



Curriculum Units by Fellows of the Yale-New Haven Teachers Institute
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Fair Haven Community and the Grand Avenue Bridge

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Opening Statement

Mathematics is a continuously difficult subject for so many high school students. Therefore, teaching and working with students who have had little success in high school, especially in mathematics, has been one of my specialties. Students bring with them a high level of math anxiety because of their lack of confidence in themselves. Learning is essentially a passive process for many students that offers them little opportunity to take responsible action. Because of poor attendance and many other factors, students operate with limited math skills. Many of the students can barely function in a traditional classroom setting and even more are lost in a large school setting. Therefore some give up hope of completing the challenge of an education. For many students completing anything is a challenge due to lack of self-esteem, self-motivation, and self-confidence.

To heighten the interest in mathematics this unit, will focus on bridges in the students' own neighborhood. There are many bridges which they will view and discuss as they prepare for the study of the Grand Avenue Bridge and The Fair Haven Community. Students will identify bridges in the Fair Haven Community as links to other neighborhoods, jobs, and schools. Students will investigate the query, "Does the functioning of a bridge affect me and how"? "How dependent on bridges is the socio-economic status of neighborhoods?" This hands-on unit will be an important lesson for students to understand. It will continue to link everyday math to real-life problem solving, and math can begin to "make sense" for students.

The unit is divided into several parts. The first part is the study of various maps of Fair Haven that can be obtained from the Planning and Zoning office for the city of New Haven. These maps will be instrumental in giving students a clear picture of the history, leading up to the present. Studying maps will fill the room with curiosity leading the way for a walking tour of Fair Haven, centered around the Grand Avenue Bridge. A scavenger hunt will be interwoven throughout the walking tour.

Theme

Mathematics is becoming more and more of a challenge to teach. Teachers are always looking for innovative ways to make mathematics challenging, engaging, effective, appreciated, and fun. The study of the Grand Avenue Bridge alone has so much excitement to offer, being a movable truss bridge that has now been preserved as a historical bridge, along with the community involvement from its first inception. The formulas used for construction of a particular design include geometry of frame, forces/fractions, slopes/angles and torque of rotation. There are many mathematical learning components of bridges: fractions, ratio-proportions, angles, and slopes. Using a multi-disciplinary hands on and interactive approach developed around the architecture of bridges teamwork among students will be key. In this project the students will construct a model of one of the many Fair Haven bridges; confidence will be built as students create a bond while designing and constructing this project together.

Objectives:

The students will:

- Increase students' awareness of the Fair Haven Community
- Develop students' appreciation and understanding of how a community, its people and buildings evolved over a period of years.
- Increase students' understanding of urban development and historic preservation.
- Increase students' ability to read maps and locate essentials on it.
- Develop self-confidence and initiative through activities such as students interviewing community members in order to gain information.
- Increase students' ability and willingness to work together.
- Increase students' confidence in their own mental and physical abilities. "Yes I can meet and interview strangers. I can conquer my fear of math through studying bridges."

Socio-economic Development of the Fair Haven Community

The history of Fair Haven centers largely on its geography. The area is surrounded on three sides by water: the Quinnipiac River on one side, the Mill River on the other, and New Haven harbor to the south. The Quinnipiac tribe inhabited Fair Haven prior to the arrival of European settlers. The natural bounty of the area, with its 'endless' supply of oysters, encouraged them to settle on the coastline of Fair Haven. War with neighboring tribes and years of poor harvests weakened the tribe and they easily gave their land to English colonists. At first, the settlers used Fair Haven for agricultural purposes; it was only the last part of the 17th century that people started living there. When a bridge was built over the Quinnipiac River in 1791, the woodlands of Fair Haven became more accessible to New Haveners and a surge of land acquisition ensued.

By the 1800's, the oyster industry was in full swing, with most of the residents of Fair Haven involved in some

aspect of the fishery. The industry was so successful in Fair Haven that related businesses began to spring up around it, such as factories to produce the barrels in which oysters were shipped as far as Europe. Shipbuilding was another important industry with large shipyards on both sides of the Quinnipiac River. The demand for oysters began to outstrip the supply and by the 1870's so many oysters had been scraped from the bottom of the river that the industry's best days had come and gone. At the time of the Civil War, demand for war materials spurred shifts in production from consumer goods to munitions. It also led to a dramatic increase in population; in the 1860's alone, ten thousand people migrated to New Haven. At that point, Yankee ancestors still prevailed in Fair Haven, but it was soon to be outnumbered by a flood of immigrants from Ireland, Germany, Poland, Russia, and Italy. Immigration to the prosperous area fueled a land boom and construction flourished. By the twentieth century, Fair Haven was no longer dependent on the oyster trade and had changed from a fishing village to an industrial center with carriage factories, foundries, and other large commercial ventures. The residential population was no longer located along the banks of the rivers, but towards the center of the peninsula. Water-dependent industries now dominated those previously residential areas. Immigration continued; indeed, many immigrants were lured to Fair Haven by the prospect of work in such factories as Rolling Mill, the American Steel and Wire Company, United Illuminating and the National Box Folding Company. General patterns of employment were such that the Yankees continued in the oyster trade. By 1930, the population of Fair Haven was 23,960 with the west side of the village comprised largely of immigrants and the east side made up primarily of descendants of the original settlers. Fair Haven has long been a staging area for new immigrants who arrive there and move to surrounding areas when they become upwardly mobile.

By the 1950's much of the manufacturing base of Fair Haven had diminished and many of the once handsome residential neighborhoods had decayed. Only two oyster companies remained in operation and far fewer working industries lined the shores of Fair Haven. At this time, the population of the area changed once again. As one historian described "When federally funded projects in the center of New Haven disrupted traditional ethnic and racial sections, blacks and Hispanic people were forced to move. Many of them retreated to Fair Haven."

In the 60's and 70's, Fair Haven, like many eastern cities, was targeted for "urban renewal," which included the construction of federally funded housing projects and various other government programs designed to revitalize the area. At this time Interstate 95 was built, which displaced many New Haven residents; a large percentage of those forced to move were minority groups. In addition, immigration, largely from Latin America, reshaped the residential population. The Hispanic tradition of community organizing led to the creation of a number of grassroots groups that became (and still are) active agents for social change in Fair Haven.

In the 1980's there was another cycle of renewal, and the population of Fair Haven grew once again as young professionals began moving into the area, but the process didn't last long. With the recession in the late 1980's Fair Haven was hit especially hard. Much of the middle class population moved to the suburbs decreasing the stability of the area and setting the scene for other social disturbances. It is important to remember that many groups have landed and moved through Fair Haven in the last three centuries.

The total population south of the Grand Ave. Bridge is 4,909. The Fair Haven population is notably young; the median age in the area is 29.6 years. Approximately one-third of the population south of Grand is below eighteen. People 65 years and older represent 12% of the total. The dependency ratio, which measures people with income generating potential (between the ages of 18 and 65) compared to those who are generally dependent on them (under 18 and over 65), is 42% for the area south of Grand, as opposed to 36% for all of

New Haven.

Fair Haven is mixed socio-economically. While there are pockets of affluence, most neighborhoods are made up of middle to low-income households. Census data for the area south of Grand Avenue indicate that unemployment is around 13%, the average income per capita is \$10,874, and 27.5% of the population lives below the poverty level. The high dependency of Fair Haven, along with the unemployment data, suggests that there is great pressure on the resources in the community as well as on families.

Fair Haven is a very racially diverse area. The Hispanic community is large and growing and represents approximately 35% of the population. The total minority population south of Grand is 42.5%. There seem to be relatively few racial tensions in Fair Haven and the community appears to be divided more along social-economic lines than racial lines. Fair Haven residents frequently cite the diversity of their neighborhood as a benefit. Churches, synagogues and mosques are vital to any community's foundation and there are numerous religious institutions in Fair Haven. Both the Catholic and Pentecostal churches are strong in the community and the majority of community residents seem to attend one church or another on a regular basis.

Grand Avenue Bridge Construction

New Haven in 1780 was given permission by the General Assembly to build a bridge across the Quinnipiac River, or Dragon River as it was then called, to connect New Haven with East Haven. Money was raised for the new bridge through a lottery but it still was not enough. In 1789 a committee worked on the expense for the proposed bridge and finalized the expenses with the bridge builder.

The thought of building a bridge was not a well thought out plan for people who lived in East Haven, because the town was thriving on a lucrative ferry business taking individuals and goods across the river. Even though East Haven was against the building of the bridge they hesitated to file the proper papers to stop the building of the bridge.

In 1791 permission was finally given by the General Assembly to build the bridge, after many failed objections from East Haven. Henry Daggett, James Prescott and Thomas Punderson built the first bridge in Fair Haven. There was not enough money to build and maintain the bridge therefore individuals paid a toll in order to cross the bridge.

The bridge was fenced on both sides and at all times attended by someone to accommodate the public and help people to pass.

"The bridge was completed in 1791 along with a wide highway christened Grand Street. Herman Hutchkiss, the founder of New Haven, bought the first piece of land. The Dragon Bridge and Grand Street made a big difference between New Haven and East Haven. There were no more frustrating scenarios to deal with fear of crossing the river during bad weather and causing the river to be unsafe. The towns of New Haven and East Haven were now joined by a bridge people could walk across. These two towns seized the opportunity jointly. People began to settle around the bridge creating farms and a flourishing oyster business while building clapboard houses and large barns.

The first bridge being made of wood began to deteriorate after sixty years. Many businesses and homes surround both sides of the bridge. New talks began about repairing the bridge or building a new bridge. The

bridge had a draw so that vessels could pass through. The draw was constantly being hit by ice in the winter and flood tides in the spring. It got so bad until a plank had to be put down in order for one to cross the bridge."

In the early part of 1898 a new Grand Avenue Bridge was completed after the community used a temporary bridge for two years while the new bridge was being completed. The new bridge was built at the expense to the city of New Haven. The total net cost of the bridge was \$135, 465.98.

The new Grand Avenue Bridge over the Quinnipiac River was completed in the early part of the year. The contract for the construction of the substructure was signed in 1896 and work began on the temporary bridge, which was to serve the public during the construction of the new bridge. The new bridge was opened to the public in 1898, although there still remained to be done the laying of the asphalt pavement on the sidewalks and some further work on the gates and on the machinery. This bridge was built at the joint expense of the City and Town of New Haven, and under the supervision of the City Engineer, and a joint committee on bridges representing the Board of Public Works of the City, and the Selectmen of the Town. The total net cost of the bridge to the City and Town was \$135,465.98 one half of which was paid by the City of New Haven.

The total length of the bridge is four hundred and twenty-seven and one-half (427½) feet, and consists of four fixed deck plate girder spans, two at each end, and one swing span at the center, 210 feet long from center to center of end pins. The width is 52 feet from center to center of sidewalk railings, and the width of roadway between wheel guards is thirty-four (34) feet.

The entire roadway of the bridge is paved with vitrified brick on a flooring of creosote yellow pine, covered with two thickness of three-ply tarred roofing felt, one-fourth of an inch of water proof cement, composed of coal tar and bitumen, and a cushion of sand. The sidewalk is paved with a mixture of Seyssel rock asphalt mastic, fine grit and refined bitumen on a flooring of creosote yellow pine covered with two layers of three-ply roofing felt. The paving of roadway and sidewalks was done by the Connecticut Concrete Company as sub-contractors.

The swing span has about one-sixth of its weight carried at the center and five-sixths on the outer rim of the drum of the turntable. This load is distributed in equal parts at eight different points on the drum by means of radial and distributing girders.

The bridge is turned and has its ends raised and lowered and latched by electricity. The gates are operated by hand. All the controlling devices and wheels and levers for handling the gates are in the tender's overhead house.

Improvements in metal-truss technology allowed the construction of larger and stronger swing bridges. In addition to the trusses themselves, the many specialized components of the swing bridges underwent constant development in the late 19th century. Swing bridges changed from hand cranks to steam engines to electric drive, and iron-roller rim bearings gave way to phosphor bronze center-bearing pivots.

Bascules could more easily be built in congested settings, they provided a singlewide channel rather than two narrower ones, and they could be opened part way for smaller boats. Steel girders, carefully machined trunnions (the axles that bear the weight of the bascules as they open), concrete counterweights and steam or electric-driven gearing replaced the timber bascule technology of an earlier era.

Since then, there has been a renovation of the Grand Avenue bridge in January 1980. The renovation closed

traffic for several years. This created a change in the area travel direction. At this time neighbors of the Grand Avenue bridge felt the great inconvenience of having to go around to the next bridge (Ferry St.). Travel time was increased by public transportation, and especially if you are a walker this could make even a greater difference.

Fair Haven has the personality shaped by time and tradition to become a most interesting and graceful historic district. As an oyster center of the past, this part of the city retains a basic charm. There is architecture to be preserved; both residents and visitors can savor architecture that gives this neighborhood flavor.

Conclusion

In many ways, urban communities such as Fair Haven are centered on a bridge of some sort. In this scenario the Grand Ave. Bridge is a focal point of the Fair Haven Community. The concept of community is important to many of the students because their territories are quickly marked within a community. This hinders students from getting involved in their community as being labeled by a territory.

The concept of community and utilizing the many resources are important as the students mature socially. To concentrate on their community and the Grand Ave. Bridge will provide a deeper appreciation for their surroundings. Knowing their community could mean getting involved with many resources available to them.

Students cross a bridge daily without clearly understanding how important it is for the communities survival. This unit will afford the opportunity to tour many buildings in Fair Haven and gain a clear understanding how Fair Haven has evolved over the years.

Lesson Plan I

Objective: The students will increase their knowledge of Fair Haven and bridges. The students will use books and Internet to research Fair Haven. They will concentrate on: when the city was originated, who founded the city, what was the purpose that the city was founded. The students will look into the neighborhoods of the city and research them.

After researching the city the students will then research bridges in the city. After discussion on the bridges of New Haven the students will focus on the Grand Avenue Bridge. After discussion of the Grand Avenue Bridge, the students will do activity one. Before activity one the teacher will introduce:

1. Introduce "bridge" terminology and mathematical concepts necessary for viewing and understanding the Grand Avenue Bridge of Fair Haven.
2. Identify three basic types of spans used to design a bridge. (simple, continuous, cantilever)
3. Identify materials used to construct various bridges. (metal, wood, stone, concrete, iron)
4. Establish the form of a bridge (beam, arch, truss)

Activity 1: The students will take a field trip, viewing the bridges of Fair Haven and they will list the types of bridges, their locations, designs, names and uses.

Lesson Plan II

Objective: The students will learn about comparisons of modes of transportation.

Activity 2 Students will determine distance, rate, time, calculations and comparisons of walking, biking, driving, and public transportation from the Grand Avenue Bridge to their school.

The students will draw a map of the route from the bridge to their school, labeling streets, landmarks, and public transportation routes.

This table will be used in comparison of time between modes of transportation:

(table available in print form)

Homework: Comparisons of home-to-school walking, bus, and car mentioned in Activity Two.

Lesson Plan III

Objective: The students will learn to compare and graph the population from 1600 to the present.

Using the population of Fair Haven

(table available in print form)

Draw a graph to represent the information above.

Activity 3 Review 10-year census figures from (1930 to 2000) and the growth of particular populations near the Grand Avenue bridge, The student will predict, using the census and voter registration, the future changes in racial/ethnic populations in the Fair Haven Community.

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Resources

Sandra K. Peterson

Government Documents and Information Center

Yale University Libraries

Box 208294, 38 Mansfield Street

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Connecticut Transportation Institute

University of Connecticut: School of Engineering

<http://www.eng2.uconn.edu/ti/>

Connecticut Department of Transportation Local Bridge Program: Fiscal Year 2001

John C. Roland Governor. James F. Sullivan, Commissioner

[http://www.dot.state.ct.us/bureau/eh/ehen/localbridge/fy2001program manual](http://www.dot.state.ct.us/bureau/eh/ehen/localbridge/fy2001programmanual)

City of New Haven Public Works

Middletown Avenue

New Haven, CT.

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City of New Haven

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