

**Bridges and the City: An interdisciplinary history, science,
math, art, literature and writing project**

As her group prepared their end-of-summer museum exhibit, Chelsea, age 8, used a metaphor to explain what they were studying. "We are learning about the 'Big Apple' because it is the 100th anniversary of New York City. The boroughs of New York got married 100 years ago."

Chelsea attends the summer and after-school program of the Morris L. Eisenstein Learning Center, a day care and after-school program in Brooklyn, New York. Each summer, group activities in the Learning Center are organized around a centerwide theme. In 1998, the theme was precipitated by the one hundredth anniversary of the merger of the twin cities of New York and Brooklyn into a new, consolidated New York City. The summer program ended with the creation of a school museum that included an eight foot-long, seven-foot tall, suspension bridge that the children could walk across.

Each group in the Learning Center contributed an exhibit to the museum, which was set up in a large all-purpose community room. Along one wall, a large sign announced, "I Live in the City." Using cardboard, clay and various props, the five-year-olds created an exhibit of landmarks in Brooklyn, including the "Big Clock" and the Brooklyn Academy of Music. The three-year-olds attached drawings of themselves to paper cutouts of their houses which were mounted on a map of Brooklyn. Along other walls were exhibits about, "Brooklyn, then and now," and "East New York, then and now." The Bronx Zoo was constructed out of plastic building blocks. As her class toured the museum, a teacher of a three year old group asked her children, "What is this? Who lives here?" Children shouted out, "Animals! Monkeys! It's the zoo!"

The children in the oldest group, seven-to-twelve-year-old boys and girls, constructed a cardboard and paper model of New York City and its bridges. Katrina

and Keith, both age 9, proudly showed off model bridges they made out of milk cartons, cardboard, and wool yarn. Keith told spectators that the roadways in their model bridges were held up by the yarn, but in the real bridges, "wire holds up the road." Anthony, age 9, added, "That's what makes them suspension bridges."

At the center of the museum was an eight foot long replica of the Brooklyn Bridge. The actual bridge, completed in 1883, is a suspension bridge that spans the East River separating Manhattan Island and Long Island in New York harbor. Since the original New York City was located on Manhattan Island and Brooklyn is located on Long Island, the bridge played a major role in creating one city out of two. Building the replica of the Brooklyn Bridge was the culmination of a multi-step interdisciplinary process that involved children between the ages of seven and twelve in science, history, math, art, poetry and writing.

The multiage groups began the project by reading a children's book, *The Brooklyn Bridge*, by Elizabeth Mann (1996). After writing short reports about the history of New York City and its bridges, the children and their teachers went on a trip to a promenade overlooking New York harbor and walked across the Brooklyn Bridge. From the promenade, several children were able to identify the bridge, the Statue of Liberty, Ellis Island, and the Manhattan skyline. They drew sketches of the bridge, and they listened to their teacher read the poem, "The New Colossus," written in 1883 by Emma Lazarus (Ravitch, 1990). The children expressed surprise that Lazarus referred to the Statue of Liberty, now dwarfed by the World Trade Center and other skyscrapers, as a colossus. Lazarus also describes how the Statue of Liberty commands the "air-bridged harbor that twin cities frame." The teacher explained that the twin cities were New York and Brooklyn before they merged.

As they slowly walked across the bridge, teachers encouraged the children to pause, look, ask questions, and "describe the things you see." Some of the younger children were nervous on the bridge and worried it would fall down. A group of the

older children and the teachers took their hands, and they all began to jump up and down to test the bridge's strength. When the tension was eased, and the children were laughing, the children and their teachers discussed what made it a suspension bridge. When the teachers asked, "What holds the bridge up?", most of the children pointed towards the twin giant granite towers which stand near the opposing shores. Though they had read about suspension bridges, it was difficult to convince them that the roadway actually hangs from the four woven steel cables draped across the towers and the network of wires that attach the road and cables. During the walk a teacher asked, "Is there anyway to test what holds up a suspension bridge?" The children were uncertain. Finally they decided to build their own suspension bridges to see if the idea really works.

From the Brooklyn Bridge, the children could see the Williamsburg Bridge (opened in 1903) and the Manhattan Bridge (opened in 1905) slightly upriver. Their teachers explained how these bridges were built decades after the Brooklyn Bridge when steel production had expanded and new technology was available. As a result, these bridges have steel towers and can carry greater weight. The children saw that subway trains ran across these bridges but not on the Brooklyn Bridge.

When they returned to the Learning Center, the children discussed what they had learned and mapped out the activities for the next few days. They touched up and painted their sketches, wrote stories and poems about the history of New York City, and worked in teams to design and build model suspension bridges. The model bridges were constructed using half gallon milk and juice containers for the towers, pieces of manilla folder for the roadway, and wool for the cables and wires. The sketches, paintings and models were all exhibited at the end-of-summer museum.

When their models were complete, the children met with a community volunteer who is an amateur carpenter. Ten of the girls and boys volunteered to help him design and construct a suspension bridge that they could walk across. They used their

pictures of the Brooklyn Bridge and their model suspension bridges to help figure out the materials needed to build a suspension bridge. They decided to use wood for the towers, plywood for the roadbed, polyethylene (plastic) rope for the cables and wires, and nails, screws, and eyebolts to hold everything together. They measured and helped cut the wood, and they assembled and painted the bridge.

While they worked, the team, and children who watched them, speculated on whether their bridge was strong enough to hold them. They discussed if they should "test it with a big weight" or "have one of the littler kids walk across first." They decided that "for safety," they would use the weight, and if the bridge held up, bigger and bigger kids, "but no teachers," could try walking across.

As the children worked on the bridge, their conversation and behavior showed their sense of ownership of the construction project. Demitrus, age 11, who was responsible for much of the measuring, explained to other children that it was "an eight-foot long suspension bridge and the ropes hold up the roadway. The quarter inch plywood road is two-feet wide and the distance between the towers is 55 inches." Christopher, age 12, who had some previous experience with carpentry, was a leader on the construction project, helping the younger children hold the electric drill and saw, attach nuts and bolts, and hammer in the nails. According to Chris, "I like working with wood and building things and showing the other kids which tools are right to use."

Yvette, one of the group teachers, felt that the entire project was very successful. "The kids learned how the bridge was built from a book before our trip, but when they walked across, they could actually see the cables that held the roadway up." She explained that "the bridge project brings all the different subjects we study together. The children discussed the history of the bridge and the city, why we needed the bridge, the problems engineers and architects faced designing and building a bridge that would support all the weight, and what it was like to be a worker on the bridge.

The children loved to work with the tools and wood, but the most important part was that they had to learn to plan ahead and to work together."

As visitors came in to tour the museum, the older children were happy to identify their handiwork. They pointed out the Brooklyn, Manhattan and Williamsburg bridges in their model of New York City, and they talked about how they had worked together to build the larger wooden bridge. The younger children were excited about walking across the wooden bridge, and they ran from one end to the other to cross it again and again, until their teachers explained that they were "jumping in the East River and getting all wet." As you can see from the photographs, the Learning Center version of the Brooklyn-to-Manhattan suspension bridge really worked!

While every class may not be able to build a suspension bridge that children can walk across, we believe this project offers ideas for developing thematic, interdisciplinary, multiage school projects that can be implemented in other settings (see appendix: Exploring the Relationship between History, Geography and Technology). The children made and tested hypotheses through each stage of the project. They gained social and academic skills in the process of doing research, writing, making a site visit, drawing the bridge, and making cardboard models of suspension bridges. Of primary significance was their ability to read and write about an historical event, and then visit the actual site. Finally, they established a sense of ownership over their learning as they helped to plan and set up the museum displays.

Maxine Greene (Greene, 1993), an educational philosopher, describes the importance of metaphors like the one cited at the beginning of the article, which Chelsea used to explain the 100th anniversary of New York City. Greene believes that the formulation of metaphors plays an essential role in the creation of meaning by all human beings. For the children at the Learning Center, the Brooklyn Bridge in all its manifestations, in the books they read, in real life, in their pictures and

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models, and in their suspension bridge, became a metaphor for continuity and change over time. It represented the birth of their city and their own ability to be creative learners.

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Exploring the Relationship between History, Geography and Technology

Even if they don't have the Brooklyn Bridge in their neighborhood, teachers can use interdisciplinary projects to help elementary school children discover the relationship between technology, history and geography. Since ancient times bridges (Corbett, 1978) have been constructed using different designs because of the variety of geographical conditions and the availability of technology and materials. There are bridges made of rope, wood, rock, bricks, and concrete and steel. Modern suspension bridges like the Verrazzano-Narrows in New York harbor and Golden Gate in San Francisco Bay span large open spaces. Arch bridges generally span shorter distances. Often an arch bridge consists of a series of connected arches that stand on a row of natural or human made islands. Very long bridges like the Chesapeake Bay Bridge in Maryland are actually a series of different types of bridges attached to each other. Children can study ancient Roman arches and learn how this technological discovery made possible the construction of aqueducts, buildings and bridges. They can search for examples in their communities and build miniature keystone arches.

Just as bridges allow roads to cross rivers, canals make it possible for rivers to cross dry land. The construction of canals in the nineteenth century created a vast transportation network across the eastern United States. The remnants of famous canal systems have been turned into parks in New York, New Jersey, Pennsylvania, and along the Potomac River in Washington DC and Maryland. Classes can visit the canals, study how they transformed society, and construct models of locks used to raise and lower boats along the canals. Similar interdisciplinary units can focus on the idea of crossroads or the way towns grew up along railroad lines.

The New Colossus

by Emma Lazarus

Not like the brazen giant of Greek fame,
With conquering limbs astride from land to land;
Here at our sea-washed, sunset gates shall stand
A mighty woman with a torch, whose flame
Is the imprisoned lightning, and her name
Mother of Exiles. From her beacon-hand
Glow world-wide welcome; her mild eyes command
The air-bridged harbor that twin cities frame.

"Keep, ancient lands, your storied pomp!" cries she
With silent lips. "Give me your tired, your poor,
Your huddled masses yearning to breathe free,
The wretched refuse of your teeming shore.
Send these, the homeless, tempest-tost to me,
I lift my lamp beside the golden door!"

Color Pictures (please return photos):

- 1- Children from the MLE Learning Center visit the Brooklyn Bridge.
- 2- Inspecting Brooklyn Bridge cable.
- 3- Children's paintings of the Brooklyn Bridge. Some paintings are remarkably accurate (middle row, left). Others are more symbolic representations of bridges.
- 4- Milk container suspension bridges and a cardboard New York City.
- 5- Children construct a model Brooklyn Bridge out of wood and rope.
- 6- Children with New York City display.
- 7- Children with their scale model of New York City and the Brooklyn and Manhattan bridges.
- 8- Learning to use an electric drill.
- 9- Standing on their model Brooklyn Bridge.

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**Bridges and the City:
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history, math, art, literature and
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