Promoting Cultural Inclusion on a School Campus: Research Results from a Pilot Program*

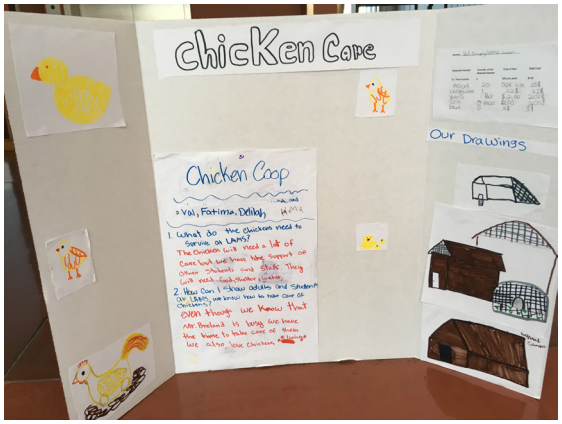
Victoria Derr[1], Kianni Ledezma[1], Raquel Hernandez[1], Cecilia Gutierrez[1], Julie Haws[2]
[1]Environmental Studies Program, CSUMB; [2]Los Arboles Middle School

California State University MONTEREY BAY

Abstract

Little research bridges culturally relevant knowledge about nature, participatory research with youth, and greenspace planning in an urban U.S context. Yet Arjun Appadurai (2004) has argued that it is within cultures that people are embedded and nurtured; when people sit within their own cultural processes for describing their present circumstances and their ideas for the future, they are building their own capacity to aspire to a better future. Through a Faculty Incentive Grant that was made possible by the University Corporation at Monterey Bay, we partnered with Los Arboles Middle School in Marina to conduct ethnobotanical research and create models of gardens that promote cultural inclusion and connection to nature in their school campus. We planned and led one-hour classes twice a week for three months. Lesson plans for these classes were developed to focus on ethnobotanical research and to encourage students to research their cultural background. Activities include a photovoice activity, creating Amate bark paintings, and conducting interviews with family members. The project took place from October to December of 2018 through an elective course. Pre- and Post- course surveys helped us learn about the project impacts. This report shares the evolution of students' thinking and what we learned about fostering a culturally inclusive approach to science education.

Our Approach to Youth Participation and Cultural Inclusion



Students advocated for chickens in the outdoor classroom, conducting research into their needs and requirements and building models for coop designs.

In 1988, Bruno Latour reflected on a shift from a "culture of science" to a "culture of research" (p. 208), in which society collectively experiments and learns. These principles extended to children in 1989, with the United Nations' adoption of the Convention on the Rights of the Child (CRC). The CRC deemed that children have a right to voice their opinions on decisions that shape their environments and to have these rights taken seriously (Hodgkin & Newell, 1998). Basic conditions for participatory projects that translate children's rights into action include that research projects create opportunities for the development of competence. Competence includes not only the development of knowledge, but also the ability to develop and practice skills for influencing decisions and physical environments. These frameworks have created a theoretical and practical approach to engaging young people that guides much international research and action today. Latour's (1988) ideas of a "culture of research" have more recently been incorporated into community views that experimental processes can lead to effective collaboration and change (Evans, Karvonen, & Raven, 2016). When a "culture of research" is integrated with frameworks for participatory action, youth can be empowered to guide their own learning, thus showing more investment and engagement.

As a discipline, ethnobotany seeks to understand the traditional knowledge and customs people have for plants, including for medicines, foods, religion, or other cultural practices. We drew from the ideas of ethnobotany as a means to engage students in thinking about plants, and we sought methods that would get students to think about the plants that are part of their lives, and a part of their families' cultural practices. We were interested in whether an ethnobotanical approach would increase students engagement or interest in science and their school grounds. We saw the merging of ethnobotany principles with frameworks for participation as a potential means to create a culture of inclusion in thinking about Los Arboles' greenspaces and outdoor classroom.

*This project was supported with funding from a Faculty Incentive Grant from the University Corporation at Monterey Bay

Methods

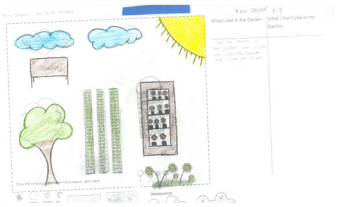
Overview

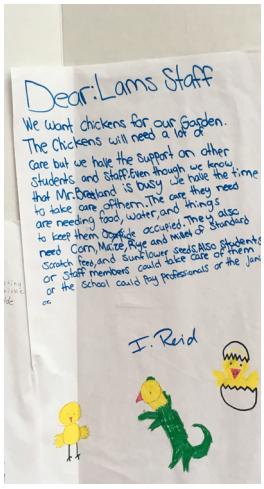
A total of 31 students enrolled in the elective course for this project. Some of these students had inconsistent attendance. Twenty four students participated in all activities and the pre- and post-course assessments. Of these, 20 of 24 students came from economically disadvantaged backgrounds. Eleven were English Only students, and the remainder were English learners or other designation that English is a second language. Twelve students were Hispanic, four were white/Caucasian, and two each were Asian, African American, Filipino, Pacific Islander, or two or more races. Correspondingly, other languages spoken by students included Punjabi, Spanish, Tagalog, Tongan, and Vietnamese. Six students had identified disabilities with educational support plans and seven had behavioral support plans.

CSUMB students worked with Julie Haws and two student teachers to carry out a range of activities. CSUMB students led activities on the days they were present; Ms. Haws completed most of the activities in the class periods between visits. Activities included:

- Photovoice and a walking tour (photo, below left)
- Student-led interviews with family and friends
- Amate bark paintings (photo, below middle left)
- A guest speaker from Marina Tree and Garden Club who presented culinary herbs
- A landscape drawing and visioning exercise (photo, below middle right)
- Foods and cooking from around the world

After the landscape visioning, middle school students voted for the projects they wanted to work on. They voted for building a chicken coop and a rose garden. They built 3D models of possible chicken coops, wrote advocacy letters (photo, below right), and planted primroses in their garden.





Photovoice

Photovoice is a method that is used to engage people in observing and commenting on their own environments and experiences. We used photovoice as a method that involved taking students on a walking tour around the Los Arboles campus and let them take pictures with frames that represented aspects of their physical environment they liked (green frames) and didn't like (red frames), with an emphasis on getting them to notice the plants in their environment.

This occurred on the first two days of class. Students walked around their campus for about 20 minutes on both days, taking pictures and writing down why they liked or didn't like the aspects in their pictures. Students then printed their pictures and glued them onto group posters where they wrote more detailed notes as to what they took pictures of and why they took them. They hung their posters on their classroom walls, did a gallery walk, and discussed what they saw in the other group posters that were similar to and different from their own posters.

"I like the smell, and the bees. I like what I observed because it is pretty, bright colors and the smell. It makes me feel happy because of the bright colors."

"I like the flower. Why because the flower is bright and wonderful. It make me want to enjoy my self in life."

"I like the California popples because they are light of the area. When I see this, I feel happy and bright."

"I like this plant because it's very colorful and has very nice movment and represents our school it makes feel good because were doing good on growing."

"I like the green and pink plants. I like the shape of the green plants and the innocent color of the pink flowers. When I see this I think of summer and winter at the same time.

Interviews and Amate Bark Paintings

We asked students to interview a family member who had some knowledge of or interest in plants. The purpose of the activity was for students to access "funds of knowledge" (Bouillion & Gomez, 2001) from their own families or friends and to become familar with plant names, their uses, and the importance of them in their culture.

To prepare students for interviews, we provided some training in interviewing and had students conduct practice interviews with each other. Students were given a list of questions that were split into three sections: background information on the person being interviewed, cultural knowledge of plants (food, medicinal, spiritual), and if they were to have a garden in Marina, what they would have in it.

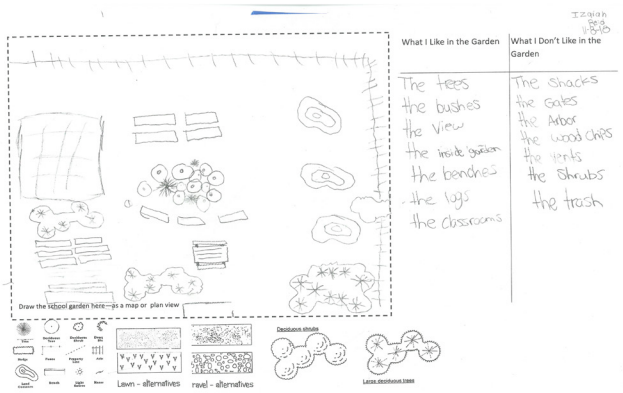
After students conducted the interview, we reviewed how the interviews went and asked volunteers to share their experiences when conducting interviews. We explained that Amate bark paintings are a particular type of painting from precontact times in Mexico and reviewed some of the features of this painting style. We then asked students to make their own Amate bark paintings, drawing from their interviews or their own cultural interests. Students began with sketching and then painted their pictures. They wrote up short summaries of their paintings and interviews together and displayed these in the classroom.

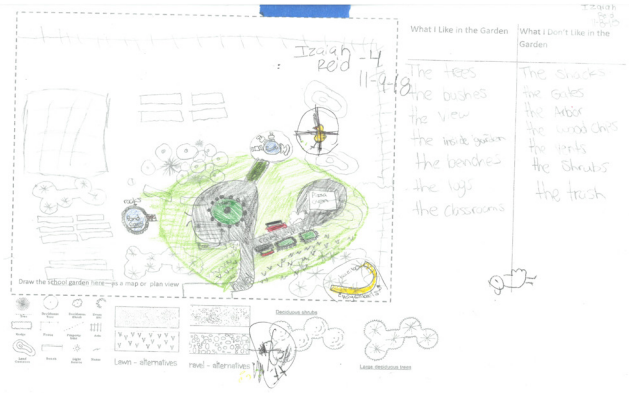
Marina Tree & Garden Club

We invited a representative from the Marina Tree and Garden Club to one of the class sessions to incorporate more plant education into our project. Juli Hofmann brought herbs from her own garden and had different types of species of plants on each table for the students. Throughout her lesson she passed around plants and discussed how they can be used in the kitchen. The students were also asked to bring in their own herbs from home. Many of the students could relate to the herbs because they used them in their own cooking at home.

Landscape Drawings

The purpose of the landscape drawing activity was to have students develop an awareness of their outdoor classroom and the connection they have with how they can shape their environment. We gave a lesson on how to draw from a bird's eye view and the difference between deciduous and evergreen plants. Students were taken to the outdoor classroom and were given a worksheet that asked them to draw the outdoor classroom as it currently exists and to write down what they liked and disliked about the outdoor classroom currently. The next day, we taped tracing paper onto their garden plans and asked them to draw what they wanted to see in their outdoor classroom on the trace paper. Once they finished, we were able to see what students wanted in the outdoor classroom such as ponds, more garden beds with plants, more trees, and chicken coops. The trace paper could be flipped over and let us see the original outdoor classroom drawing underneath it.





A sample landscape drawing of the outdoor classroom: existing classroom (left) and as the student envisioned it (right).

Methods

Planning their Visions

Building on the landscape drawing activity, students were asked to think about the possibilities for the outdoor classroom and what they would most want to see come to fruition. Students made proposals with small groups and presented them to the class. As a class, we collected all project ideas, and then students voted with sticky dots for the change they most wanted to see in the outdoor classroom. The initial topics of interest included:

- A pizza oven
- Planting more vegetables and fruits
- A sink to be able to wash their hands and vegetables
- A rose garden
- A Chicken coop

Primroses planted by the rose group

When students voted, they overwhelmingly chose the chicken coop, with a small group of students choosing to focus on the rose garden. As a result, students worked in five groups: four that made proposals for chicken coops and one that made a proposal for a rose garden. Students researched the requirements for their project, made proposals and letters to the principal, and built three dimensional models and posters.

The second to last week we were at LAMS, we purchased about 20 primrose plants for the Rose group to plant in the outdoor classroom. The CSUMB students gave the students a demonstration on how to properly transplant and then let the students try it on their own, helping them out when they needed it. Because they enjoyed planting so much, we also transplanted larger plants that were already in their outdoor classroom.

Foods from Around the World

Students took an interest in cooking based on the presentation from the Marina Tree and Garden Club; therefore, for our last week at LAMS, we decided to make a series of PowerPoint presentations of different countries and the plants they use and in what way the plants are used, followed by a cooking activity. We presented on places in South America, Asia, North America, Europe and Africa. We also tried to choose places that represented some of the students' own family heritage, including Mexico, Romania, and the Philippines.

When the presentation was over, we split the class in half. Half of the class made guacamole and the other half made mango salsa. We picked simple recipes and chopped all the fruits and vegetables beforehand to save us time and to reduce safety risks. We allowed the students to take turns adding and mixing ingredients so that they felt like they were a part of making these recipes. Once the recipes were completed students passed around plates and chips so that they could enjoy what they had just made and each group was able to share their recipes with each other.

Art Night

Los Arboles Middle School had an Art Night where parents and students could see the work they did over the quarter. The students in our research presented their photovoice posters, Amate bark paintings and interviews, and their project proposals, including posters and 3D models.

Results

Overview

The research we carried out at Los Arboles Middle School brought about very different results from the results we were expecting.

- We had a class with a very high number of English learners and students with learning and behavioral differences. While the methods we chose were designed to engage a range of students, include English learners, we found that some of the students, particularly those with learning or behavioral differences, did not engage much, and this affected the overall feel of the course. Our over-riding feeling was that it was hard to get students to engage and interact.

- While we did not see much change in student engagement or interest in learning over the semester, students were most engaged with landscape drawing, chicken coop planning and research, planting, and cooking. The rose garden group was fairly consistently engaged across time. The students who voted for the rose garden enjoyed planting primroses and wanted us to come back the following semester.

Students voted to have a chicken coop in their outdoor classroom, which is far from what we were trying to connect them with, which were plants. However, we made the decision to let the students pursue this interest rather than forcing them to conceive of a project based on ethnobotany or plants. In so doing, students showed a high level of engagement in researching requirements for chicken coops and building their models. This demonstrates that students will invest their efforts and creativity into something they care about:

- Students wrote professional letters to their principal to ask for permission to have a chicken coop
- Students researched how to take care of chickens
- Students built 3D models of different chicken coops and made posters for them, reflecting the research they had done
- Parents volunteered to help build the chicken coop, with plans for this to be constructed in the summer.

Project Assessment

We issued a pre- and post-project survey to students that included three Likert-scale question items. The Likert scale questions asked students to rate their interest in the following on a scale of 1 (not at all true) to 5 (always true): i) I am curious about the world around me; ii) I am interested in learning about science; and iii) I feel science is connected to me and my life. The post-test also asked the students to rate (on a scale of 1-5) how the project impacted the following:

- Learning more about science
- Feeling my culture is relevant to science
- Being able to make a difference at my school
- Being able to make a difference in my community
- Thinking that my voice and perspectives mattered
- Working to make my environment better
- Someday pursuing a degree in a university

Students were also asked to list the activities that they most enjoyed and what they liked about them. We analyzed each Likert scale response by calculating overall mean scores. The mean scores were all approximately 3.0, with a standard deviation of approximately 1.0. In actuality, student scores were variable, with some students rating their interest as very low (1 out of 1), and some rating it very high (5 out of 5). We therefore chose to look at data as a series of profiles of students, in which low interest students scores and qualitative responses are grouped and analyzed together, as well as students with average, and high interests being grouped and analyzed.

Results

Project Assessment (Continued)

Low Interest Students. Low interest students were defined as those who scored a 1 or 2 on their curiosity and interest in science on their pre-test. There were a total of four students in this group. Of these students, half showed an increase in their curiosity and interest in science; however, half showed a decrease in the extent that they saw science as connected to their life (Figure 1).

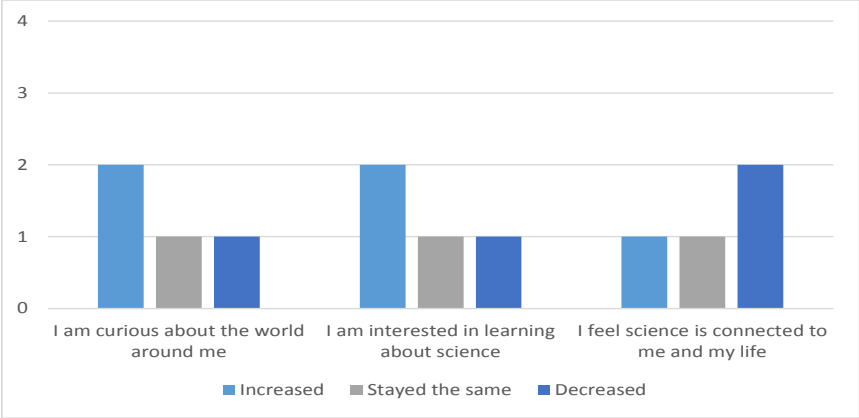


Figure 1. Low interest students responses to pre- and post-project questions

For the post-project influence questions, this group showed the highest responses to feeling that they were interested in making their local environment better (3.0), that they were able to make a difference in their community (average of 3.5), and someday pursuing a university degree (average of 4.0). All other responses ranged from 2 to 2.5 (Table 1). The qualitative question about what students enjoyed most about this project show a diversity of perspectives. Two students wrote comments such as, "none cause i aint care." However, the other two provided comments that: "I really liked the chicken coop because it came out nice," and "paints because is so fun for me. . . it feels me happy."

Moderate Interest Students. These were defined as those who scored a 3 on their curiosity and interest in science on their pre-test. There were a total of four students in this group. Of these students, half showed an increase in their curiosity and feeling that science is connected to their life; however, 75% showed a decrease in the extent that they were interested in learning about science (Figure 2).

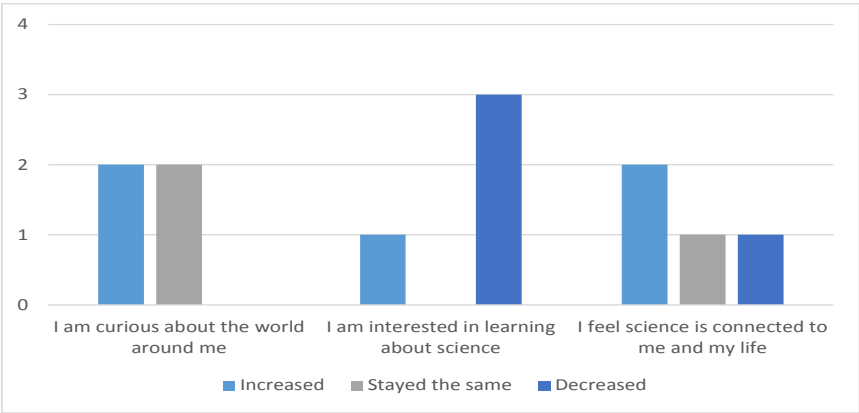


Figure 2. Moderate interest students responses to pre- and post-project questions

For the post-project influence questions, 100% of this group responded with a 3.0 to the project influencing their interest in learning about science, and the project influencing their interest in pursuing a university career. They responded with a mean score of 3.25 to feeling their voice and perspective matter. They responded with a mean score of 3.5 to the project influencing their ability to make a difference in their school, being able to make a difference in their community, and working to make their local environment better. The lowest mean response was a 2.75, to feeling their culture was relevant to science. However, this score was brought down by one student, with three of the four students rating this a 3.0 (Table 1).

Results

Project Asssessment (Continued)

For the qualitative assessment, moderate interest students responded that:

- The project was "very nice and awesome."
- "Paint the vegetables I live with and interviewing my parents."
- "Eating" and
- "Helping nature."

High Interest Students. These were defined as those who scored a 4 or 5 on their curiosity and interest in science on their pre-test. There were a total of 13 students in this group. At the start of the project, this group had an average score of 4.5 in curiosity, 3.7 in science interest, and 3.8 in feeling science is connected to their lives. After the project, each of these scores went down overall, to 4.1 in curiosity, 3.2 in science interest, and 3.3 in connected to science. Figure 3 shows that for interest in learning about science and science connections, one or two students showed an increase, seven stayed the same, and four or five students scores actually decreased. For curiosity, this trend is higher, with six students saying they are less curious about the world around them (Figure 3).

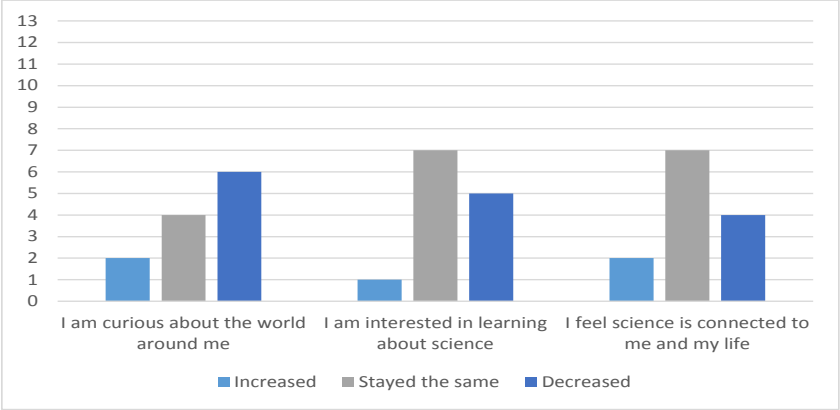


Figure 3. high interest students responses to pre- and post-project questions

For the post-project influence questions, student responses in this group were an average of 3.16 to 3.6 overall. One student scored all aspects of the project a 2, and wrote somewhat negative comments in the initial assessment, despite scoring his or her interest initially as a 4. When this student was omitted from analysis, means went up to 3.25 5o 3.75. This group rated the project as most influencing their ability to make a difference at their school (3.5 or 3.67), make a difference in their community (3.6 or 3.75), and thinking that their voice and perspectives matter (3.6 or 3.75) (Table 1).

For the qualitative assessment, three students said their favorite part was making and eating food. Three students also said that their favorite part was working on the chicken coops. Two students liked working on the rose gardens. Three students also said that they liked the art projects and making things with plants.

Table 1. Student ratings of project influences (mean scores of Likert scale questions, with 1 being no influence and 5 being very high influence)

	Learning more about science	Feeling my culture is relevant to science	Being able to make a dfference at my school	Being able to make a difference in my community	Thinking that my voice and perspective matter	Working to make my local environment better	Someday pursuing a university degree
Low Interest	2.5	2.5	2.3	3.5	2.0	3.0	4.0
Moderate Interest	3.0	2.8	3.3	3.5	3.3	3.5	3.0
High Interest	3.3	3.2	3.3	3.6	3.6	3.4	3.5

Discussion

Project Reflections

The research we carried out at Los Arboles Middle School brought about very different results from the results we were expecting. We had a class with a very high number of English learners and students with learning and behavioral differences. Some of the more challenging students behaviorally were likely the "low interest" students, and these results should be read with an understanding that other factors are likely impacting their engagement. However, these students showed the strongest belief (of the three groups), that the project influenced their interest in obtaining a university degree (Table 1). It could be that exposure to CSUMB students in general had a postive effect.

For the "moderate interest" students, in general, the project seemed to have a positive effect, with many comments that students made to reflect these outcomes and an increase in students thinking that science was connected to "me and my life." However, overall, the students interest in science was lower during the time of this project.

Similarly, for the "high interest" students, the project influenced student beliefs that students voices mattered and that they could make a difference in their community in school. However, it was disappointing to see the number of students in this cohort whose scores decreased in curiosity, interest in science, and feeling that science is connected to themselves. There are a number of possible factors for this decline. Some students thought the class was a "cooking" class and may have been disappointed that there was not more cooking overall. Some students may not have liked the structure of the class, with CSUMB only coming in a couple of days a week, and the rest seeming like "school" work rather than a "fun" elective. And, consistent with research related to middle school science, boys, and plants, these students may reflect findings of other research that plants are not of great interest at this age (Frisch, Unwin, & Saunders, 2010). Students who said they were very interested in plants in the beginning of the semester, may be interested in other aspects of science that were not a part of the course. Finally, it is possible that students who enjoyed the art, cooking, and chicken coops may have decided that they liked these activities best and therefore were not interested in some preconceived notion of "science."

Collectively, students in this class felt that the project influenced their ability to make a difference in their community, with means of 3.5 or 3.6 across groups (Table 1). The moderate and high interest groups also felt that the project helped them be able to make a difference at school (means of 3.5), working to make their local environments better (means of 3.4 or 3.5), and working to make the local environment better (means of 3.4 or 3.5) (Table 1). These are beneficial outcomes in that while the project did not impact a direct, or necessarily positive, change in students' interest in science, they were directly using science to achieve making their school a better place. Future projects might make this connection more explicit with the students.

It was disappointing that while one of our goals was to find culturally relevant ways of engaging students in science, this was consistently scored among the lowest impacts of the project among all cohort groups. This could be because some of the activities were from Latin American culture, and not from all students' own cultures. At the end of the project, when reviewing with students the aspects of the project that they liked the most, we had a realization that if we had flipped the order of the projects, starting with cooking from diverse cultures, then moving into more research with family and school, we might have had different results when it came time for students to reenvision the outdoor classroom. Cooking seemed to be the easiest point of entry to talking about plants, and may have had students of all cultures feel connected, if they learned about foods from their own family's heritage.

Our partner teacher, who has a long history of teaching, also emphasized what a challenging group of students this particular class was, and that this could have been a factor in the experience and assessment results. We also felt that having a higher teacher-to-student ratio would have been helpful, particularly for a class with many students who required specific accommodations.

We were surprised when students voted to have a chicken coop in their outdoor classroom, because this was not connected to the plants we sought to connect them with. The idea for the chicken coop emerged from a very small aspect of a model garden photograph on the landscape drawing day, and it spread like wildfire. However, in our own leadership discussions about whether to support students in their interest in chicken coops or whether to push them toward more plant-oriented projects, we ultimately decided that what was most important was allowing student voice and interest in science more generally, so we let them move forward with it. Students in the chicken coop groups were very engaged in this aspect of the project, including writing professional letters to their principal to ask for permission to have a chicken coop; researching how to care for chickens and the cost of maintenance; building creative three dimensional models out of repurposed materials; and making creative posters to advocate for chickens at the school. At the Art Night, parents volunteered to help buiid the chicken coop, and there are plans for this to be constructed this summer.

Discussion

Project Reflections (Continued)

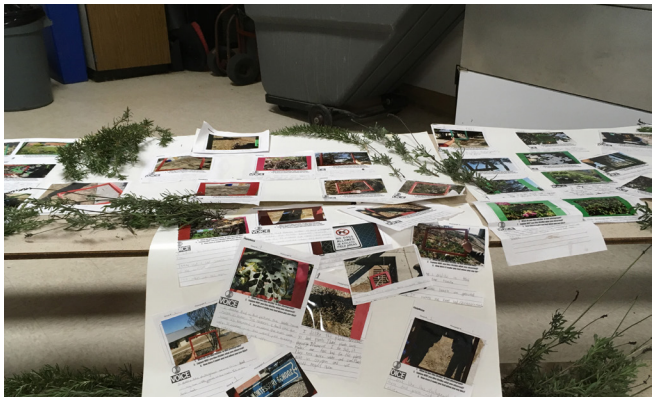
While student responses to assessment questions were not all as positive as we would have hoped, there were successes along the way in this project, and particularly aspects that we would do again or emphasize more. These include integrating more art projects and drawing into the lessons because students really enjoyed having the freedom to be creative and express themselves. This is supported by a range of studies that have used art-based education for creating more inclusive classrooms (Coemans & Hannes, 2017).

In the context of science education, while we know that "place matters," few direct models demonstrate connections between culture, sense of place, and science learning (Lim & Calabrese Barton, 2006). "Instructional bridges" between the culture of sciences and students' home cultures (Calabrese Barton, 2002; Lee & Fradd, 1998), "funds of knowledge" (Bouillion & Gomez, 2001), and social and cultural capital (Monkman et al., 2005) are some suggested means to achieve direct connections between culture, place, and science learning. We did not find this to be consistently true in our project. As noted, this may be because the links between students' diverse cultures and the specific curricular examples or activities were not directly enough tied together, or because we did not make explicit links between talking about culture and culturally relevant science.

Studies of place-based education have found that while lower performing students and English learner students benefit from place-based education, higher performing students actually benefit the most (Smith & Sobel, 2010). This is consistent with our findings in that students in the "low interest" group showed some gains, particularly in thinking the could make a difference in their community and that they had interest in attending university while the "high interest" group showed more gains in making a difference in community, school, local environment, and feeling their voice mattered.

Image Gallery

Amate Bark Paintings: Top left: An early seed for the rose garden. Top middle: "My dad talked about his country and where he was born. The plants he talked about came from the farm and the garden. He used them for food to survive." Top right: "My dad and I talked about sunflowers, seeds, lemons, oranges, epazote, mint, and ice plants. They are in the backyard in the garden. I use them for medicine and to cook. I added trees and sun and a rainbow." Far left, below: "My parents talked about the fields where they work. They pick berries. Strawberries and raspberries."



At the art night, all the students work was displayed. The Amate bark paintings were hung along the wall (left), and the photovoice posters were displayed along tables (right).

Literature Cited

Appadurai, A. (2004). The capacity to aspire. V. Rao & M. Walton (Eds.), *Culture and Public Action*, 59-84. Stanford, CA: Stanford University Press.

Bouillion, L. & Gomez, L. (2001). Connecting school and community with science learning: Real world problems and school-community partnerships as contextual scaffolds. *Journal of Research in Science Teaching 38*: 878–898.

Calabrese Barton, A. (2002). Urban science education studies: A commitment to equity, social justice, and a sense of place. *Studies in Science Education 38*: 1–38.

Coemans, S., & Hannes, K. (2017). Researchers under the spell of the arts: two decades of using arts-based methods in community-based inquiry with vulnerable populations. *Educational Research Review 22*, 34-49.

Evans, J., Karvonen, A., & Raven, R. (2016). The experimental city: New modes and prospects of urban transformation. *The Experimental City*, 1-12. Abingdon: Routledge.

Frisch, J. K., Unwin, M. M., Saunders, G. W. (2010). Name that plant! Overcoming plant blindness and developing a sense of place using science and environmental education. In A. M. Bodzin et al. (Eds.), *The Inclusion of Environmental Education in Science Teacher Education*, 143-157. Springer Science+Business.

Hodgkin, R., & Newell, P. (1998). Implementation handbook on the Convention on the Rights of the Child. Nairobi: UNICEF.

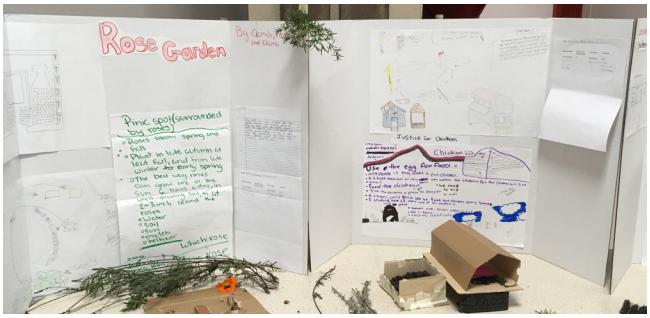
Latour, B. (1998). From the world of science to the world of research? *Science, 280*(5361), 208-209.

Lee, O. and Fradd, S.H. (1998). Science for all, including students from non-English language backgrounds. *Educational Researcher 27*(4): 12–21.

Lim, M., & A. Calabrese Barton. (2006). Science learning and sense of place in an urban middle school. *Cultural Studies of Science Education 1*: 107–142.

Monkman, K., Ronald, M. and Theramene, F. (2005). Social and cultural capital in an urban Latino school community. *Urban Education 40*(1): 4–33.

Smith, G., & Sobel, D. (2010). *Place- and Community-Based Education in Schools*. New York: Routeldge Press.



Rose garden and chicken coop proposals (left). In the post-project drawings, one student from the rose group drew a happy person tending roses (right). Many of the drawings showed herbs or plants that the students had learned about or eaten during the class.