, they were more confident in their own decisions—in their own ability to have agency over their choices, their ability to solve problems, and their confidence in terms of looking at art and deriving meaning from it, and just sort of practical skills such as like learning how to build stuff. [Teaching Artist 4, 2008]

> It's hard for me to say that it changed them as people, but I got the feeling that these were experiences they weren't used to having. And that they really grabbed and ran with. I mean, they [were asked to look for] inspirations in this room, so they transformed a space. . . . It was a classroom that wasn't being used this year, but they took it and very physically and literally transformed it into something different. And I think that's a pretty powerful thing for a small person to be able to walk into their own creation. [Teaching Artist 2, 2009]

Most teaching artists also described *LTA*'s impact as broadening students' views and making them more attune to the world. This includes learning to ask questions of the world and one's self as well as learning from others' approaches and decisions (see the quotations below).

> I mean, it's amazing. When we come in and they have their aprons on and they talk about, 'I'm an artist and this is my work' . . . and then for them to reflect on what is an artist and all these different ideas and so that was a huge impact. . . . They saw their little universe up there as much wider and just saw things that they hadn't seen before. I think their eyes are wider now, and I

think that their minds are more open now. I think they have much more confidence. And just in terms of interacting with each other as people—that's another huge element to this program; like, we're sharing ideas and you know, your idea might not be the same as my idea, but we can learn from each other. I hope they will take that with them outside of the classroom and into their future years. [Teaching Artist 1, 2008]

Looking at things and thinking about things, that's something that I've noticed a lot of students would mention when talking about our projects in the program. That it's not just finding one way to do things but getting to experience lots of different ways of making things or thinking about things or describing things. [Teaching Artist 2, 2008]