A Study on the Relationship between Theater Arts and Student Literacy and Mathematics Achievement

Rafael Inoa, Gustave Weltsek, and Carmine Tabone

Abstract

Past studies have shown positive correlations between the arts and academic achievement when the arts were integrated into the literature curriculum. Other studies have shown positive associations between the arts and other areas of the curriculum, such as mathematics and science. Considering the Theory of Change, which employs understandings in Critical Literacy, Multi-modal Literacy, and Transmediation, this study employed a multi-stage cluster randomized design and conducted a series of comparison and treatment group statistical analyses among predominantly low income students in an urban school district, some of whom had participated in the Integrating Theater Arts Project (ITAP). The study assessed whether a relationship existed between the presence of a theater arts intervention and student achievement in language arts and mathematics. Results showed that students receiving intervention often outperformed their control group counterparts in both math and language arts. Furthermore, students in the theater arts program outperformed their control group counterparts in every case that showed statistical significance. These cases included math achievement among sixth grade students, both language arts and math achievement of sixth grade males, and math achievement of sixth grade Hispanics. The authors conclude that programs like ITAP and methods relative to the Theory of Change may in fact promote academic achievement among participating students. They also invite future studies to consider how achievement of other academic subjects – in this case, mathematics – may also relate to such interventions.

Introduction and Background

Madeleine Grumet (2004), in writing about the importance of integrating arts into the literature curriculum, states that, "When children understand literature as something meaningful and complex, they sense its capacity to inform their lives. This is the kind of literacy that influences reading scores in middle school and high school, when we often see the gains of intensive reading instruction diminish in national assessments" (p. 67).

Over the past 30 years, there has been a growing awareness of the effectiveness of arts integration in improving classroom learning, especially for students from low income families. For instance, Stevenson and Deasy (2005) studied 10 schools where students from economically disadvantaged circumstances were succeeding. These 10 schools identified the arts as a key reason for that success. Teachers in the case study schools also said they derived delight, professional renewal, and satisfaction from incorporating arts into their teaching. Another example is the study of the Chicago Arts Partnerships in Education (CAPE) program that partnered artists and art agencies with teachers at all grade levels in low-socioeconomic urban public schools. Findings demonstrated that CAPE schools clearly outperformed the control schools in a wide variety of outcomes, such as, positive changes in school climate and improved reading and math scores (Catterall and Waldorf, 1999). Moreover, Catterall (2002) points to research that shows consistent positive associations among dramatic enactment and reading comprehension, oral story understanding, and written story understanding. Finally, in a review of 80 different studies, Ann Podlozny (2000) reported a consistent correlation between classroom drama and oral language development. Other studies include De la Cruz (1995), who reported a quantitative link between creative drama and the oral language skills of children with learning disabilities; Williamson and Silvern (1992), who found that kindergarten students who acted out roles and scenes from stories substantially increased their story comprehension and verbal abilities; and Tabone (2004), who reported that the use of puppets and masks with third and fourth graders provided the safety and distance required for children to overcome their fear of using language incorrectly.

Several studies have further established a positive correlation between classroom drama activities and reading comprehension, writing, and oral communication skills. These include Parks and Rose (1997), who reported substantial improvement on standardized reading comprehension tests by fourth grade students who participated in drama activities; Wagner (1986), who studied fourth and eighth graders and provided evidence of the value of role-playing as a pre-writing activity; and Wolf (1998), who looked at third and fourth grade children designated as "at risk" and with special needs and found that involvement in classroom drama contributed to a more comprehensive understanding of literature.

Classroom drama activities have also been shown to motivate and reinforce the development of intrapersonal communication, interpersonal communication, and general social skills. For instance, De la Cruz (1995) reported that children with learning disabilities who participated in a creative drama program showed enhanced social skills, including courtesy to others, greater self-control, the ability to focus and social compliance. Heath's study (1999) of several urban and rural arts educational programs in various parts of the country found that the arts were a consistent and significant force in social learning. And a ten-year study of 124 after-school adolescent arts programs revealed that involvement in the arts "builds and sustains a host of skills and capacities rooted in their personal recognition of themselves as competent, creative and productive individuals" (Heath with Roach, 1999, p. 29).

Interestingly, several studies have demonstrated a positive association between classroom drama and other areas of the curriculum, including math and science. An analysis by Catterall, Chapleau and Iwanaga (1999) of longitudinal data collected nationwide revealed that students who experience arts integrated into the curriculum scored substantially higher in various measures than students without such exposure. Additionally, Burton, Horowitz and Abeles (1999) found that students in Minneapolis applied competencies gained from experience with the arts to other areas of the curriculum and enhanced their image of themselves as learners. Last, Ingram and Seashore (2003) documented a positive correlation between students exposed to educational arts programs and academic performance, with the strongest correlation among low income students in Minneapolis.

Theoretical Frameworks

Burnaford et al (2007) posits three categories that help bring together varying perspectives on arts integration: arts integration as learning “through” and “with” the arts; arts integration as a curricular connections process; and arts integration as collaborative engagement. Integrating Theater Arts Program (ITAP), the program under study, fits well into these three categories, since theater arts has been used as methodology, connects directly to the district's curriculum, and acts as a way to create both engagement with what is being studied and collaboration among students.

While much interest has centered on how learning occurs in and through the arts, as noted by the history of arts education, curriculum integration, and arts integration, there are also a number of theoretical perspectives in the field of literacy and cognitive learning that are useful for understanding how learning is promoted through the arts. In this article, we highlight three of these perspectives with illustrative examples of how each is reflected in activities that occur in an arts integrated classroom, and employ them in the development of the Theory of Change, which hypothesizes increased academic and social achievement when certain ascribing features are present.

Critical Literacy

Critical literacy studies (Barton & Hamilton, 2000) refer to literacy-teaching approaches that access and explore the cultural variables that play into student literacy learning. Perry (2012) notes that critical literacy refers to finding ways to make literacy instruction meaningful and relevant by recognizing and incorporating students' out-of-school ways of practicing literacy and decreasing achievement gaps for students whose families and communities practice literacy in ways that may differ from those in the mainstream or in positions of power.

As an example, in one infusion strategy, "Hot Seat," characters from a story are interviewed by students as a means to dive more deeply into character interpretation and explore the characters' personality traits and motives. Initially, the teacher takes on the role of one of the characters and sits in the hot seat, prompting students to ask this character a series of questions. Throughout the activity, the teacher comes out of role and directs the class in discussion, asking for thoughts and feelings about things such as personality, moral choices, and motives that the character represented. Because this activity steps outside of the text, there are no predetermined questions or incorrect answers. In essence, the students become the authors of a new text.

This strategy allows students to think about possible issues and problems within a story. In order to do this, students must first consider their own lives and their own experiences dealing with similar situations. When the students find a comparable experience, they can reflect on how their entire person engaged within that situation, remembering the place, time, and others present, as well as the engagement of their senses (i.e. touch, sound, smell, and taste) in addition to, and often most important, the emotions connected to the event. This personal understanding of the situation is then used as a way to respond within the fictional role of interviewer and the non-fictional role of student. As promoted through critical literacy studies, the "Hot Seat" strategy allows students to access and use culturally-defined, lived experiences as a way to engage, interpret and process the curriculum, which is a practice that they can repeat in other academic situations. In short, the "Hot Seat" strategy values the knowledge students bring into the classroom as a valid interpretive curricular tool.

Multi-modal Literacy Studies

Multi-modal literacy studies are literacy teaching approaches grounded in semiotics, "an interdisciplinary field of studies that examines how meaning is made through signs of all kinds—pictures, gestures, music—not just words" (Siegel, 2006, p. 65). Each day, students interact with numerous forms of media. They read visual images, such as television programs, magazines and billboard edits, and create iconic text messaging symbols, as well as multiple forms of graffiti art, to name a few. In this way, students come into contact with visual images by processing and reading them. They also use visual images to communicate iconic texts, and, therefore, "write" visual images as well. They speak and take on different roles within various relationships and settings and use gestures and body positions to convey emotions. Furthermore, they receive information and engage various media sources, including movies, television shows, Internet websites, smart phones, and tablets. In a multi-modal literacy studies approach, teachers create classroom environments and lessons that use multiple sign systems, including writing, art, storytelling, and drama, among others, to fully engage to make meaning. As Harste et al (1984) argued in his study on multimodal work in literacy studies, "Talking, gesturing, dramatizing, and drawing are 'an intimate and integral part' of the writing process" (aqd. Siegel, 2006).

"Vote from your Seat," another strategy, engages students through four distinct modalities: voice, body, visual space reasoning and traditional writing. For example, students are asked to vote on a given statement inspired by classroom text. They stand up to agree, sit down to disagree, or raise their hands if unsure. After responding, they are prompted to explain the

reasoning behind their vote, using textual and personal information as backing. At this point, students have utilized vocal and physical modality. Following, the teacher reads aloud a section of the text that includes characters, setting and an implied theme. The students are invited to use their chairs and desks in the room to "create" a visual representation of the aforementioned setting, activating a modality of visual/space reasoning. The final element in this strategy asks students to explain their opinion of the given statement with writing that incorporates personal, textual, and classroom evidence. This part of the strategy asks student to use traditional writing, another modality, to make meaning around the selected text.

Transmediation

Transmediation theory posits that knowledge is constructed through the translation of content from one sign system into another (Suhor, 1984). The idea behind transmediation is that as students are asked to move – or translate – from one sign system to the next (e.g. from a printed text to a dramatized moment to a drawn interpretation and written statement), cognitive dissonance occurs, and a problem arises for which a solution must be created. The complex use of a variety of sign systems can help teachers make the teaching of writing more interesting, valued, and reflective. Research shows (Leland & Harste, 1994) that when the target system (writing) is given added meaningful focus through, for example, mini-lessons and direct instruction, there is an increased ability to use that target system. Transmediation, as a literacy practice, creates lessons that purposefully move the students in and out of various uses of sign-systems as a way to help them make meaning through their exploration and creation of language, text and writing.

In the first step of the "Vote from your Seat" strategy, the students are asked to mentally process a question inspired by a text they have been reading. Before they naturally access their past, present, and future connections to the question in their formulation of an opinion, they must transmediate their mental opinion of the question into a physical stance by standing up, sitting down, or raising their hands. Again, the theory of transmediation holds that by having the students turn the mentally processed opinion into a physical statement, they are forced into a state of cognitive dissonance that they must resolve in order to execute the task. Furthermore, by forcing the solution formation through sign translation, students access their critical understanding of how multiple signs are culturally positioned while making meaning across the various sign systems. What occurs is a link between and amongst the sign systems. This process enriches and supports the student in the development of complex language schema, which utilizes a variety of sign systems.

Theory of Change

Employing our understanding of critical literacy, multi-modal literacy and transmediation, the theory of change ascribed to this project is defined as the use of culturally-situated learning practices, through a system of multi-modal and transmediated strategies. These approaches create an environment in which student learning can be engaged and advanced through deeply personal, authentic, and meaningful experiences and so allow students to realize a high level of academic and social achievement.

In making a case for arts education, ample studies show positive relationships between the arts and student development and achievement. As previously noted, outcome variables, amongst others, include reading comprehension, language skills, oral communication, and classroom learning in various subjects, inclusive of math and science. Specifically, we turn to the benefits of theater arts infusion on student learning and development.

Integrating Theater Arts Project (ITAP)

Vygotsky (1987) discusses learning as “a process that occurs through social interaction with a more competent other during participation in culturally meaningful, productive activity" (Rueda and Monzo, 2000). Theater-infused lessons immerse students in meaningful and productive activities. Moreover, the use of drama and theater as an infusion relies heavily upon the students’ use of personal and community literacies alongside school-based literacy learning (Barton et al. 2000). What this means is that the students are not only encouraged, but required, to use their own knowledge and way of communicating it (personal and community literacy) to interact and make decisions within the creative process promoted through drama infused work. This type of literacy learning, which engages students’ own ways of communicating within the context of literacy learning, has been supported through multiple studies (Medina 2004, Leland et al, 2002, Harste et al 2000, Vasquez 2000). A theater infused approach takes seriously the need to “construct a unique blend of elements suited to specific student needs” (Graham & Perin, p. 11). The systematic infusion of theater strategies enables students to orally, physically, and visually generate ideas for writing, develop the voice of a particular piece, clarify the intended audience, and create a “rehearsal” for the intended genre of writing. Students in a role have a clearer picture of identity or voice as a writer, as well as a sense of audience, making it easier to write. This use of literacy evolves naturally into writing and readily into making connections into literature. The lessons create a way of working that fosters higher-order thinking, active participation, and the carrying out of tasks that require students to use analysis, synthesis, and evaluation as they work. The development of critical thinking and meta-cognition has been shown to be central to the academic success of students. Good readers are critical thinkers, visualizing and gaining insight into character and setting, predicting plot, and engaging with concepts and themes (Perkins, 1992).

The Arts in Education – Model Development and Dissemination (AEMDD) grants program, awarded by the United States Department of Education (USDOE), promotes integration into the arts, the strengthening of the arts both within student curricula and arts instruction, and the improvement of student academic performance. In 2008, a large East Coast urban school district was awarded this grant to partner with a local arts organization on a middle school Theater Arts Integration project and to improve student literacy and provide professional development for middle school teachers. The objectives brought together curricula, standards, and areas of learning from both language and theater arts. The long-term goals of the project were to develop lifelong learners who enjoy reading and expressing themselves through writing; the short-term goals included improvements in student comprehension skills and student motivation in reading and writing, as well as the exploration of themes and characters from academic novels and the establishment of opportunities that lead students to work meta-cognitively through discussion, personal reflection, and writing.

A previous article on this project (Walker, Tabone, Weltsek, 2011) looked at only one year of data and studied the extent to which students' language arts and mathematics performance were positively impacted by being in a classroom setting in which theater strategies were integrated into the local district's language arts curriculum. Reviewing the results of standardized state test scores for the 699 students in the study, the authors noted that evaluator findings showed students in treatment groups consistently outscoring control group students on standardized tests. Evaluators also looked at student impact after moving into the eighth grade. Once again, results were encouraging.

Some highlights of the findings reported to the USDOE and outlined in that article include:

- 56% of sixth and seventh graders in arts integrated classroom settings passed the state Assessment in Skills and Knowledge Test in Language Arts area as compared to 43% of students in the control group classes.
- 78% of eighth graders who participated in the arts integration project when they were in the seventh grade were successful in grade 8 on the state's assessment in Language Arts, compared to 69% of control students; and
- 49% of the eighth grade students who were arts integration participants in the seventh grade passed the mathematics exam as compared to 35% of students in the control group.

Walker, Tabone, Weltsek (2011) concluded that the infusion of theater based learning strategies into the language arts curriculum consistently helped students achieve higher test scores and also played an important role in developing a community of learners who were more engaged, receptive to learning, and curious about the world in which they live.

This present article presents findings from two program-years (2008/2009 and 2009/2010) in language arts and mathematics test scores for 1,193 sixth and seventh grade, treatment and control students.

Methods

Selection of Schools, Treatment and Control Students, and Teachers

At the beginning of the project, eight schools were matched by size, demographics and performance on the state's assessment. A multi-stage cluster randomized design was used to select four schools for the treatment and four to serve as the counterfactual. At the second stage of sampling, 28 sixth and seventh grade classes were randomly selected from the treatment schools to receive 24 theater arts lessons that would be integrated into the language arts curriculum in each school for two years, and 28 sixth and seventh grade classrooms were selected in the non-treatment schools as the control. These schools received the standard language arts curriculum. The 18 teachers who taught language arts to the 28 treatment classes participated in a total of 24 hours of professional development outside of the classroom consisting of strategies, lesson planning and arts integration philosophy over the first two years of the project. These teachers were expected to use the 24 lessons during the third year of the project on their own. Additionally, during the third year of the project all sixth and seventh grade teachers (approximately 100) in the school district received six hours of professional development.

All participants in the study were students in a large East Coast urban school district. There were a total of 1,193 students in the data file; 464 were in the control group and 729 were in treatment. Due to baseline equivalency results, as detailed in the subsequent section, student demographical data is presented by grade level (See Table 1).

Table 1. Demographical data of 6th and 7th grade students in treatment and control groups.

6th Grade	Control (n=373)	Treatment (n=274)	Total (n=647)
Gender			
Male	46.0%	52.0%	49.5%
Female	54.0%	48.0%	50.5%
Race/Ethnicity			
Black	27.4%	28.4%	28.0%
Hispanic	42.3%	42.3%	43.4%
Asian	16.8%	17.2%	17.0%
White	10.9%	9.7%	10.2%
Lunch			
Free/ Reduced	84.3%	88.2%	86.6%
Paid	15.7%	11.8%	13.4%
7th Grade	Control (n=190)	Treatment (n=356)	Total (n=546)
Gender			
Male	55.8%	50.0%	52.0%
Female	44.2%	50.0%	48.0%
Race/Ethnicity			
Black	31.1%	28.9%	29.7%
Hispanic	44.7%	41.6%	42.7%
Asian	16.8%	15.2%	15.8%
White	6.8%	13.2%	11.0%
Lunch			
Free/ Reduced	78.4%	80.3%	79.7%
Paid	21.6%	19.7%	20.3%

Among sixth grade participants, there were a total of 647 students across both conditions, with 274 in treatment and 373 representing the comparison cluster. Females comprised 54% of students in the latter with 46% males; in treatment, there were 48% females and 52% males.

Of the students in the counterfactual, 27.4% were racially or ethnically classified as Black, with 42.3% Hispanic, 16.8% Asian, and 10.9% White. Similarly, 28.4% of students who took part in the theater arts program were Black, 42.3% were Hispanic, and 17.2% and 9.7% were Asian and White, respectively.

Regarding lunch status, 84.3% of students in the control group were on free or reduced school lunch and 15.7% were on paid lunch, while 88.2% of experimental group students were on free or reduced lunch and 11.8% paid for lunch.

There were 546 students in the seventh grade, with 190 in the comparison group and 356 in treatment. Females in the comparison group made up 55.8% of their group with 44.2% males, while each gender in the experimental condition consisted of exactly half their group.

Of the participants in the control group, 31.1% were Black with 44.7% Hispanic, and 16.8% Asian and 6.8% White. In treatment, 28.9% were Black and 41.6% were Hispanic, while 15.2% classified as Asian and 13.2% as White.

Last, 78.4% students in the counterfactual were on free or reduced lunch with 21.6% on paid lunch; 80.3% student in the experimental group were on free or reduced lunch and 19.7% were subject to a paid lunch.

Baseline Equivalency

The first analysis employed in the study was to establish that randomization had resulted in equivalent groups. Baseline equivalency was tested across grade level, gender, race and ethnicity, and lunch status. No significant differences were found between the groups except for grade level, leading to grade level disaggregation of the two groups. At each grade level, there were no significant between group differences across gender, race and ethnicity, and lunch status. (See Table 2).

Table 2. Chi-square tests at the 6th and 7th grade level across race/ethnicity, gender, and lunch status.

Variable	Chi-Square	DF*	P
6th Grade			
Race/Ethnicity	6.004	6	.423
Gender	2.294	1	.130
Lunch Status	2.061	1	.163
7th Grade			
Race/Ethnicity	5.741	4	.219
Gender	1.664	1	.197
Lunch Status	.218	1	.596

*DF, degree of freedom

Data Collection

During the two academic school years (2008/2009 and 2009/2010) in which this study took place, sixth and seventh grade students in the district were required to take a state assessment in the spring season. The two assessment areas administered during the four-day, approximately 6-hour, assessment were language arts literacy, consisting of reading and writing skills, and mathematics. Student performance on the test was categorized as either partially proficient, proficient, or advanced proficient. Each student obtained a scale score between 100 and 300. Proficient students are those with a scale score between 200 and 249; partial proficiency is a score below the scale proficiency range; and advanced proficiency is any scale score above 249. Student proficiency scores on this state assessment for all treatment and control participants were provided by the school district. In this study, students are categorized as non-proficient or proficient. As in the state assessment, the former reflects students scoring below 200; the latter, however, combines assessment categories of proficient and advanced proficient into one category – students scoring between 200 and 300. The benefits of creating a dichotomous variable surpassed that of representing an advance proficient category, since students fitting into such a category were minimal in both groups. (For example, in language arts, approximately 2.8% of control group students were advanced proficient compared to 2.7% in the experimental group; in math, approximately 6.3% placed advanced proficient in the control group versus 8.2% in treatment.)

Measures

The primary outcome measures were 2009 and 2010 proficiency scores in mathematics and language arts on the New Jersey Assessments of Skills and Knowledge. The independent variable is participation in the arts integration project, dummy coded 0 control and 1 treatment. Subgroup variables were gender, grade level, and race and ethnicity.

Data Analysis

The analytic sample consisted of 1,193 sixth and seventh grade students divided into two grade-level cohorts. There were 647 students in sixth grade and 546 students in seventh. Using

data analysis software, cross tabulations between students who participated in ITAP and those who did not were conducted, while testing for differences between each group's math and language arts proficiency levels. Additional analysis controlled for gender, as well as race and ethnicity. In addition, all cross tabulation analyses were paired with chi-square tests in order to establish a level of significance in all the between-group differences shown.

Independent sample t-tests were also conducted at each grade level, testing the difference in mean scores between conditions for both the math and language arts standardized exam that students at the district take yearly. This measure allowed for continuous variable testing to be utilized in the current study, as most analysis is based on dichotomous testing (i.e. proficient versus not-proficient).

Findings

The first set of findings provides basic descriptive statistics on students' performance in language arts and mathematics. Furthermore, in an effort to further understand whether the average passing scores differed for the treatment and control groups, an independent sample t-test was also conducted at each grade level.

Whole Group Differences

Sixth grade. Student performance tests in this study showed 38.7% of sixth grade students in the control group at or above proficiency; in the treatment or arts integration group, 46.4% were proficient of better. At the same time, mathematics achievement among these same students showed 39.4% in the counterfactual at or above proficiency, compared to 50.9% in the arts integration group.

These findings suggest that sixth grade students in the arts integrated group were more likely to pass the state assessments in language arts and mathematics than students who were part of the control group. These differences were statistically significant for sixth grade math level (X^2=8.441, df=1, p≤.01). In sixth grade language arts, the differences were just slightly below the .05 probability level (See Table 3.)

Independent sample t-test results showed that there was a significant difference in the mean scores for sixth grade literacy. Students in the arts integrated classrooms (M=196.66, SD=20.821) scored higher than students in the control classrooms (M=193.16, SD=22.744); t(645) = -2.036, p=.042. In math, there was also a significant difference between among grade mean scores, where treatment (M=203.47, SD=30.603) once again scored higher than control students (M=191.80, SD=28.844); t(645)=4.914, p=.000.

Seventh grade. Regarding the seventh grade cohort, 53.7%of control group students were proficient in language arts, and among treatment participants, 57.3% passed the state assessment. With respect to mathematics, 41.6% of students in the control group were proficient in math; in the arts integrated group, 43.8% were proficient. (See Table 3.)

While seventh grade students who participated in the arts integration intervention slightly outperformed their control group counterparts, none of the results at this grade level were found to be statistically significant (See Table 4.)

Table 3. Language Arts Literacy (LAL) and Math Proficiency of 6th and 7th grade students in treatment and control groups.

	Control (n=1,193)	Treatment (n=464)	Total (n=729)
6th Grade LAL			
Proficient	38.7%	46.4%	43.1%
Not Proficient	61.3%	53.6%	56.9%
6th Grade Math			
Proficient	39.4%	50.9%	46.1%
Not Proficient	60.6%	49.1%	53.9%
7th Grade LAL			
Proficient	53.7%	57.3%	56.0%
Not Proficient	46.3%	42.7%	44.0%
7th Grade Math			
Proficient	41.6%	43.8%	43.0%
Not Proficient	58.4%	56.2%	57.0%

The independent sample t-test demonstrated that in seventh grade math, students in the experimental group (M=196.52, SD=32.606) scored virtually equivalent to control group students (M=196.11, SD=38.839). Similarly, while mean scores in language arts were slightly higher for treatment students (M=202.56, SD=23.826) than control (M=200.11, SD=27.989), this between-group mean difference was also not statistically significant; t(332.851)=-0.125, p=.901.

Table 4. Chi-square tests for the Language Arts Literacy and Math Proficiency of 6th and 7th grade students in treatment and control groups.

Variable	Chi-Square	DF*	P
6th Grade LAL	3.813	1	.051
6th Grade Math	8.441	1	.004
7th Grade LAL	.659	1	.163
7th Grade Math	.254	1	.614

*DF, degree of freedom

Group Differences by Gender

Sixth grade. When gender level differences were analyzed in the sixth grade, 45.3% of females in treatment were found to be proficient in language arts compared to 41.9% in the control. Among males, 47.4% of those in the arts integration group were proficient compared to 34.9% proficient in the comparison. In mathematics, approximately 45.3% of sixth grade females in the treatment group were proficient compared to 37.8% in the counterfactual. For males in the same grade level, 56.2% of those in the arts integration project were proficient, while in the comparison group, 41.3% were proficient.

Results also showed that the 12.5 percentage point difference in language arts proficiency between experimental and conditional among sixth grade males was statistically significant (X^2=4.886, df=1, p≤.027) (See Table 6.) Additionally, between-group differences in math proficiency among sixth grade males, resulting in an approximate 15 percentage point advantage for those in treatment, showed statistical significance (X^2=6.798, df=1, p≤.009) (See Table 6.) Also notable, even though statistical significance was not present, is the fact that sixth grade females in treatment were 7.5 percentage points more likely to rank proficient in math than their control group counterparts.

Seventh grade. In seventh grade LAL, the percentage of females passing the state assessment was virtually identical across both conditions. In the treatment group, 57.9% of females were proficient; while in control, 57.5% were proficient. When we look at the performance of males, 56.7% of students in the treatment group were proficient and in the comparison group, 48.8% (See Table 5.) In seventh grade math, 38.2% of females in the arts integration group were proficient while in the control group, 38.7% were proficient. For males in the arts integration group, 49.4% were proficient versus 45.2% of males in the control (See Table 5.)

While the difference among seventh grade males across condition was not significant, it is important to note that males in treatment did score 7.9 percentage points higher than seventh grade males in the comparison group (See Table 5.) Furthermore, seventh grade males showed a 4.2 percentage point advantage above their control group counterparts though statistical significance was once again not present (See Table 5.)

Table 5. Language Arts Literacy (LAL) and Math Proficiency of 6th and 7th grade students in treatment and control groups by Gender.

	Control (n=1,193)	Treatment (n=464)	Total (n=729)
6th Grade Females			
Language Arts			
Proficient	41.9%	45.3%	43.7%
Not Proficient	58.1%	54.7%	56.3%
Math			
Proficient	37.8%	45.3%	41.9%
Not Proficient	62.2%	54.7%	58.1%
6th Grade Males			
Language Arts			
Proficient	34.9%	47.4%	42.5%
Not Proficient	65.1%	52.6%	57.5%
Math			
Proficient	41.3%	56.2%	50.3%
Not Proficient	58.7%	43.8%	49.7%
7th Grade Females			
Language Arts			
Proficient	57.5%	57.9%	57.7%
Not Proficient	42.5%	42.1%	42.3%
Math			
Proficient	38.7%	38.2%	38.4%
Not Proficient	61.3%	61.8%	61.6%
7th Grade Males			
Language Arts			
Proficient	48.8%	56.7%	54.2%
Not Proficient	51.2%	43.3%	45.8%
Math			
Proficient	45.2%	49.4%	48.1%
Not Proficient	54.8%	50.6%	51.9%

Table 6. Chi-square tests for the Language Arts Literacy and Math Proficiency of 6th and 7th grade students in treatment and control groups by Gender.

Variable	Chi-Square	DF*	P
Female			
6th Grade LAL	.372	1	.542
6th Grade Math	1.829	1	.176
7th Grade LAL	.003	1	.958
7th Grade Math	.006	1	.936
Male			
6th Grade LAL	4.886	1	.027
6th Grade Math	6.798	1	.009
7th Grade LAL	1.446	1	.229
7th Grade Math	.403	1	.525

*DF, degree of freedom

Group Differences by Race and Ethnicity

For both grade levels, between-group differences in language arts and mathematics proficiency were also tested while controlling for race and ethnicity. Racial and ethnic groups comprised students who identified as either Black, Hispanic, White, or Asian.

Sixth grade. In 6th grade, 46.2%f of black students in the treatment group were proficient in language arts, while in the control group, 37.3% were proficient. In math, 51.9% of black students were proficient in the arts integration group versus 38.7% in the counterfactual (See Table 7.)

A similar trend existed among Hispanic and white students, where 41.8% of Hispanics and 52.8% of white students in treatment were proficient in language arts, while in the counterfactual, only 34.5% of Hispanics and 33.3% of white students scored at or above proficient on the state assessment. Math proficiency figures also showed a similar trend, where 47.3% of treatment Hispanics were proficient compared to 35.3% of Hispanics in the control group. Among racially white students, 52.8% in treatment were proficient in math compared to 40.0% in control (See Table 7.)

Asian students were the only group showing similar proportions of between-group language arts proficiency. Sixth grade Asian students proficient in language arts were 54.7% in treatment, while in the control group, this figure was 54.3%. However, in math, Asian students in treatment and control followed the previous trend (of black, Hispanic, and white students), where 59.4% in treatment were proficient compared to 43.5% of control group students. As a result, while 6th grade Asian students in treatment and control ranked proficient at virtually equal rates, in math, Asian students in the conditional outperformed their comparison counterparts by 15.9 points (See Table 7.)

Virtually all cases across Grade 6 cohorts showed students in treatment outperforming their control group complements (except for Asian students in literacy). These differences were statistically significant only for Hispanics in sixth grade math (X^2=3.969, df=1, p≤.046). Other differences remaining moderately closer to the .05 probability level were found among black and Asian students proficient in math (See Table 9).

Table 7. Language Arts Literacy (LAL) and Math Proficiency of 6th grade students in treatment and control groups by Race and Ethnicity.

	Control (n=1,193)	Treatment (n=464)	Total (n=729)
6th Grade Black			
Language Arts			
Proficient	37.3%	46.2%	42.5%
Not Proficient	62.7%	53.8%	57.5%
Math			
Proficient	38.7%	51.9%	46.4%
Not Proficient	61.3%	48.1%	53.6%
6th Grade Hispanic			
Language Arts			
Proficient	34.5%	41.8%	38.8%
Not Proficient	65.5%	58.2%	61.2%
Math			
Proficient	35.3%	47.3%	42.3%
Not Proficient	64.7%	52.7%	57.7%
6th Grade Asian			
Language Arts			
Proficient	54.3%	54.7%	54.5%
Not Proficient	45.7%	45.3%	45.5%
Math			
Proficient	43.5%	59.4%	52.7%
Not Proficient	56.5%	40.6%	47.3%
6th Grade White			
Language Arts			
Proficient	33.3%	52.8%	43.9%
Not Proficient	66.7%	47.2%	56.1%
Math			
Proficient	40.0%	52.8%	47.0%
Not Proficient	60.0%	47.2%	53.0%

Table 8. Language Arts Literacy (LAL) and Math Proficiency of 7th grade students in treatment and control groups by Race and Ethnicity.

7th Grade Black			
Language Arts			
Proficient	55.9%	56.3%	56.2%
Not Proficient	44.1%	43.7%	43.8%
Math			
Proficient	33.9%	42.7%	39.5%
Not Proficient	66.1%	57.3%	60.5%
7th Grade Hispanic			
Language Arts			

Proficient	50.6%	54.1%	52.8%
Not Proficient	49.4%	45.9%	47.2%
Math			
Proficient	40.0%	36.5%	37.8%
Not Proficient	60.0%	63.5%	62.2%
7th Grade Asian			
Language Arts			
Proficient	62.5%	64.8%	64.0%
Not Proficient	37.5%	35.2%	36.0%
Math			
Proficient	56.3%	50.0%	52.3%
Not Proficient	43.8%	50.0%	47.7%
7th Grade White			
Language Arts			
Proficient	46.2%	59.6%	56.7%
Not Proficient	53.8%	40.4%	43.3%
Math			
Proficient	46.2%	57.4%	55.0%
Not Proficient	53.8%	42.6%	45.0%

Seventh grade. In seventh grade, black students in treatment and control ranked similarly in terms of language arts proficiency. In treatment, 56.3% of black students were proficient, compared to 55.9% proficient in the control. However, in math, there was a wide gap between the two groups, where 42.7% of black students in the experimental were proficient, while 33.9% in the control group ranked proficient (See Table 8.)

Among seventh grade Hispanics, in treatment, 54.1% ranked proficient in language arts, while in the counterfactual, 50.6% were proficient. On the contrary, math showed treatment at their first disadvantage, where 36.5% of experimental group students were proficient, while in the comparison group, 40.0% were proficient (See Table 8.)

Seventh grade Asian students in the conditional group also slightly outperformed their control group counterparts in language arts, where 64.8% were proficient compared to 62.5% in the latter. However, in math proficiency, treatment group was outperformed for the second time by their control group counterparts, where Asian students in the experimental group were at an even 50% proficient, but in the control group, 56.3% ranked proficient (See Table 8.)

Finally, in the treatment group, racially white students were 59.6% proficient in math, while in the control group, 46.2% were proficient. Similarly, 57.4% of Asian students in the treatment group were proficient in math, compared to 46.2% in the comparison group who were proficient in math (See Table 8.)

In seventh grade, treatment once again outperformed control in both literacy and math, though proficiency differences showed smaller gaps between each condition when compared to the sixth grade results. Even so, all between-group difference at the seventh grade level yielded no statistically significant results (See Table 9.)

Table 9. Chi-square tests for the Language Arts Literacy and Math Proficiency of 6th and 7th grade students in treatment and control groups by Race and Ethnicity.

Variable	Chi-Square	DF*	P
Black			

6th Grade LAL	1.421	1	.233
6th Grade Math	3.086	1	.079
7th Grade LAL	.002	1	.963
7th Grade Math	1.221	1	.269
Hispanic			
6th Grade LAL	1.544	1	.214
6th Grade Math	3.969	1	.046
7th Grade LAL	.260	1	.610
7th Grade Math	.284	1	.594
Asian			
6th Grade LAL	.001	1	.972
6th Grade Math	2.713	1	.100
7th Grade LAL	.047	1	.829
7th Grade Math	.315	1	.575
White			
6th Grade LAL	2.512	1	.113
6th Grade Math	1.073	1	.300
7th Grade LAL	.747	1	.387
7th Grade Math	.525	1	.469

*DF, degree of freedom

Limitations

Even though students who participated in ITAP did often outperform students in the comparison level subgroups, sometimes by seemingly substantial margins, these differences were rarely statistically significant. Due to a lack of homogeneity during initial equivalency testing, students were disaggregated by grade level, which resulted in decreased sample sizes. Furthermore, subgroup sample sizes, when controlling for gender and the race and ethnicity variable, resulted in further condensation, potentially causing additional losses in significance. Larger sample sizes might have resulted in heightened statistical significance in the between-group achievement differences across treatment and control, even when disaggregated by variables like grade, gender, and race and ethnicity. This is especially true if the trends shown throughout the current sample remain consistent throughout larger sample sizes. This was most apparent among the seventh grade cohorts, where significance, amidst wide gaps in performance rates, were still well below the standard level of .05.

Discussion

In the present study, students receiving a theater arts intervention at both sixth and seventh grade outscored their control group counterparts in both math and language arts. The most significant results occurred in sixth grade, where students receiving a theater arts intervention outperformed their control group counterparts by almost eight percentage points, a difference that missed statistical significance by one-hundredth of a point, while in math, treatment once again surpassed control group participants, this time by 11.5 percentage points, a difference that was statistically significant. The overall results of this study are encouraging, since they predict academic benefit to those students who participate in a theater arts related intervention. This benefit, however, is not limited to student achievement in literacy related skills.

Even though theater arts seems most relatable to reading, writing, and speaking, especially considering the abundant literature focusing arts integration with literacy (i.e. Grumet,

2004; Medina, 2004; Catterall, 2002), in the current study, students receiving theater arts instruction also demonstrated heightened math achievement. In fact, when controlling for gender, students in the treatment group often outscored their control group counterparts, with statistical significance found among sixth grade males in both language arts and mathematics. Even more, when controlling for other variables, math achievement was often a greater predictor than language arts proficiency, as was the case among sixth grade black, Hispanic, and Asian students. Like this study's found relationship between theater arts and mathematics, the relationship between the arts and non-literacy-based subjects has been supported in earlier studies (i.e. Catterall et al., 1999; Burton, Horowitz and Abeles, 1999; Ingram and Seashore, 2003); nonetheless, this segment is scarcely represented.

The current study warrants future focus on the influence that the arts may have on other academic subjects, in this case, the relationship between theater arts and mathematics. Studies forthcoming may consider how programs that employ aspects of the Theory of Change, which greatly relies on theoretical frameworks relative to literacy components, may also relate to the development of skills intrinsic to math achievement (i.e. problem solving, reasoning, analysis and abstract thinking).

In addition to interest in the relationship between theater arts integration and math achievement, controlling for gender also offered interesting conclusions relative to the impact that theater arts intervention may have on the academic achievement of male students. For instance, while sixth grade females in the intervention were more likely to score proficient in math and language arts than females who were not part of the theaters arts program, males who were part of the theater arts intervention outperformed control group males at each grade level, in both math and language arts, and did so at a higher rate than did females in the study. This is important considering the barriers faced by many minority, male youths living in low-income urban areas.

The benefits of a theater arts program for low income students in urban school districts are shown continually throughout this study. In addition, while statistical significance was found predominantly among sixth grade and males, the results of this study do not diminish the benefits that such an intervention can have on females and students in Grade 7. In most instances, ITAP students still outperformed control group students of their same grade, gender, and race or ethnicity classification; very rarely did the opposite occur, and in cases where it did, differences were highly insignificant. As such, we may understand theater arts infusion as a strategy that benefits students of all races and ethnicities, both males and females, in both sixth and seventh grade. An even greater statistical impact may present itself if students are not demographically separated. In other words, the effects that theater arts infusion may have on academic achievement may be compounded when all students are looked at collectively. As a result, future studies may look to replicate the type of analyses conducted in this study among larger populations.

Another major point of interest is the relationship that a theater arts infusion program may have on the academic achievement of students with an Individual Education Plan (IEP). Due to small sample size, meaningful results could not be determined regarding this relationship; however, because of the student centered, individualistic approach that programs working under the Theory of Change employ, studies delving into the experiences of special-needs students enrolled in such programs may assist in uncovering policies and practices that help promote heightened academic achievement among them. Programs, like ITAP, may serve as prime

examples of the achievement potential that can result from the enrollment of at-risk or special needs youth. Further research is warranted.

In advocating for programs that help improve student academic success, this study is yet another example of the benefits that the arts can bring to student learning. Nevertheless, while adding to the body of literature in significant ways, the current results should also be treated as a precursor in our attempt to fully understand the range of benefits that can be achieved when the Theory of Change and programs like ITAP are implemented among diverse student populations.

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