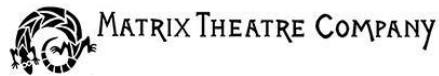


STEAM PROGRAM

Description and Results

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“It is really cool to say in my area we have a nice little theatre that is fun and eco-friendly.” --7th grade girl who participated in the STEAM program

In 2012, the National Endowment for the Arts provided an award to the Matrix Theatre Company to partner with the Southeast Michigan Stewardship (SEMIS) Coalition to strengthen student understanding of environmental science using a school-based arts integration program called STEAM¹. This award supported five arts-infused education projects which served 165 students in eight different classrooms in Southeast Michigan. Students were able to work with Matrix Theatre Company teaching artists and environmental instructors from SEMIS to create new theatre and visual arts pieces centered on science themes with a focus on place. Most classes took a field trip that supported their work, and each student participated in a public performance or exhibition of their work.

PROJECT ACTIVITIES

Two classes of 4th graders at Neinas Elementary School in Southwest Detroit studied weather in a “Survival” project. Instructors worked with the students who read stories about hurricanes, tsunamis, and arctic exploration as they discussed local and international weather phenomena. These students created tableaux on the various topics, and performed them for their peer groups and teachers.

Teaching artists and environmental educators also worked with students in a 2nd/3rd grade split special education classroom at Neinas Elementary School. In a project entitled “The Story of My Community” students examined community life and issues. Their activities included exploring where the water in sewers and storm drains comes from and goes to, participation in community walks, and writing and performance of a new play entitled “Our Community.” After their performance, the students participated in a talkback with their audience about how and why they wrote their play.

At the Nsoroma Institute in Detroit, a class of 7th graders created and performed an original choreopoem titled “Fight for Your Food” about issues of food security in Detroit, which included rhythmic accompaniment on homemade instruments made of recycled materials. They performed their work at D-Town Farms, an offshoot of the Detroit Black Community Food Security Network which works to raise awareness about food issues, and the role food plays in building healthy families and communities. After their performance, the students participated in a talkback with their audience about how and why they wrote their choreopoem.

John Paul II School in Lincoln Park, Michigan hosted a STEAM program in a 7th grade Science classroom. For this project, the students wrote several new plays about influential scientists and how their work is

¹ The acronym STEAM reflects support for the infusion of Arts into the STEM (Science Technology, Engineering, Math) education movement. “Going from STEM to STEAM.” This program roots the STEAM approach in the best practices of eco-arts education. As formulated by Hilary Inwood, “Eco-art education integrates art education with environmental education as a means of developing awareness of and engagement with environmental concepts and issues, such as conservation, preservation, restoration and sustainability.”

still used and built upon today. In addition, this class had a Community Connections component that brought local earth science and environmental issues to greater awareness. These students also had the opportunity to participate in a talkback with their audience.

Honey Creek Community School in Ann Arbor hosted a project in three of their 4th/5th grade classrooms. The students studied body systems and made a quilt showing how body systems work together, and how different kinds of food affect our bodies. This quilt now hangs permanently in the Honey Creek Community School.

Throughout the year, classroom teachers, teaching artists, and environmental educators had several professional development opportunities thanks to workshops and conferences provided by Matrix Theatre Company and SEMIS. Throughout these trainings, attendees were able to gain deeper and greater knowledge about place-based education as well as arts-infused education, and were able to gain new skills and techniques to implement these methods in the classroom.

SEMIS hosted and facilitated professional development events throughout the year for classroom teachers and teaching artists. SEMIS and Matrix staff also collaborated on the development of evaluation measures and tools for this project.

ORGANIZATIONAL AND COMMUNITY BENEFITS

There were several benefits to the Matrix Theatre organization as a result of this program. The first was a deeper relationship with the SEMIS Coalition, who Matrix had worked with in previous years, but never in such a deep, collaborative way. SEMIS' best practices and methods, clearly and thoroughly outlined throughout the year-long series of professional developments, helped Matrix to strengthen their methods of place-based education going forward.

The intensive professional development sessions were hugely beneficial to Matrix teaching artists, some of whom were working in arts-infused education for the first time. As a result of this project, Matrix Theatre Company's teaching artists are more comprehensively trained and better prepared to implement and lead arts-infused education programs in the future.

Deeper relationships with local schools and teachers was another benefit of this project. The way the STEAM project was set up allowed for a great deal of collaboration between classroom teachers and teaching artists, a practice that both Matrix and SEMIS like to utilize wherever possible. This project also allowed for more communication between Matrix and school administrators, hopefully creating long-standing, mutually beneficial relationships.

The benefit to the community comes largely through the numbers of students who are now educated about their own local environmental systems in a much deeper way than they would have been otherwise. Through this program, students were able to learn about science in a deeply personal way, and are better prepared to make informed choices about the ways in which they interact with their ecosystems. Students who participated in the STEAM program also have had the benefit of learning through the arts, which provides them with ample opportunity to practice 21st Century skills such as creativity, collaboration, leadership, and innovation.

PROGRAM EVALUATION METHODOLOGY

The primary program goals included demonstration of teacher and student improvements. Instruments used to measure the improvements included teacher and student surveys, teacher interviews, and student performance, creativity and engagement rubrics. At least three instruments were used to measure improvement for each project.

A *pre-program teacher survey* was administered online to all teachers who attended a SEMIS meeting in fall 2012. This included the 5 teachers whose classrooms participated in the STEAM project, who were also SEMIS participants. A *post-program teacher survey* was administered online in the summer of 2013 after the conclusion of the STEAM programs. The surveys were anonymous and linked by coded information provided by the respondents. The teacher surveys included items to measure teacher sense of efficacy, theatre knowledge and skills, environmental literacy, and understanding of the cultural roots of environmental problems.

A *pre-program student survey* was administered in the classroom to students who participated in three of the programs prior to the beginning of the program. A *post-program student survey* was administered in the classroom after the program was concluded. Confidentiality was maintained by having the surveys linked by codes derived from cover sheets that were removed by the evaluator. The survey was completed by 47 students and included measures of sense of efficacy in using theatre tools and practices, classroom culture and self-confidence, and environmental literacy. The post-program student survey also included items to measure student satisfaction and impact.

Both the teacher and student surveys were designed collaboratively by the program team and the program evaluator. The items were selected from a variety of validated measures in the fields of environmental, place-based, and civic education as well as items developed by the team to capture some of the measures unique to this project.

Pre- and Post-program student performance and creativity rubrics were completed by the Teaching Artists (TA) at the end of the first week of the program and after the program was concluded. In four of the programs, the TA completed the rubrics for each of the 88 student participants in their programs. These rubrics included 20 performance measures and 12 measures of student creativity.

Classroom teachers in two programs completed *pre- and post-program rubrics assessing 20 measures of engagement*.

For all the pre- and post-program assessments in this analysis, a paired sample t-test was conducted. Significant pre/post changes are reported here for all differences that this test indicates have less than 5 percent probability of occurring by chance ($p < .05$).

The SEMIS Director conducted a *post-program structured telephone teacher interview* with each of the 5 teachers whose classrooms participated in the project. With permission, the interviews were audio-recorded. Confidentiality was maintained by the evaluator transcribing the recorded interviews without names before the audio recordings were destroyed. The interviews provided insight on how the program affected the teacher's sense of efficacy and how the program impacted their students.

PROGRAM EVALUATION RESULTS

When viewed overall, the data acquired from the assessment instruments provide compelling evidence that the arts infusion intervention changed knowledge, skills, and attitudes of both the teachers and

students who participated in the program. Pre- and post-program results from teacher and student surveys and performance quality, creativity, and student engagement assessments demonstrate significant changes in all of these areas. The post-program teacher interviews provide valuable insight into the nature and quality of some of the features of the program that they reported had significant impact.

Teacher improvements

Objectives to reflect teacher improvement included demonstrating: 1) improved sense of efficacy; 2) increased theatre skills and knowledge; 3) environmental literacy; and 4) improved understanding of the cultural roots of environmental problems.

Teachers indicated an increased sense of efficacy as a result of using theatre skills and knowledge they acquired to help students learn concepts in areas such as math and science. Moreover, the teachers reported increased environmental literacy they now feel more confident about using to help students gain environmental awareness through arts media such as theatre.

Improved sense of efficacy: Teacher survey results show significant improvement in confidence in their ability to engage students, teach important science or math concepts, and help students to exam connections related to environmental issues. The teachers' interviews support these results as they projected tremendous energy while relating examples of new teaching techniques they had learned. One teacher's comment about her planning is exemplary of these sentiments: "Now instead of using so much direct instruction, we're using more hands-on things. Not just in science. In ELA, in math, in everything.... That's a big difference!" Another teacher described how the teaching methods "...really opened my eyes about the possibilities of teaching kids big ideas. Teaching kids things that really, really matter.... It made it easier just having [program staff] in the classroom. The kids looked forward to them coming. It just made it fun. They had a thirst for knowledge!"

Increased theatre skills/knowledge: Teacher survey results indicate significant improvement in their ability use theatre arts to engage reluctant learners, create community awareness, and express ideas related to environmental stewardship. As one of many examples shared in the interviews, one teacher described her delight at learning all the ways she could use arts to teach science. "...you can do plays...monologs...skits.... (I couldn't) have realized that before!"

Improved environmental literacy: Teacher survey results show significant improvement in reported knowledge about environmental issues and ability to integrate science/math teaching with becoming better environmental stewards. In the interviews, all of the teachers described ways they had learned to use the arts to teach concepts such as climate change, cellular biology, and food security.

Improved understanding of the cultural roots of environmental problems: Teacher survey results demonstrate significant improvement in reported understanding of the cultural roots of environmental problems. This is particularly important since SEMIS is rooted in an EcoJustice approach to environmental and place-based education. This approach helps teachers and students to better understand and critically think about the inter-related root social and environmental causes of current problems.

Student improvements

Objectives for students included improvement in their: 1) use of specific theatre tools/practices; 2) skills in describing or sharing creative practices used in their projects; 3) classroom culture and self-confidence; and 4) environmental literacy.

Students indicated improvements in their use of theatre skills and creativity. This seemed to provide more positive classroom culture and student self-confidence as well as an increased appreciation of their community and relationship to their environment.

Improved environmental literacy: Student survey results demonstrate significant improvement in students' desire to learn more about nature, understanding of how humans can harm the environment and that nature must live in harmony, importance for them to do something to stop pollution and to keep the Earth for future generations. During the interviews, the teachers talked at length about how much students learned about their communities through the arts infusion. One of the most colorful examples involved a project which began with a community nature walk and culminated in a student-produced play with a backdrop they created from natural paints.

Improved classroom culture and self-confidence: Student survey results show significant improvement in student feelings that they can respectfully disagree with the teacher, that they are an important part of the class, they have a lot to be proud of, and that people understand them when they are talking. Teacher interviews strongly supported these sentiments. One teacher, for example, described in detail the change in classroom culture that was instilled by the program. She explained, "One of the most powerful things was really for me (because my particular class had very low energy)...in terms of being excited about their academics in any subject area. Getting them to participate in anything was really challenging. But in their work with the Teaching Artist, on the first day they had a level of enthusiasm we had not seen! Other teachers who actually stepped into the room for various reasons during the time that they were working with the TA were really surprised at the dynamic, [that is,] that the students were engaged and enthusiastic and creative!" Student comments also provided numerous examples of ways that they perceived their confidence was enhanced by the program (see below).

Improved use of theatre tools/practices: Teaching artists' assessments demonstrate significant improvement in all 12 measures of students' performance quality.

Skills in describing/sharing creative practices: Significant improvement in creativity is indicated for all 20 measures of creativity assessed by the teaching artists and all 12 measures of student engagement rated by the classroom teachers.

In the interviews, all of the teachers provided numerous examples of how students demonstrated creativity as a result of the program. Examples included emotionally-related stories of students who were painfully shy or disengaged who seemed to blossom with enthusiasm for these activities. One teacher described a performance by a student "who didn't even want to get up out of his chair.... I was just blown away!" "You were definitely touching kids who might not thrive in a more traditional assessment who were stars; they were just stars!"

Student narrative descriptions

In the open-ended section of the post-program student survey, students described their pride in accomplishments, pride in knowledge/skills acquired, gratification from working together and how much they enjoyed the activities.

Nearly half of the students who participated in the survey described their pride in what they accomplished in the final product. One middle-school girl described her pride in the class's performance and the skills they learned: "I was happy and proud of my classmates and myself for having the courage to stand up in front of a crowd and perform because all of us have never done that and it was something new." A younger girl wrote, "It made me proud when I was on the stage and knowing all the work we did turned out great."

One boy reflected many of the themes the students conveyed in their comments when he wrote, "What makes me happy about this is that we chose what we want to do and how we do it. Theatre arts work helps people open up to people and not be afraid and also have fun." Reflecting many of the comments the students made about working together toward creating a gratifying end-product, a middle-school boy said, "I am proud that we all worked as a team to create something amazing."

Students also indicated their appreciation for the knowledge they acquired about healthier eating. One student wrote, "We sent out a message when we were singing about good and healthy food." An elementary school student said that thanks to the STEAM program, "I know that I am learning how to take care of my body." One of the youngest students stated that as a result of the program, "I eat healthier now." She then drew a picture that she helpfully labelled "cucumber."

STEAM Program Summary

Program Theme	Host School	Grade	Artistic Product
Weather phenomena	Neinas Elementary, Detroit	4 th (2 classrooms)	Creation and performance of tableaux
Community life		2 nd /3 rd (special education classroom)	Writing and performance of a play
Food security	Nsoroma Institute, Detroit	7 th (1 classroom)	Writing and performance of choreopoem
Influence of scientists and Community connections	John Paul II Catholic School, Lincoln Park	7 th (1 classroom)	Writing and performance of plays
Food and the human body	Honey Creek Community School, Ann Arbor	4 th and 5 th (3 classrooms)	Creation and exhibit of a quilt