

TO INFINITY AND BEYOND:  
MUSEUM-SCHOOL PARTNERSHIPS BEYOND THE FIELD TRIP

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## Abstract

Partnerships between schools and informal science institutions (museums, zoos, aquariums, botanical gardens, etc.) for the most part fall short of what true partnerships can accomplish. Limited by financial factors as well as educational legislation, they typically do little more than ensuring that students have a single field trip to an informal science institution. But partnerships that go beyond the field trip to build an in-depth relationship between a school and an informal science institution can not only help students meet the standards set by educational legislation but can also be extremely beneficial to students, as well as teachers, and the institutions themselves.

This paper explores four fruitful partnerships between schools and informal science institutions around the country; *Urban Advantage National Network* in New York City, Denver, Miami, and Boston; the *Calumet Environmental Education Program* in Chicago, Illinois; the *Watsonville Area Teens Conserving Habitats* program in Monterey, California; and *Quasars to Sea Stars* in Santa Barbara, California. The origins, structure, and impact of each program will be discussed. Already existing evaluations of these programs will be examined and the benefits of each program will be discussed to demonstrate how these programs not only help students meet standards, but also how these programs benefit the teachers, communities, and institutions as well.

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## Introduction

Teachers have been taking their classes to museums since 1872, when large groups of students visited the American Museum of Natural History after school hours and on weekends under the guidance of their teachers.<sup>1</sup> In the years that followed, school trips to museums increased and museums around the country responded accordingly, hiring lecturers and creating lessons around school curricula.<sup>2</sup> In 1905, this interaction between schools and museums went a step further when the Department of Public Instruction in Buffalo, New York, required all elementary school classes to visit the Buffalo Society of Natural Sciences. This requirement ensured that all elementary age students were exposed to the museum, which enhanced the lessons with specimens and equipment that teachers did not normally have access to in the limited schools.<sup>3</sup> And with this, the first museum-school partnership was born.

In the century since the first field trip to a museum, partnerships between schools and museums, as well as other informal science institutions (zoos, aquariums, botanical gardens, science and technology centers, etc.), have increased but they have not changed much. While they provide an opportunity for students to visit informal science institutions for the most part they only allow for a single encounter. These partnerships fall short of the in-depth relationships implied by the term itself. A typical example of this is the fifteen-plus-year partnership between the Museum of Science and History in Jacksonville, Florida and Duval County Public Schools. This partnership ensures that every sixth grader in Duval County visits the museum to participate

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<sup>1</sup> Grace Fisher Ramsey, *Educational Work in Museums of the United States* (New York: H. W. Wilson, 1938), 72-73.

<sup>2</sup> *Ibid.*, 70.

<sup>3</sup> *Ibid.*, 79.

in a space science program, but only allows for a single encounter between the schools and the museum each year.<sup>4</sup>

Some museums around the country attempt to step beyond this format by joining forces with teachers to design program curriculum. The Newark Museum in Newark, New Jersey invites teachers from Newark, Jersey City, and New Brunswick to attend professional development days where they tour the museum and choose which objects they want to be incorporated into their contracted programs. Throughout the year, public school students from Newark, Jersey City, and New Brunswick in grades three, five, and eight visit the museum and participate in the programs which their teachers helped to design.<sup>5</sup> However, this option is only available to art and humanities programs, not the science programs at the museum.

At a time when schools are narrowly focused on meeting standards and passing tests, field trips are in decline. Additionally, science education suffers both in schools where standardized tests focus heavily on mathematics and language arts, and in informal science institutions (museums, zoos, aquariums, botanical gardens, etc.) where science programs correlate to school standards but seldom allow for in-depth programming. Finally, decreases in educational funding and strong emphasis on math and language arts have resulted in a decline in field trips to any informal science institution.

But there are some partnerships that buck the general trend. This thesis discusses a number of partnerships between informal science institutions and schools that go well beyond the standard field trip format. It explores how such partnerships, aimed at in-depth and prolonged contact can benefit students, teachers, and even the participating institutions.

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<sup>4</sup> Ramie Stradley, interview by author, April 16, 2012

<sup>5</sup> Stephanie Gebhardt, interview by author, April 16, 2012

The first section of this thesis is devoted to a discussion of current educational legislation and the way in which it limits creative programming in both schools and informal science institutions. The following sections explore four in-depth science programs, already in place, that are built on a close partnership between schools and informal science institutions. The origin, and structure of each program is discussed and the impact on students and teachers is examined. The four programs include the *Urban Advantage National Network* which brings together over eleven informal institutions and more than four school districts in different cities across the country; *Calumet Environmental Education Program*, based at the Field Museum in Chicago, Illinois; *Watsonville Area Teens Conserving Habitats*, based at the Monterey Bay Aquarium in Monterey, California; and *Quasars to Sea Stars* based at the Santa Barbara Museum of Natural History in Santa Barbara, California. The purpose of this paper is to show, through examination of these already existing programs, that close partnerships between informal science institutions and schools focused on in-depth programs can and do benefit students by enabling them to meet standards set forth by the educational legislation currently in place. Evaluation efforts by the respective institutions have shown that these programs have a profound influence on student interest in and attitude toward science, in addition to providing assistance to teachers, and creating datasets for use in informal science institutions as well as in the community, thereby benefiting all involved.

## Part I: The Rules of School

Throughout the twentieth century many laws passed in the United States have had an impact on education. *Brown vs. Board of Education* in 1954 marked the Supreme Court ruling that put segregation in public schools into question; The National Defense Education Act of 1958 placed an emphasis on mathematics, science, and languages in response to the launch of Sputnik and the fear of Soviet attack. And multiple rulings on the issue of separation of church and state have influenced schools in areas ranging from curriculum to the daily recitation of the Pledge of Allegiance. But when it comes to museums and their relation to schools, there are few acts that have had as significant an impact as the Elementary and Secondary Education Act of 1965 or its most recent reauthorization, *No Child Left Behind*.

### I. Elementary and Secondary Education Act, 1965

Prior to the passing of the Elementary and Secondary Education Act in 1965, the federal government did little more than provide land for schools and special programs in the United States. For the most part states and local communities were left to educate students as they saw fit with the federal government not wanting to take away from states' rights to decide on curriculum and general operations within the schools.<sup>6</sup> What federal laws had been passed impacted limited areas of education, for example, the "GI Bill" of 1944 which funded sending almost eight million veterans to college, and the George-Barden Act of 1946 which emphasized vocational studies in high schools.<sup>7</sup>

The first instance of federal education legislation impacting a broader area of education came in 1958. The National Defense Education Act was passed by Congress as a response to the

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<sup>6</sup> Leslie Standerfer, "Before NCLB: The History of ESEA," *Principal Leadership*, April 2006, 26.

<sup>7</sup> "The Federal Role in Education," U. S. Department of Education, last modified March 30, 2011, accessed November 15, 2011, <http://www2.ed.gov/about/overview/fed/role.html>.



launch of Sputnik and the general sense of unease caused by the Cold War. The act provided more loans to college students and placed emphasis on mathematics, science, and languages in an attempt to ensure that the United States could compete with the Soviet Union in science and technology.<sup>8</sup>

With the election of President Lyndon B. Johnson in 1964 came the passing of the Civil Rights Act, ending segregation in many public places. While the Supreme Court ruling in 1954 had deemed segregation in public schools unconstitutional on the basis that “the ‘separate but equal’ doctrine adopted in *Plessy v. Ferguson*, 163 U.S. 537, had no place in the field of public education,”<sup>9</sup> it was not until 1964 that the desegregation of schools was federally mandated.<sup>10</sup> Yet while schools were normally integrated, they were far from equal. President Johnson put education at the forefront of his War on Poverty and on April 11, 1965 his Elementary and Secondary Education Act was approved by the United States Senate without a single amendment, thus marking the federal government’s first step toward closing the achievement gap in public education.<sup>11</sup>

The first two years after President Johnson signed the Elementary and Secondary Education Act into law significant changes were made in the federal support to schools. Instead of just providing land for schools, the government lent assistance to local communities with low-income families, gave textbooks and resources to school libraries, and provided financial assistance to strengthen state boards of education.<sup>12</sup> From 1965 to 1967 alone, the Office of Education’s annual budget for some 27,000 school districts nearly tripled from 1.5 billion to 4

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<sup>8</sup> “The Federal Role in Education,” <http://www2.ed.gov/about/overview/fed/role.html>.

<sup>9</sup> *Brown v. Board of Education*, 1 U.S. 1469 (1954).

<sup>10</sup> *Civil Rights Act of 1964*, Public Law 88-352, *U.S. Statutes at Large* 78 (1964): 246.

<sup>11</sup> Julia Hanna, “The Elementary and Secondary Education Act: 40 Years Later,” *HGSE News*, Harvard Graduate School of Education, last modified June 1, 2005, accessed November 17, 2011, [http://www.gse.harvard.edu/news/2005/0819\\_esea.html](http://www.gse.harvard.edu/news/2005/0819_esea.html).

<sup>12</sup> *Elementary and Secondary Education Act*, Public Law 89-10, *U.S. Statutes at Large* 79 (1965): 36, 47.

billion dollars annually.<sup>13</sup> Schools were no longer left to the states or local governments but the federal government took an active role to ensure that every child, regardless of race or social standing, received a quality education.

As is the case with all government reauthorizations, the Elementary and Secondary Education Act of 1965 had to be evaluated for efficiency. But in order to do so, the government needed to understand the full extent of the achievement gap in public education. An attempt to provide this understanding was laid out in Section 402 of the Civil Rights Act of 1964 –

“SEC. 402. The Commissioner [of Education] shall conduct a survey and make a report to the President and the Congress, within two years of the enactment of this title, concerning the lack of availability of equal educational opportunities for individuals by reason of race, color, religion, or national origin in public educational institutions at all levels in the United States, its territories and possessions, and the District of Columbia.”<sup>14</sup>

James Samuel Coleman, a sociologist at Johns Hopkins University, was commissioned to carry out the survey mandated in Section 402. Coleman studied 600,000 students in 4,000 schools for the survey and published his findings in 1966 as the Coleman Report, or more formally *Equality of Educational Opportunity*.<sup>15</sup>

The study marked the first use of standardized testing on such a grand scale with tests being administered to students in first, third, sixth, ninth, and twelfth grades.<sup>16</sup> According to the report the tests “do not measure intelligence, nor attitudes, nor qualities of character... what they

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<sup>13</sup> Hanna, “The Elementary and Secondary Education Act.”

<sup>14</sup> *Civil Rights Act of 1964*, Public Law 88-352, *U.S. Statutes at Large* 78 (1964): 247.

<sup>15</sup> Barbara J. Kiviat, “The Social Side of Schooling,” *Johns Hopkins Magazine*, April 2000, accessed November 17, 2011, <http://www.jhu.edu/jhumag/0400web/18.html>.

<sup>16</sup> James Samuel Coleman, *Equality of Educational Opportunity* (Washington, D.C.: U.S. Dept. of Health, Education, and Welfare, Office of Education, 1966), 20.

measure are the skills which are among the most important in our society for getting a good job and moving up to a better one, and for full participation in an increasingly technical world.”<sup>17</sup>

Coleman’s findings indicated a definite achievement gap between races despite continuity in teacher characteristics.<sup>18</sup> Additionally Coleman did not find a strong correlation between academic achievement and the quality of schools. Rather a student’s performance was more closely tied to the social makeup of the student’s school, his/her family background, and the extent to which the student felt in control of his/her environment and future.<sup>19</sup> Coleman’s conclusions stated that a disadvantaged minority child would increase in academic performance if his/her school were improved by incorporating children with a greater advantage. Furthermore this increase would be greater than in a child of the majority. Simply put, disadvantaged minority children benefited from integration in public schools.<sup>20</sup>

Following Coleman’s lead of standardized testing, the National Assessment of Educational Progress was developed as a means of determining the achievement gap nationally. The first tests were administered in 1969.<sup>21</sup> Since the Coleman Report was published in 1966, little has changed. Despite efforts of the federal government to focus on education, the achievement gap still remains. A reassessment of the Coleman Report done in 2006 indicates that while this gap has narrowed since 1966, it has not been eliminated and it is still substantial.<sup>22</sup>

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<sup>17</sup> Coleman, *Equality of Educational Opportunity*, 20.

<sup>18</sup> Hanna, “The Elementary and Secondary Education Act.”

<sup>19</sup> Kiviat, “The Social Side of Schooling.”

<sup>20</sup> Coleman, *Equality of Educational Opportunity*, 21.

<sup>21</sup> “NAEP - Measuring Student Progress Since 1964,” National Center for Education Statistics, U.S. Department of Education, last modified May 25, 2010, accessed November 14, 2011, <http://nces.ed.gov/nationsreportcard/about/naephistory.asp>.

<sup>22</sup> Adam Gamoran and Daniel A. Long, “Equality of Educational Opportunity: A 40 Year Retrospective (WCER Working Paper No. 2006-9),” Wisconsin Center for Education Research, published December 2006, [http://www.wcer.wisc.edu/publications/workingPapers/Working\\_Paper\\_No\\_2006\\_09.php](http://www.wcer.wisc.edu/publications/workingPapers/Working_Paper_No_2006_09.php), 5.

Furthermore segregation in schools, although against government mandate, remains at nearly the same levels as in 1966.<sup>23</sup>

Since the signing of the Elementary and Secondary Education Act of 1965, closing the achievement gap in public education has continued to be a priority in the United States. As a result of the still significant achievement gap, the federal government has reauthorized the Elementary and Secondary Education Act of 1965 a number of times. The most recent reauthorization is the No Child Left Behind Act of 2001.

## II. No Child Left Behind

On January 8, 2002, President George W. Bush signed the No Child Left Behind Act of 2001 into law in Hamilton, Ohio. This new bill, which is arguably the most significant educational-reform legislation since the original Elementary and Secondary Education Act of 1965, continues to provide financial assistance to low-income school districts. However a new, heavy emphasis is placed on higher standards for students as well as accountability through national testing.<sup>24</sup>

In regards to No Child Left Behind, President Bush made it clear that the first priority of the act was accountability through standardized testing. At the signing ceremony, the President stated “in return for federal dollars, we are asking states to design accountability systems to show parents and teachers whether or not children can read and write and add and subtract...The fundamental principle of this bill is that every child can learn, we expect every child to learn, and

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<sup>23</sup> Gamoran and Long, “Equality of Educational Opportunity,” 5.

<sup>24</sup> Nicholas Lemann, “The President's Big Test,” Interview by FRONTLINE (PBS: Public Broadcasting Service, March 28, 2002), <http://www.pbs.org/wgbh/pages/frontline/shows/schools/nochild/lemann.html>.

you must show us whether or not every child is learning.”<sup>25</sup> No Child Left Behind mandates that students in third through eighth grade will be tested in reading and math every year.<sup>26</sup>

The bill makes a point to forbid national testing or curricula controlled by the federal government, leaving the states to decide upon their own curricular standards as well as their own test.<sup>27</sup> However, a national measure is required to truly hold schools accountable. The National Assessment of Educational Progress is used as this national measure, against which all state tests are compared. Every other year a random sampling of students in fourth and eighth grades take the National Assessment of Educational Progress test in reading as well as mathematics. Their scores are compared to previous National Assessment of Educational Progress test scores as well as the scores from the state tests.<sup>28</sup> The use of the National Assessment of Educational Progress as a basis for comparison for all states ensures that all states are held accountable to the same high standard. While there is no mandated penalty for consistently failing to meet National Assessment of Educational Progress standards, yearly reporting of each school’s progress is intended to keep states in check and ensure that they are maintaining high standards.<sup>29</sup> Ultimately the goal in this standardized testing is that students will reach 100 percent proficiency on the state test and the National Assessment of Educational Progress within twelve years.<sup>30</sup>

Today No Child Left Behind is not without controversy. Despite the intent of the federal government to leave education at the states’ disposal, some say that No Child Left Behind is a clear step toward a national curriculum.<sup>31</sup> With the National Assessment of Educational Progress

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<sup>25</sup> George W. Bush, “Signing Ceremony for No Child Left Behind Act” (Address, Hamilton High School, Hamilton, OH, January 8, 2002).

<sup>26</sup> FRONTLINE, “The New Rules,” PBS: Public Broadcasting Service, last modified 2002, accessed November 15, 2011, <http://www.pbs.org/wgbh/pages/frontline/shows/schools/nochild/nclb.html>.

<sup>27</sup> *No Child Left Behind Act*, Public Law 107-110, *U.S. Statutes at Large* 115 (2002): 1984.

<sup>28</sup> See note 26 above.

<sup>29</sup> Lemann, “The President’s Big Test.”

<sup>30</sup> See note 26 above.

<sup>31</sup> See note 29 above.

as a national benchmark for testing and national standards provided by the federal government, it would appear that a national curriculum is not farfetched regardless of the Title IX prohibition. Other issues arise in the testing. Some teachers and administrators are concerned that there is too much teaching to the test. Others state that the heavy emphasis on testing leaves little room for much else to be taught throughout the school year and that with the focus on reading and math other subjects, such as history and science, are ignored.<sup>32</sup>

Meanwhile there are also arguments in favor of No Child Left Behind. The anticipation that standards and testing on a national level will eventually close the lingering achievement gap in education is difficult to overlook. Additionally federal funding for education has certainly increased with the federal government providing nearly sixty percent more funding to public education in 2003 than in 2000.<sup>33</sup>

### III. Impact on Museums

The influence of the No Child Left Behind Act of 2001 spreads beyond public education. Home schooled students and students of private schools, though not required to participate in yearly testing, are definitely impacted by the standards set forth by each state and corresponding yearly testing.<sup>34</sup> Museums have been impacted in a similar manner.

Well before they were officially declared as educational institutions by the Tax Reform Act of 1969, museums were increasingly focusing on museum education.<sup>35</sup> Field trips to museums have been happening since as early as 1883, when teachers from the local schools in

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<sup>32</sup> Kim Fortney and Beverly Sheppard, eds., *An Alliance of Spirit: Museum and School Partnerships* (Washington, DC: AAM, American Association of Museums, 2010), 15.

<sup>33</sup> "Claims Made in Favor of the Act," K12 Academics, accessed November 14, 2011,

<http://www.k12academics.com/us-education-legislation/no-child-left-behind-act/claims-made-favor-act>.

<sup>34</sup> See note 32 above.

<sup>35</sup> *Museums for a New Century: A Report of the Commission on Museums for a New Century*, (Washington, D.C.: American Association of Museums, 1984), 55.

Milwaukee took their classes to the newly opened Milwaukee Public Museum. The director of the museum would walk the classes through the museum and talk to them about exhibits.

Similar talks also occurred at the Buffalo Society of Natural Sciences in Buffalo, New York, and at the Davenport Academy of Sciences in Davenport, Iowa in the late 1800s.<sup>36</sup> According to the sixth annual report of the Milwaukee Public Museum, informal lectures were introduced at the museum beginning in 1889, where the director would address visiting students from the public schools. Initially, these lectures were only open to eighth grade students and museum staff were not required give them, but ten years later the superintendent of schools began a system which allowed for students in all grades to take trips to the Milwaukee Public Museum. Additionally, the school board appointed a lecturer at the museum to accommodate visiting school groups.<sup>37</sup>

Beginning in 1895 to 1900, museums began engaging schools groups in different ways. At the Park Museum of Natural History in Providence, Rhode Island, and the Fairbanks Museum of St. Johnsbury, Vermont, students brought in natural materials and a structured lesson or experiment regarding those materials was given rather than a grand lecture.<sup>38</sup> In 1905, museum field trips to the Buffalo Society of Natural Sciences were made mandatory by the Buffalo school system. The department of public instruction in Buffalo scheduled a field trip to the museum for every class in every grade level. At the time, the equipment, specimens, and other objects at the museum enhanced the lessons for students, who had little access to such materials in their classrooms.<sup>39</sup>

Since that time, education has been a priority for museums. In its second annual report in 1884, the Milwaukee Public Museum stated its hope “that teachers and principals will frequently

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<sup>36</sup> Ramsey, *Educational Work in Museums of the United States*, 69.

<sup>37</sup> *Ibid.*, 70.

<sup>38</sup> *Ibid.*, 71.

<sup>39</sup> *Ibid.*, 79.

make use of the opportunities afforded by this museum...<sup>40</sup> Museum education continued to grow from the earliest days of museums as the mutually beneficial relationship, between schools wanting to enhance lessons with objects, and museums eager to reach out and increase visitation, became more apparent. By the 1920s John Cotton Dana, director of the Newark Museum from 1909 to 1929 was advocating for museum education as he felt it was a museum's social responsibility to serve as an institute of learning.<sup>41</sup> Museums have responded to education accordingly and increasingly since Dana's charge with many museums around the country putting a focus on education.

Although education in a museum is significantly different from the formality of the classroom, museums do not escape the influence of educational legislation. No Child Left Behind has had a drastic impact on museum education and the relationship between museums and schools. One of the biggest issues between No Child Left Behind and museums is the idea of teachers' lesson plans accommodating standardized tests. With the tests focusing primarily in reading and math, other subjects often get overshadowed as teacher prepare students for the tests. A study done in 2007 by the Center on Educational Policy reported that sixty-two percent of school districts increased time spent on math and language arts, while forty-four percent cut time from other subjects such as science, social studies, and the arts – all subjects which are most often associated with museums. In the sciences, an average of seventy-five minutes per week was cut, in social studies an average of seventy-six minutes per week, and in the arts an average of fifty-seven minutes per week.<sup>42</sup> This focus on testing and standards makes creating educational programs difficult as museums try to cater to as many standards as possible.

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<sup>40</sup> Ramsey, *Educational Work in Museums of the United States*, 69.

<sup>41</sup> *Museums for a New Century*, 55.

<sup>42</sup> Fortney and Sheppard, *An Alliance of Spirit*, 15.



Additionally the standardized testing mandated by No Child Left Behind has drastically affected field trips. Heavy emphasis on testing as well as limited time in which to prepare students makes scheduling field trips to museums a challenge. Many schools will not schedule any field trips for long periods prior to testing and in some cases will not schedule any field trips until testing is over. The fact that the test is not always at the same time every year, thus making testing periods difficult to predict also present a problem with schools cancelling pre-arranged field trips.<sup>43</sup> Also funds that were once used for field trips are now being used to provide extra preparation for standardized tests as well as remediation for students who are struggling to meet the standards, presenting another challenge for museums.<sup>44</sup> Museums that were once ideal for field trips and learning are seeing declining numbers of school field trips each year. For example at the Chicago Children's Museum, field trips dropped ten percent from 2005 to 2008 and at the New England Aquarium in Boston field trips dropped twenty-five percent in the same time frame.<sup>45</sup>

Yet museum education has endured. In response to No Child Left Behind, museums have developed educational programs to accommodate the standards and the tests. Educational programs in museums are often inter-disciplinary, meeting different standards on the local, state and national levels. Advertising for the programs allows teachers and administrators to see exactly what standards are being met with each program. Additionally, museums have integrated math and writing in science, social studies, and art programs where possible. Finally

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<sup>43</sup> Fortney and Sheppard, *An Alliance of Spirit*, 15.

<sup>44</sup> *Ibid.*, 16.

<sup>45</sup> Philip M. Katz, "Research Round Up," American Association of Museums, last modified April 2008, <http://www.aam-us.org/pubs/webexclusive/nclb.cfm>.

museums are looking for ways to cut the cost of field trips as well as looking for financial assistance to fund buses and other field trip related needs.<sup>46</sup>

A 1984 report by the Commission on Museums for a New Century urged museums to make education the primary purpose of their institutions as well as look at the relationships between museums and schools in a new light.<sup>47</sup> In the time since that report partnerships between museums and school have increased and in some cases grown beyond the average field trip. Hopefully partnerships between museums and schools will flourish, and schools will view museums as a resource for meeting standards as opposed to a luxury only afforded once the standards have been met.

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<sup>46</sup> Fortney and Sheppard, *An Alliance of Spirit*, 16.

<sup>47</sup> *Museums for a New Century*, 63.

## Part II: At the Museum

When one thinks of museums partnering with schools, one typically thinks of field trips. Schools plan the field trip into their yearly schedule, schools pay expenses for field trip costs, and schools physically go to the museum to participate in an educational program. This is the system that has been in place since schools and museums have begun working together. This system revolves around a singular encounter or one-time visit to an institution. Granted, attempts have been made to extend this encounter by integrating pre- and post- visit activities to be implemented by the teacher or even a museum staff member who visits the school.

Today museums are branching out to be more than just a field trip. Outreaches, classroom visits, travelling trunk programs, educational loan collections and distance learning opportunities are just some the ways museums and other informal learning institutions are stepping outside of the standard field trip. In many ways these opportunities have proven successful and in some cases can be more cost effective to the school. But these variations of the typical educational program still fall short of what a museum-school partnership could be.

A partnership implies more than one encounter. It implies that two sides are working together repeatedly over time towards a goal. A partnership implies a mutually beneficial relationship between the parties involved. While field trips, outreaches, classroom visits, travelling trunk programs, educational loan collections and distance learning opportunities are good examples of museums reaching out they do not allow for a long-term relationship between the museums and the schools. What if the single encounter of a field trip was extended to build a relationship? Museums could potentially bring education to life, which is exactly what is being done at nearly a dozen museums, aquariums, zoos, and botanical gardens around the United States through the *Urban Advantage National Network*.

### *Urban Advantage National Network*

Between the current economic recession and the stricter educational legislation in place today it is no wonder that museums have seen a decline in field trips. A lack of funding for field trips and heavy emphasis on standards at the local, state, and national levels make field trips seem like a superfluous luxury. But what if museums could find a way to make these field trips meet a school's needs? What if museums were essential to meeting educational standards rather than just a luxury to supplement them? Through the *Urban Advantage* program, museums attempt to answer these questions.

#### I. New York City

The New York City Department of Education standards for science states that by the time students leave the eighth grade they should “demonstrate scientific competence” through one of four types of scientific investigation – controlled experiment, field study, design experimentation, or secondary research.<sup>48</sup> The intention of the Department of Education is for students to demonstrate this competence via an eighth grade exit project at the culmination of their middle school science classes. But in 2004, someone noticed that this standard was not being met, and in some cases the schools were ignoring this policy altogether.<sup>49</sup> The lack of performance on the exit projects is what paved the way for the *Urban Advantage* program.

##### a. Origins: Meeting a Need

In 2004 the American Museum of Natural History partnered with seven informal science institutions – New York Hall of Science, New York Aquarium, New York Botanical Garden,

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<sup>48</sup> “Overview of Performance Standards,” New York City Department of Education, accessed January 9, 2012, <http://schools.nyc.gov/offices/teachlearn/documents/standards/science/ms/66overview.html>.

<sup>49</sup> Preeti Gupta, interview by author, October 20, 2011

Bronx Zoo, Brooklyn Botanical Garden, Queens Botanical Garden, Staten Island Zoo – as well as the New York City Department of Education in an attempt to try and resolve the lack of performance on the eighth grade exit projects. Students have the opportunity to choose from four different types of exit projects – controlled experiment, field study, design study, or secondary research.

The controlled experiment is similar to a science fair project, with students designing and conducting an experiment that they can carry out in a short time on their own. Field studies involve collecting data at one of the eight institutions. These can be anything from testing water or soil at one of the botanical gardens to examining animal behaviors at a zoo or aquarium. Design studies focus more on engineering, with a student examining and testing the variables of some technological design, such as a plane, rocket, or bridge for instance. Secondary research is primarily done through the American Museum of Natural History, with the student analyzing and drawing a conclusion from already existing data.<sup>50</sup>

The goal is for students to conduct a scientific investigation as opposed to a book report, which many of the students were producing. The projects were “not meeting the potential of what they should have been,” said Karen Saur of the New York Hall of Science in an interview with the author.<sup>51</sup> Saur mentioned that the basis of the program is the idea that students in the New York City area have something to gain from the large number of cultural institutions in the metropolitan area. These institutions – museums, galleries, theaters, etc. – can easily enhance what is taught in the classrooms, if they are used as appropriate resources. Furthermore students are not the only ones who can benefit from these institutions. These resources are put to best use when teachers as well as parents know how to take advantage of them. As such professional

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<sup>50</sup> Karen Saur, interview by author, November 30, 2011

<sup>51</sup> Ibid.

development and family outreach are just as important, if not more, to the program. This “urban advantage” is unique and should be used to augment the work of the schools, especially since education is an integral part of each institution’s mission.

b. Structure: Six Components

The goal of *Urban Advantage* is “to improve students’ understanding of scientific knowledge and inquiry through collaborations between the public school system and science-rich cultural institutions of New York City.”<sup>52</sup> The program reaches students from all five boroughs of New York City, and is divided into six components ranging from professional development for teachers, to family outreach, to overall program assessment, all the while revolving around the eighth grade science exit projects. Students will generally begin the projects in October by picking topics after initial visits to partner institutions. In January experimentation is carried out with presentations of projects taking place March through June.<sup>53</sup> Yet while the students and their exit projects were the need that inspired the program, they aren’t necessarily the first focus of the program. Both Karen Saur and Preeti Gupta, formerly involved with the program through the New York Hall of Science and both interviewed by the author, cite the teachers as really being at the heart of *Urban Advantage*.<sup>54</sup> Reaching the teachers first allows for the institutions to reach the students. “Teachers are the biggest part,” says Saur, who points out that by reaching the three-hundred and seventy or so teachers involved with *Urban Advantage*, you can easily

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<sup>52</sup> Hudson Roditi, Jim Short, and Meryle Weinstein, “The First Six Years of the Urban Advantage Collaborative: From Development and Evaluation to Impact and Policy Implications,” PowerPoint (Chicago: Visitor Studies Association, 2011), accessed December 6, 2011 in email from Suzanne Elgandy, 7.

<sup>53</sup> Saur, interview, November 30, 2011.

<sup>54</sup> Ibid.

impact their nearly 35,000 students.<sup>55</sup> Hence, the first component of the program is professional development for both teachers and administrators.

Teachers participating in their first year with the program are required to complete a total of forty-eight hours of professional development. The first twelve hours are dedicated to introducing the teachers to the program itself and the partner institutions. Teachers are provided with examples of long-term exit projects structures, familiarized with each partner institution, and given recommendations as to planning field trips and appropriating other resources provided by *Urban Advantage* (such as experimental equipment and vouchers for visits to the institutions). The last thirty-six hours of the first year are devoted to teachers becoming familiar with the exit project format. Teachers attend professional development sessions at two institutions of their choosing and complete two exit projects. This allows for teachers to fully understand what the students are expected to achieve on the projects and how to best utilize the partner institutions of the program.<sup>56</sup>

Teachers involved in *Urban Advantage* are encouraged to continue with the program beyond their first year. Years one through four of the program saw heavy recruitment amongst teachers. The aim was to grow the programs by bringing in new teachers and in those years every teacher was accepted to the program.<sup>57</sup> According to Preeti Gupta, a cut in funding led program coordinators to focus on continuing teachers as opposed to recruiting new ones, which was the focus in the first few years of *Urban Advantage*.<sup>58</sup> In the second year of participation, as well as any year beyond the first, teachers complete ten hours of professional development. This expands on the work done in the first year of professional development allowing for teachers to

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<sup>55</sup> Gupta, interview, October 20, 2011.

<sup>56</sup> “Urban Advantage Middle School Science Initiative,” information brochure, (New York, 2010), 4.

<sup>57</sup> Roditi, Short, and Weinstein, “The First Six Years of the Urban Advantage Collaborative,” PowerPoint, 21.

<sup>58</sup> Saur, interview, November 30, 2011.

become more fully aware of what all eight partner institutions has to offer to the schools. As a bonus for continued participation, the ten hours, which takes place after school and on weekends, includes a stipend. But this stipend is not the only draw for the teachers. A principal involved with *Urban Advantage* comments, “At first the teachers went at my request...but they came back so happy and enthused by the professional development that it kind of set fire to others to also get involved.”<sup>59</sup> As a result of this “fire” what began with only sixty-two new teachers in 2004-2005 has grown to three-hundred and seventy-one in 2010-2011, of which two-hundred and eighty-five are continuing teachers.<sup>60</sup>

In addition to the teachers, administrators also have opportunities to participate in *Urban Advantage*. Every year workshops are held for principals of schools involved. These workshops provide administrators with information regarding the latest studies on how students learn science, as well as suggestions on implementing *Urban Advantage* within the schools.<sup>61</sup>

The second and third components of the *Urban Advantage* program are the ones that directly impact the students. Component two allows for equipment and materials to be provided to each school participating in the program. These materials are essential to the students’ designing and carrying out experimentation for their exit projects. Schools in their first year of participation receive things like microscopes, lighted plant-growing environments, digital cameras, magnifying glasses, stopwatches, and other such things to support inquiry-based learning and experimentation in the classroom. Continuing schools receive additional equipment – field guides and kits for water and soil testing, etc. – which supports learning outside the physical walls of the classroom.<sup>62</sup> These much needed materials enable students to explore

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<sup>59</sup> “Urban Advantage Middle School Science Initiative,” information brochure, 4.

<sup>60</sup> Roditi, Short, and Weinstein, “The First Six Years of the Urban Advantage Collaborative,” PowerPoint, 18.

<sup>61</sup> See note 59 above.

<sup>62</sup> “Urban Advantage Middle School Science Initiative,” information brochure, 5.



science using the methods and technology of their age. Additionally, encouraging students to experiment and collect data beyond the boundaries of the classroom sends the message that learning does not stop once class has ended.

The idea that learning and discovery continue beyond the classroom is the basis for the third component of the *Urban Advantage* program. Each school that participates in *Urban Advantage* is partnered with one of the eight institutions. The schools take field trips, which give students the chance to decide on an exit project and collect data at the institution if they so desire. Beyond this, vouchers are provided to the students so they can return to the institutions to continue their projects or seek help from the staff as necessary.<sup>63</sup> The project topics range anywhere from examining aquatic habitats to the climbing pattern of monkeys and depending on the project, access to the institution is crucial. For example, secondary research projects are done exclusively at the American Museum of Natural History and require students to utilize already existing data. Without access to the museum many of these projects would not reach their full potential.

The idea of outreach, which is hinted at in component three of the program, is at the forefront of the fourth component of *Urban Advantage*. In the same way that students and teachers are given vouchers to visit the institutions, families are provided vouchers to their school's partner institution and encouraged to visit as well. Specific days, usually Sundays in October, are set up so that families can visit any one of the eight institutions. These Family Science Sundays not only serve as outreach for each institution but expose many of these families to these institutions for the first time.<sup>64</sup> Incorporating the institutions into students' projects gives the students a sense of ownership in regards to their partner institution. This sense

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<sup>63</sup> "Urban Advantage Middle School Science Initiative," information brochure, 5.

<sup>64</sup> Ibid.

of ownership makes the institution more relevant to a student's life and makes them more willing to share with their families and friends, which benefits all parties involved. Although she could not disclose specific numbers, Gupta commented that there is evidence that students definitely bring their families back to the institutions.<sup>65</sup>

Each school also has on staff a parent coordinator, which is a full-time position for New York City schools. *Urban Advantage* provides workshops for these parent coordinators so that they understand their essential role in their school's participation of the program. Parent coordinators have a hand in setting up field trips to partner institutions for the classes. They also plan family field trips to the institutions on school holidays. Family science nights and science fairs are also held for the students and their parents. At Family Science Nights, *Urban Advantage* partner institutions set up science events at the schools for families. This gives parents and siblings of students a chance to participate in the program as well. Typically one science night is scheduled per year.<sup>66</sup>

Science Fairs are also a family outreach tool for the *Urban Advantage* program. While the exit projects themselves are not entered into a formal science fair competition, *Urban Advantage* schools hold internal competitions for participation in the annual Eighth Grade Science EXPO. This yearly event hosted by the American Museum of Natural History is the culmination of the students' work. Each *Urban Advantage* teacher is permitted to send two projects from their classes to be displayed in the EXPO. The result is some five-hundred students and around two-hundred projects with topics reflecting many different areas in life, Earth, and physical sciences. The event is not only open to the families but also to the general public and is often attended by members of the New York City Department of Education and the

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<sup>65</sup> Gupta, interview, October 20, 2011.

<sup>66</sup> "Urban Advantage Middle School Science Initiative," information brochure, 6.

City Council.<sup>67</sup> As such the EXPO serves as an outreach tool to non-*Urban Advantage* schools as well as an assessment of the current success of the program.

The final two components of *Urban Advantage* are a result of the long-term success of the program itself. “The number of teachers involved [in *Urban Advantage*] was purposefully grown in 2004,” says Gupta.<sup>68</sup> However in light of the current economic recession, encouraging teachers to continue has become just as important a focus as recruitment. Component five concerns capacity-building and sustainability of the program. One of the draws of *Urban Advantage* is the long-term partnership between the schools and the institutions. The multiple field trips and opportunities for students and families to visit the partner institutions build a relationship between the two parties that can only benefit either side. The resources and professional development provided to the schools and teachers involved in the program encourage continued participation, which ultimately benefits the students. According to an *Urban Advantage* principal, “*Urban Advantage* contributes to teacher satisfaction and lessens the propensity to leave [the system]. There is a lot of ground lost when teachers leave – student performance is affected and learning communities are disrupted.”<sup>69</sup> Inconsistency is a detriment to the program, hence the strong emphasis for teachers to continue beyond the first year. Continuing teachers are not only offered a stipend, but some are selected to be lead science teachers. These teachers work with the *Urban Advantage* partners at each institution by contributing to and facilitating professional development. Essentially the lead science teachers serve as mentors to their colleagues, offering assistance on planning field trips, coaching students through the exit science projects, and preparing lessons regarding how to conduct experiments and present research. Every year they attend a Leadership Institute which providing information

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<sup>67</sup> “Urban Advantage Middle School Science Initiative,” information brochure, 6.

<sup>68</sup> Gupta, interview, October 20, 2011.

<sup>69</sup> “Urban Advantage Middle School Science Initiative,” information brochure, 7.

on helping their fellow teachers and ultimately the students. They also receive an additional stipend for their involvement.<sup>70</sup>

Schools that have participated in *Urban Advantage* for a number of years are given the opportunity to apply to the Demonstration School Initiative. Schools that apply are chosen based on their involvement in *Urban Advantage* and implementation of the program within the school itself, location, and diversity of the student body. Every demonstration school must have a lead science teacher on staff. Each year between five and ten schools are selected based on these criteria.<sup>71</sup> Teachers and administrators that are considering becoming involved with *Urban Advantage* are encouraged to visit a demonstration school to see real life examples of the program implementation. The Demonstration School Initiative serves not only as an outreach to non-*Urban Advantage* schools but as a benefit to continuing schools, as the selected schools receive additional support from the program.

Component six deals with the assessment of the program and participating students. According to Gupta, a substantial amount of evaluation was done right from the beginning with Gaylen Moore leading the evaluations in the first six years of the program. Early evaluations examined the effectiveness of the teachers' aspects of the program – how professional development helped the teachers and the rate at which resulting changes could be seen in the classroom.<sup>72</sup> One staff member at a partner institution commented, "I now get to see what teachers do through student projects. The impact of professional development on teachers is transferred to student work."<sup>73</sup> Assessment of the program has now expanded to include the students. Classroom observation, teacher interviews, and school visits are conducted. In

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<sup>70</sup> "Urban Advantage Middle School Science Initiative," information brochure, 7.

<sup>71</sup> Ibid.

<sup>72</sup> Gupta, interview, October 20, 2011.

<sup>73</sup> See note 70 above.

addition the caliber of projects, especially those displayed at the annual EXPO, is taken into consideration, as is student performance on the New York State Eighth Grade Intermediate-Level Science Test.<sup>74</sup> Saur states that evaluation has indicated a correlation between test scores and the program. That correlation is being studied more closely in recent assessments.<sup>75</sup> Also the fact that the program has been in existence since 2004 has led to studies regarding the long-term effects of the program. New York University has been approached to look at how participation in *Urban Advantage* has influenced students' college acceptance and chosen majors, if at all.<sup>76</sup>

c. Impact: Growth and Success

Since the beginning evaluation and assessment have been an important part of *Urban Advantage*, so much so that a structural component of the program is dedicated to evaluation. As such, *Urban Advantage* has a whole arsenal of datasets examining nearly every imaginable aspect of the program. The New York City Department of Education supplies demographic data on each student that participates in the program as well as annual test scores. From 2003 to 2006, reports were provided by the Department of Education, including data on each school, teacher, and student. Additionally, from 2006 to 2010 school reports cards were provided also including information in on each school, teacher, and student.<sup>77</sup> These reports examine everything from teacher effectiveness and student performance both before and after participation in *Urban Advantage*, to differences between participating and non-participating schools.

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<sup>74</sup> Roditi, Short, and Weinstein, "The First Six Years of the Urban Advantage Collaborative," PowerPoint, 17.

<sup>75</sup> Saur, interview, November 30, 2011.

<sup>76</sup> Gupta, interview, October 20, 2011.

<sup>77</sup> Roditi, Short, and Weinstein, "The First Six Years of the Urban Advantage Collaborative," PowerPoint, 22.

There is little doubt that the *Urban Advantage* program is successful. What began in 2004 with thirty-one schools, sixty-two teachers, and 5,500 students has grown to one-hundred and fifty-six schools, three-hundred and seventy-one teachers, and 37,822 students in 2011.<sup>78</sup> Of the current participants, fifty-nine schools have three or more *Urban Advantage* teachers on staff and fifty-seven schools include sixth and seventh grade as well as eighth (see Appendix A). These numbers indicate that *Urban Advantage* currently serves thirty-five percent of New York City schools with eighth grade and twenty percent of schools with grades six through eight.<sup>79</sup>

Prior to the start of the *Urban Advantage* program in 2004, fewer than forty percent of eighth grade students in New York City demonstrated proficiency on the New York State Intermediate-Level Science Test (see Appendix A). Many of the students lacking proficiency scored well below the New York State average of eighty-six percent on the test. After the beginning of *Urban Advantage*, test scores of participating students were compared annually to test scores of non-participating students. While there was no real difference in the first two years of the program, in year three a difference did show. In that year *Urban Advantage* schools began to outperform non-*Urban Advantage* schools by 3.7 percent. This difference continued to grow to nearly ten percent in the next two years with over fifty-five percent of participating students and less than fifty percent of non-participating students demonstrating proficiency. While this difference in student performance has fluctuated from year to year it continues to remain significant. At this time the only considerable difference between *Urban Advantage* and non-*Urban Advantage* schools is size. On average participating schools are larger, as of yet there is no evidence that this affects the performance of participating students in any way. The only

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<sup>78</sup> Roditi, Short, and Weinstein, "The First Six Years of the Urban Advantage Collaborative," PowerPoint, 18.

<sup>79</sup> Emilyn Ruble and Meryle Weinstein, "IESP Policy Brief: Can Formal-Informal Collaborations Improve Science Literacy in Urban Middle Schools? The Impact of Urban Advantage," Institute for Education and Social Policy, published June 2011, accessed December 5, 2011, [http://steinhardt.nyu.edu/scmsAdmin/media/users/spa2/Policy\\_Brief\\_UA\\_03\\_11\\_June\\_2011.pdf](http://steinhardt.nyu.edu/scmsAdmin/media/users/spa2/Policy_Brief_UA_03_11_June_2011.pdf).

thing that remains clear is that *Urban Advantage* helps students meet standards and perform better in science.<sup>80</sup>

## II. Going National

Not long after its launch, the *Urban Advantage* program in New York City invited other cities around the country to share in its success. Evaluations had indicated that the program was a benefit to both teaching methods and student performance in New York City schools. So what if this partnership between schools and informal science institutions – museums, botanical gardens, zoos, aquariums, etc. – could be transferred to other cities around the country? Karen Saur, *Urban Advantage* partner at the New York Hall of Science, in an interview with the author, stated that, based on local needs for the curriculum, the program could easily be adapted to other cities if the cities had three to four informal science institutions to participate.<sup>81</sup>

Only a few years after the start of the New York City program, the American Museum of Natural History received a planning grant from the Goldman Sachs Foundation to help other cities around the country implement programs using the *Urban Advantage* model.<sup>82</sup> The basic structure with the six components remained the same. However, the eighth grade science exit projects, which were the initial reason for starting the *Urban Advantage* program in New York City, are not necessarily a requirement everywhere else in the country. Despite the concern that there would not be an apparent need to be met three cities responded in favor of starting similar programs – Denver, Miami, and Boston. The American Museum of Natural History received a grant from the Institute of Museum and Library Services to support each city, both financially

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<sup>80</sup> Ruble and Weinstein, “IESP Policy Brief,” 4.

<sup>81</sup> Saur, interview, November 30, 2011.

<sup>82</sup> Gupta, interview, October 20, 2011.

and with periodic progress meetings, as it began implementing the program, and thus the *Urban Advantage* National Network was born.<sup>83</sup>

a. *Urban Advantage: Metro Denver*

In November of 2007, after meeting with leaders from the *Urban Advantage* program in New York City, coordinators in favor of bringing a similar program to the Metro Denver area held a summit to share what they had learned from the New York City program and to discuss their vision for a similar program in Denver. The summit consisted of seventy-five of the area's leading community and business stakeholders and was received with enthusiasm.<sup>84</sup> In February of 2008 a formal feasibility study followed outlining the vision and goals for *Urban Advantage: Metro Denver* and further justifying the need to implement the program.

Students in the metro Denver area take the Colorado Student Assessment Program science test in the fifth, eighth, and tenth grades. Because the standardized testing assesses mathematics and language proficiency every year, these are the scores that contribute to determining if schools pass or fail in a given year. As a result, science is often overshadowed by math and language arts in elementary schools. The students' first in-depth exposure to science education comes in middle school where there are designated teachers and time for each subject. However in many cases middle school is too late to spark a student's interest in science. In 2007, only one in four eighth graders in the Denver area scored proficient or above on the Colorado Student Assessment Program science test. With approximately thirty percent of the test focusing on scientific investigation, it is clear that students are expected to demonstrate an understanding of the scientific investigation process in addition to understanding of subject

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<sup>83</sup> Saur, interview, November 30, 2011.

<sup>84</sup> Jean Paul Glaser, "Bringing Urban Advantage to Denver," Feasibility Study (Denver: Alchemy, 2008), 22.



material.<sup>85</sup> A shockingly low twenty-five percent proficiency amongst the students clearly indicates a need for more exposure to hands-on investigation and experimentation in the science classrooms.

Not only do test scores suffer because of this situation, so does Colorado's workforce. The state of Colorado boasts having the fourth largest aerospace economy in the United States. Local Denver industries are growing in areas of aerospace, bioscience, energy, and information technologies. But with only around two-thirds of Denver high school students graduating, resident workers could become scarce.<sup>86</sup> This "Colorado Paradox" of low high school graduation rates in the midst of a growing technology sector and economy is an ever increasing concern.<sup>87</sup> If this trend should continue, Colorado industries will be unable to hire Colorado graduates due to this incompetency, especially in science. Programs such as *Urban Advantage: Metro Denver* can help to close this gap in talent and achievement in science and ultimately produce the ideal workers for local industries.

Taking into consideration that the standardized science test occurs in the eighth grade and that middle school is where more in-depth science lessons begin, seventh grade students became the initial target for *Urban Advantage: Metro Denver*. While there is no requirement for seventh grade students to do a science project, many involved with the program do complete one. The manner in which the project is done is left up to the teachers involved.<sup>88</sup> Three informal science institutions joined as partners – Denver Museum of Nature and Science, Denver Zoo, and Denver Botanic Gardens. Additionally, three school districts joined as partners of *Urban Advantage:*

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<sup>85</sup> Glaser, "Bringing Urban Advantage to Denver," 1.

<sup>86</sup> *Ibid.*, 7.

<sup>87</sup> "Metro Denver WIRED Initiative," Metro Denver Economic Development Corporation, last modified September 2008, accessed January 15, 2012, <http://www.metrodenvercareers.org/files/MetroDenverWiredBrochure.pdf>.

<sup>88</sup> Elizabeth Leenhouts, interview by author, December 14, 2011.

*Metro Denver* – Denver Public Schools, Aurora Public Schools, and Adams County School District 14.<sup>89</sup>

While there are some differences between *Urban Advantage: Metro Denver* and the New York City program, the basic structure with six components remains the same. Elizabeth Leenhouts, coordinator of *Urban Advantage: Metro Denver*, in an interview with the author, stated that “teacher, students, families” remained at the heart of the Denver program.<sup>90</sup> Teachers remain the first component and are provided sixty hours of professional development in their first year to better understand inquiry-based learning. The first twenty-four hours revolves around the basics of scientific investigation, the next twenty-four hours is composed of practical investigations at the partner institutions, and the final twelve hours takes place throughout the year as follow-up support, including online discussions, and meetings with staff and scientists from the partner institutions.<sup>91</sup> As in the New York City program, professional development continues after the first year of involvement with the program. In the second year of involvement, as well as any year beyond the first, teachers receive sixteen hours of professional development. These sixteen hours are divided into two segments. The first eight hours are a refresher of inquiry-based learning and scientific investigations, and the second eight hours, scheduled throughout the year, are intended for follow-up and support. This support includes online discussions with peers as well as scientists and staff from partner institutions.<sup>92</sup>

Components two and three of the *Urban Advantage: Metro Denver* program are in nearly all respects identical to those of the New York City program. Classroom materials as well as funding for field trips to partner institutions are made available to each *Urban Advantage: Metro*

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<sup>89</sup> “Fact Sheet for Partner Organizations,” Fact Sheet (Denver: Urban Advantage: Metro Denver, 2011), 1.

<sup>90</sup> Leenhouts, interview, December 14, 2011.

<sup>91</sup> Glaser, “Bringing Urban Advantage to Denver,” 13.

<sup>92</sup> *Ibid.*, 14.

*Denver* teacher and school. The free access to the partner institutions inspires the students' project topics and designated "Student Help" representatives at each institution assist with student projects as necessary. Through this aspect of the program "students can call for help from scientists," says Leenhouts.<sup>93</sup> Additionally an online web portal has been created to assist students with their projects.<sup>94</sup>

Component four of the Denver program deals with family outreach much in the same way that the New York City program does. Partner institutions host Family Science Days where families can visit one of the institutions at no cost. Family Science Nights take place at the schools. Even a Science Celebration to recognize student achievement and participation is held at the end of every year, similar to New York City's Science EXPO.<sup>95</sup> One aspect that is new is the inclusion of bilingual communication in print, online, and via physical translators. This aspect was introduced as a means of reaching out to the diverse minority population in the metro Denver area.<sup>96</sup>

Components five and six concern capacity-building, sustainability, and evaluation of the Denver program. Because *Urban Advantage: Metro Denver* is in the initial phase of the program, these components are still being developed. However these components are modeled after the New York City program and the goal is to establish lead teachers as well as a demonstration school initiative.

In 2010-2011, the first year of *Urban Advantage: Metro Denver*, the program aimed at including twenty seventh-grade teachers at five schools in the three school districts. This amount would equal approximately 1,500 students. The goal was to grow this amount to thirty-five

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<sup>93</sup> Leenhouts, interview, December 14, 2011.

<sup>94</sup> "Fact Sheet for Partner Organizations," 2.

<sup>95</sup> See note 93 above.

<sup>96</sup> Glaser, "Bringing Urban Advantage to Denver," 11.

seventh-grade teachers in the second year, and then to fifty teachers from both sixth and seventh grades in year three. These numbers would equal 2,625 students in the second year and 3,750 students in the third year.<sup>97</sup> Should this growth continue as planned, *Urban Advantage: Metro Denver* will have involved approximately 18,654 seventh grade students from twenty-three schools by the end of the 2013-2014 school year.<sup>98</sup>

Initial funding for *Urban Advantage: Metro Denver* came from the Goldman Sachs Foundation. In the fall of 2010, the Denver Museum of Nature and Science received a 3.72 million dollar grant from the National Science Foundation to go towards the implementation and evaluation of *Urban Advantage: Metro Denver* over the course of five years.<sup>99</sup> The grant will be distributed by the lead institution, the Denver Museum of Nature and Science, and will be essential in providing classroom materials and vouchers to partner institutions as well as miscellaneous field trip costs. In addition, because the grant covers the cost of evaluation every aspect of *Urban Advantage: Metro Denver* can be assessed. While this is not the first collaboration between schools and scientific institutions in the area, this will be the first one evaluated. “[We] have an idea that this is working,” says Leenhouts.<sup>100</sup> The data generated from evaluations will give an indication of how effective this type of program is, and can ultimately lead to similar programs in other cities around the country.

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<sup>97</sup> Glaser, “Bringing Urban Advantage to Denver,” 14.

<sup>98</sup> Laura Holtman, “National Science Foundation Awards \$3.27 Million to Denver Museum of Nature & Science for Urban Advantage Metro Denver Partnership Program,” *Urban Advantage National Network*, Denver Museum of Science and Nature, last modified September 7, 2010, accessed December 9, 2011, <http://www.urbanadvantage.org/www/uanatl/site/hosting/documents/Urban%20Advantage%20Press%20Release%20FINAL.pdf>.

<sup>99</sup> Ibid.

<sup>100</sup> Leenhouts, interview, December 14, 2011.

b. *Urban Advantage: Miami*

In 2007, Miami joined the *Urban Advantage* National Network and went into the planning stages of launching a similar program in the Miami-Dade area. Miami-Dade Public Schools is the fourth largest school district in the country, but it is not without its share of challenges. Despite ongoing efforts by the Superintendent and the School Board, student performance remains low. On the 2007 Florida Comprehensive Assessment Test, the average scores for Miami-Dade students in fifth, eighth, and eleventh grades were below the state's average.<sup>101</sup> According to Nancy Wielert, education manager at Zoo Miami, possessing a science degree is not a requirement to be a science teacher in a Miami school.<sup>102</sup> A survey conducted amongst fifth and sixth grade science teachers in Miami indicated that thirty-three percent are not comfortable teaching science. Furthermore only forty-four percent of teachers use inquiry-based learning as part of their lessons, and twenty-six percent do not understand inquiry-based science at all.<sup>103</sup> As a result of this, many students are not receiving adequate science education as many of their teachers struggle with understanding the material themselves. Within this challenge lies the need for a program such as *Urban Advantage*.

Zoo Miami, Fairchild Tropical Botanic Garden, and Miami Science Museum partnered with Miami-Dade Public Schools and began planning *Urban Advantage: Miami*. The goal was to have a three year program targeting to sixth-grade teachers and students (see Appendix B). As in the case of *Urban Advantage: Metro Denver*, the six components that structured the New York City program would remain the same with a few alterations.

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<sup>101</sup> "Miami Urban Advantage Feasibility Proposal," Feasibility Study (Miami, 2008), 4.

<sup>102</sup> Nancy Wielert, interview by author, December 14, 2011.

<sup>103</sup> See note 101 above.

Once again teachers would be the first focus of the program. “[We’re] reaching students through the teachers,” says Wielert, “If we’ve our job right with the teachers the students will definitely benefit.”<sup>104</sup> Professional development would include a fifteen day summer institute prior to beginning participation in the program. Through this institute, each teacher would spend three days completing hands-on, inquiry-based activities at each of the partner institutions. Towards the end of the institute, teachers would develop their own inquiry-based science projects to be completed at one of the partner institutions. The culmination of the Summer Institute would be a presentation of these projects. The entire summer institute would be a simulation of what the students would experience throughout the year while participating in *Urban Advantage: Miami*.<sup>105</sup>

According to the plan, the second and third components of *Urban Advantage: Miami* would directly impact the students. Classroom materials to enhance inquiry-based science lessons would be provided to the schools and teachers participating in the program. Students would also have access to each partner institution via field trips. However, unlike the New York City and Denver programs, where these trips revolve around a specific project, students would participate in a series of activities which are unique to each institution. At Zoo Miami students would select a species and then practice collecting data on that species. At the Fairchild Tropical Botanic Gardens students would experiment with different plants and leaves. Finally at the Miami Science Museum, students would focus on space science and physics, including videoconferencing with NASA scientists.<sup>106</sup> The goal was that every participating student would visit each institution, and then choose a topic for a required science project based on the different experiences at each institution.

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<sup>104</sup> Wielert, interview, December 14, 2011.

<sup>105</sup> “Miami Urban Advantage Feasibility Proposal,” 11.

<sup>106</sup> *Ibid.*, 13-14.

At the culmination of each school year would be a Research and Creativity Forum at the University of Miami, with projects by *Urban Advantage: Miami* students side by side with undergraduate and graduate research. This event was meant to involve the families through the display of the projects, and also involve students from the university as mentors to *Urban Advantage: Miami* students. This involvement of the university adds a whole new element to the already strong *Urban Advantage* program. It reaches out to a different population in the community and demonstrates to *Urban Advantage* students that the type of science they are doing does not end when they are done with the program.

The other components of *Urban Advantage: Miami*, reaching out to families, are not quite figured out yet, says Wielert. In addition to reaching the students' families coordinators of the program would also like to add a mentoring aspect. Wielert states that the idea of continuing teachers mentoring new teachers is something that she would like to see. Also there is a plan to have University of Miami students mentor *Urban Advantage: Miami* students in addition to *Urban Advantage* alumni mentoring current participants.<sup>107</sup> The hope is that as more people get involved, more would stay involved with the program.

Unfortunately, while there is definitely a need and purpose for *Urban Advantage: Miami* to be implemented, the funding is not always there. Despite the efforts of the partner institutions and school board to make a case for *Urban Advantage: Miami*, no program has been implemented at this time.

What little funding has been received from the state of Florida has gone to a modified version of the *Urban Advantage: Miami* program. This modified version allows for students to visit the partner institutions and conduct activities and experiments using inquiry-based science. Additionally, curriculum packets are available on each institution's website as a means of

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<sup>107</sup> Wielert, interview, December 14, 2011.

connecting the field trip with the classroom and assisting the teachers in continuing the science lesson carried out. But beyond this effort little is being done in the way of providing science teachers with much needed professional development and classroom resources.<sup>108</sup>

c. *Urban Advantage: Boston*

At present the *Urban Advantage* program in Boston is still in the early planning stages. Once implemented the Boston program, called *Boston Advantage*, will be a partnership between the Museum of Science, New England Aquarium, and Boston Public Schools.<sup>109</sup>

III. Conclusion

The *Urban Advantage* program in New York City has already demonstrated success in helping students meet the standards set by today's education. There is little doubt that the programs in Denver, and eventually Miami and Boston, will also see the same results in student performance. The *Urban Advantage* program is a breakthrough in a time when science education suffers many disadvantages. Educational legislation, lack of funding, and even deficiencies in teacher preparedness can hinder a student's potential in science. It is ironic that a generation born and raised in a world of continually advancing science and technology would be unable to demonstrate proficiency in science. This irony is why programs such as *Urban Advantage* are so crucial to education.

While one key element of the *Urban Advantage* program is the presence of a number of informal science institutions in New York, Denver, Miami, and Boston, it doesn't mean that similar partnerships in other areas or even other subjects will fail. When discussing the structure

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<sup>108</sup> Wielert, interview, December 14, 2011.

<sup>109</sup> "Pilot Proposal," Proposal (Boston: Urban Advantage, 2010).



of *Urban Advantage*, Nancy Wielert of Zoo Miami stated that the template is phenomenal and could easily be expanded to other subjects.<sup>110</sup>

Additionally the inter-museum partnership seen throughout the *Urban Advantage* National Network is something that many museum employees are eager to see elsewhere. Inter-museum partnerships, and museum-school partnerships such as these “broaden the definition of the schoolhouse,” says Ellen Futter, president of the American Museum of Natural History.<sup>111</sup> By creating a classroom in a different environment museums are sending the message that learning doesn’t stop. This message could benefit students across the country. It already has in New York City with *Urban Advantage*.

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<sup>110</sup> Wielert, interview December 14, 2011.

<sup>111</sup> Jeffrey Mervis, "Report Calls for Grassroots but Comprehensive Changes." *Science*, June 19, 2009, 1498.

### Part III: In the Schools

Libraries and schools often go hand in hand. Just about every school in the country has a school library attached and every major post secondary institution has a library on its campus or associated with it. Even in elementary school, students are encouraged to go to the library, so that by the time they reach high school or college, the library is synonymous with studying or research. It is a resource utilized by hundreds of thousands of students every day. But libraries are not formal places of learning. There are no rules governing how or what people learn when they go to the library. And yet it is nearly impossible to go to a formal place of learning and not encounter a library.

Students often first encounter museums as a field trip, a break from the formal learning which takes place at school. Much like libraries they encounter museums at an early age. And just like libraries, museums are not considered formal places of learning. When a student visits a museum they do not encounter rules telling them how or what they must learn. But unlike libraries, museums are not always seen as a resource and they are not necessarily synonymous with study or research.

But what if this view of museums changed? What if museums became supplemental to formal learning instead of simply being a break from it? And what if museums became synonymous with research that could potentially benefit all? Programs such as the *Calumet Environmental Education Program* at the Field Museum in Chicago, Illinois, and the *Watsonville Area Teens Conserving Habitats* program at the Monterey Bay Aquarium in Monterey, California explore the possibility of museums having a constant presence in the schools as well as the benefits that follow.

### *Calumet Environmental Education Program*

Students today spend a majority of time indoors. Advancements of technology often decrease a student's desire to venture outside. Additionally, increased focus on standardized testing coupled with decreased funding for schools takes away the luxury of letting students experience nature while in school. Even a field trip to a museum, albeit an experience outside of school, takes away from all that the natural world can offer in terms of learning science. But what if the great outdoors became the field trip? Or even the classroom? Could students benefit in the same way, if at all? The Field Museum in Chicago, Illinois explores the possibility through the *Calumet Environmental Education Program*...

#### I. Origins: Building a Ladder

In 1976, the United Nations Educational, Scientific and Cultural Organization set a goal for environmental education “to develop a world population that is aware of and concerned about the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively toward solutions of current problems and the preventions of new ones.”<sup>112</sup> In 2002 the Field Museum in Chicago, Illinois began taking steps to work toward this goal in southeast Illinois. The museum wanted to find a way to implement an environmental education program that centered on the Calumet region near Chicago.

The Calumet region is located along the southern shore of Lake Michigan, spanning forty-five miles from southeast Chicago, Illinois to northwest Indiana. Throughout most of the twentieth century this region was known for the steel mills and factories that dominated it and

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<sup>112</sup> Laurel Ross, Kirk Anne Taylor, and Rinda West, “A Model for Science Learning: Calumet Environmental Education Program,” Evaluation Report (Chicago: Field Museum, 2005), 4.

brought a thriving industrial economy to the area, but in the 1980s these factories went into decline. Now, environment-friendly methods have led to cleaner steel production in another region nearby, leaving the Calumet area a wasteland ravaged by toxins and chemical runoff. Scientists have found at least twenty-eight toxic metals and harsh chemicals along the Calumet River.<sup>113</sup>

Yet despite the assumption that these toxins, as well as neglect over time, would destroy the ecosystem in the Calumet region, the area has done surprisingly well, as careful scientific investigation has borne out. On August 23, 2002, the Field Museum helped to sponsor the Calumet Biodiversity Blitz, also known as BioBlitz. The BioBlitz brought together one-hundred and fifty scientists to take an inventory of the wildlife of the Wolf Lake, Eggers Woods, Powder Horn Marsh, and other areas in the Calumet region.<sup>114</sup> Over the course of twenty-four hours these scientists worked to identify and catalogue as many living organisms as they could. In total, scientists identified nearly 2,300 living organisms, including one-hundred and eleven species of birds, twenty species of mammals, nine amphibian or reptile species, nine-hundred and fifty-two species of plants and fungi, and invertebrates making up over half of the total number of species found.<sup>115</sup> The purpose of the BioBlitz was to assess what life exists amongst the remnants of the steel industry and from that assessment create a rich dataset to act as a catalyst for environmental study, restoration, and conservation, and therefore benefit scientists and conservation groups that would potentially work in the area.

In 2002, the Field Museum took the results of the BioBlitz a step further. In addition to scientists, environmentalists and conservators, the museum looked for a way to have students

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<sup>113</sup> Ryan Chew, "Discovering the Calumet," *Chicago Wilderness Magazine*, Spring 2009, 7.

<sup>114</sup> Don Parker, "Calumet BioBlitz," *Chicago Wilderness Magazine*, Fall 2002, accessed January 27, 2012, <http://www.chicagowildernessmag.org/issues/fall2002/bioblitz.html>.

<sup>115</sup> Mary Beth Prondzinski, "Calumet BioBlitz 2002 Results," Report (Chicago: Field Museum, 2002), 1-4.

take action. According to Kirk Anne Taylor, manager of the *Calumet Environmental Education Program*, the museum was looking for their Division of Environment Culture and Conservation to have a community-based conservation program involving the schools in southeast Chicago.<sup>116</sup> Additionally the *Chicago Public Schools Professional Development Project*, published in 2002, encourages teachers to “coordinate [their] curriculum within and across grade levels to provide coherent and developmentally sound program[s].”<sup>117</sup> This idea of an integrated curriculum, or essentially building a ladder across grade levels was implemented into the development of Field Museum’s conservation program for schools and before long the *Calumet Environmental Education Program* was born.

The *Calumet Environmental Education Program* began with one pilot high school and the eight elementary schools that feed it. The program started with three levels corresponding to different grades – *Mighty Acorns* for grade four through six, *Earth Force* for grades seven through eight, and *UrbanWatch* for grades nine through twelve.<sup>118</sup> Eventually *UrbanWatch* took over and became *Calumet is My Backyard* or *CIMBY*, an environmental conservation program that had already been in place in southeast Chicago classroom since 1998.<sup>119</sup>

The pilot program went on for three years incorporating professional development. Once the effectiveness of the program was determined, more schools were invited to participate, all implementing the integrated curriculum across grade levels. Today the pilot schools are still involved in the *Calumet Environmental Education Program*. “[The program] is part of their culture,” says Taylor.<sup>120</sup>

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<sup>116</sup> Kirk Anne Taylor, interview by author, February 15, 2012.

<sup>117</sup> Ross, Taylor, and West, “A Model for Science Learning,” 4.

<sup>118</sup> *Ibid.*, 5.

<sup>119</sup> Allison Carney Brown, and Arthur Melville Pearson, “Tales of Restoration,” *Chicago Wilderness Magazine*, Spring 2009, 18.

<sup>120</sup> See note 116 above.

## II. Structure: Out in the Field

The *Calumet Environmental Education Program* involves students in grades four through twelve. Participating students move through three programs which are incorporated into already existing science classes. Students in grades four through six participate in *Mighty Acorns*, students in grades seven and eight participate in *Earth Force*, and students in grades nine through twelve participate in *Calumet is My Backyard*.

The *Mighty Acorns* program was actually started prior to the development of the *Calumet Environmental Education Program*. The *Mighty Acorns* curriculum was first designed in 1993 by The Nature Conservancy and Forest Preserve District of Cook County, Illinois.<sup>121</sup> In 2002, the Field Museum integrated the *Mighty Acorns* program into the structure of the *Calumet Environmental Education Program* for students in grades four through six.

Through *Mighty Acorns*, fourth through sixth grade students are introduced to basic ecological concepts. The classes adopt a local natural area in the Calumet region and go on three field trips to that area during the school year. Pre-, post-, and field activities are provided for these field trips where students not only learn about the ecology and biodiversity of their area, but also help to restore it. Furthermore this program encourages free exploration within the designated area. According to Taylor students do their own journaling during this free exploration time when they are encouraged to “be in nature, [and] hone observations.”<sup>122</sup>

Just as the overall *Calumet Environmental Education Program* is structured to build on itself, the *Mighty Acorns* program is also designed for the curriculum of each individual grade level to build on itself. Fourth grade students focus on adaptation and interdependence within their natural area. Students examine qualities of the creatures they find in said area and the

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<sup>121</sup> "History," *Mighty Acorns* website, accessed March 3, 2012, <http://www.mightyacorns.org/history.html>.

<sup>122</sup> Taylor, interview, February 15, 2012.

habitats to which those creatures belong. They look into the basic needs of the species and how the area provides those needs. Fifth grade students deal with communities and competition within their natural area. Students learn about communities created by the plant and animal life within the area and also learn about naturally competing organisms and invasive species. Students compare the health of an ecosystem to the health of a human by drawing parallels between modern medicine and environmental stewardship. In the sixth grade students learn about biodiversity. Through their activities and field trips students examine different types of animal and plant species within their natural area and how they coexist.

Throughout all levels of *Mighty Acorns*, students learn about environmental stewardship and what they can do to benefit the natural area which they visit. While at the natural site students do stewardship activities and restoration work so as to preserve the nature in the area which they study.<sup>123</sup> The *Mighty Acorns* component of the *Calumet Environmental Education Program* aims to provide students in grades four through six with skills in observation, communication, scientific measurement and classification and predicting outcomes based on provided evidence. Through the program students meet Illinois Science Learning Standards 11A, 12B and 13B, as well as Language Arts Learning Standard 4A.<sup>124</sup>

During seventh and eighth grades, students in the *Calumet Environmental Education Program* go through the *Earth Force* program. *Earth Force* is a national non-profit environmental education program based in Washington, D.C. with nine field offices around the country. The national program provides curriculum materials and teacher training.<sup>125</sup> When the Field Museum organized the *Calumet Environmental Education Program*, the *Earth Force* model was integrated into framework for students in the seventh and eighth grades.

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<sup>123</sup> "Education," *Mighty Acorns* website, accessed March 3, 2012, <http://www.mightyacorns.org/education.html>.

<sup>124</sup> Ross, Taylor, and West, "A Model for Science Learning," 5.

<sup>125</sup> *Ibid.*, 7.

*Earth Force* is arranged as a six step service learning program that aims at teaching students how to go about solving problems in their local environment. Step one of *Earth Force* involves the identification of environmental issues with slight research into each issue. Step two involves a short presentation of issues, followed by the students discussing and deciding as a class which issue they would like to concentrate on during the school year. Steps three, four, and five have students taking action to address the issue. Students research the chosen issue at length and all policies surrounding it. Then students design a plan to take action. Soon after, the students implement their plan in the community with the help of community-based organizations and volunteers. In the final step of the *Earth Force* program, students assess their work and report.<sup>126</sup>

The projects and action plans generated by students participating in the *Earth Force* aspect of the *Calumet Environmental Education Program* vary from monitoring water quality, to planting a butterfly garden, to raising beetles to control invasive plants.<sup>127</sup> In addition to taking action in their own community, students raise awareness of their chosen issue in an end of the year summit where they present the projects.<sup>128</sup> As a part of the *Calumet Environmental Education Program*, *Earth Force* utilizes skills already established in the students through *Mighty Acorns* and then continues to build on those skills. Through *Earth Force* students hone their skills of observation, communication, classification, and prediction, while also beginning to develop skills such as data collection and interpretation, investigation, and forming hypotheses.

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<sup>126</sup> "The Earth Force Process," Earth Force website, last modified 2010, accessed March 3, 2012, <http://www.earthforce.org/index.php?PID=11>.

<sup>127</sup> Ross, Taylor, and West, "A Model for Science Learning," 7.

<sup>128</sup> Taylor, interview, February 15, 2012.



*Earth Force* also helps students to meet Illinois Science Learning Standards 11A, 12B, and 13B, as well as Language Arts Learning Standard 4A.<sup>129</sup>

Students in grades nine through twelve, participating in the *Calumet Environmental Education Program* take part in *Calumet is My Backyard*, formerly called *UrbanWatch*. *UrbanWatch* was developed by scientists at the Field Museum along with the Illinois Natural History's Survey *EcoWatch* program and then merged with *Calumet is My Backyard*, a community program already in existence in some southeastern Chicago schools.<sup>130</sup> This aspect of the *Calumet Environmental Education Program* is formatted much like *Mighty Acorns* however it is much more in depth. Just as they did while participating in *Mighty Acorns*, classes involved in *Calumet is My Backyard* adopt a local natural area within the Calumet region and focus on said area throughout the school year. They visit the site three times, at which time there is guided exploration of the site, restoration work, and data collection. According to Taylor, the field activities for *Calumet is My Backyard* fall under "ecological monitoring" and the classroom components are left at the discretion of the teachers.<sup>131</sup> This ecological monitoring includes data collection and scientific measurements of variable ecological factors within the area. These measurements of scientific factors reinforce what is taught to the students in the classroom and the data collected by the students are then passed on the local scientists and volunteers in order to benefit the conservation and preservation work done by members of the community.<sup>132</sup>

By participating in the *Calumet is My Backyard* aspect of the *Calumet Environmental Education Program*, students enhance their own scientific experience by taking measurements and collecting data, and then make it relevant to their own community by sharing it with local

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<sup>129</sup> Ross, Taylor, and West, "A Model for Science Learning," 5.

<sup>130</sup> *Ibid.*, 7.

<sup>131</sup> Taylor, interview, February 15, 2012.

<sup>132</sup> "CIMBY Field Activities," The Field Museum, last modified 2012, accessed March 3, 2012, <http://fieldmuseum.org/explore/department/ecco/cimby-field-activities>.

scientists. This process allows them to take action in addition to learning. The foundation of scientific skills and knowledge already in place from student involvement in *Mighty Acorns* and *Earth Force* is further augmented by *Calumet is My Backyard*. Skills reiterated in the high school aspect of the program include observation, communication, data collection and interpretation, classification, investigation, and formation of hypotheses, with skills in experimentation being traduced in the program curriculum. Through their involvement in *Calumet is My Backyard* students fulfill Illinois Science Learning Standards 11A, 12B, 13B, and Language Arts Learning Standard 4A.<sup>133</sup>

Professional development is also an important component of the *Calumet Environmental Education Program*. Professional development is based on *The Glenn Report*, more formally known as *Before It's Too Late: A Report to the Nation from the National Commission on Mathematics and Science Teaching in the 21<sup>st</sup> Century*, published in 2000. In 2002, the Field Museum started the *Calumet Environmental Education Program* with a two day teacher workshop called "Wonders of Calumet." This workshop introduced teachers to the Calumet region and the diversity and ecology of some of the area in which they and their students would be working. The Field Museum continues this workshop every year and provides all training, materials, and curricula for the teachers. Each year the program begins with a summer institute for teachers. This institute not only provides them with resources to use in the classroom but is also designed to give teachers hands-on experience in the field. Taylor states that this training is essential for helping teachers connect to the region, especially those teacher who commute to work, "Just because they work in this community doesn't mean they live here."<sup>134</sup>

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<sup>133</sup> Ross, Taylor, and West, "A Model for Science Learning," 5.

<sup>134</sup> Taylor, interview, February 15, 2012.

Professional development does not end after the summer institute. Teachers participate in inquiry groups throughout the school year. These inquiry groups, also based on *The Glenn Report*, continue to provide support to the teachers as they collaborate across grade levels to integrate the curriculum. Finally, once a year students and educators alike are invited to participate in an annual Calumet Stewardship Day. This day invites all involved with the *Calumet Environmental Education Program* as well as others from the local community. This day supports the hand-on experiences of both the teachers and students in addition to sending a message to all participants that environmental stewardship does not end once the participation in the program is over.<sup>135</sup>

The Field Museum provides opportunities for students to remain involved with the *Calumet Environmental Education Program* beyond the school year through summer camps, volunteer days, and even an internship program for high school students.<sup>136</sup>

### III. Impact: Growth and Success

The *Calumet Environmental Education Program* is unique in many ways. Unlike other museum-school partnership programs, the students have very little contact with the partner museum. At all three levels of the *Calumet Environmental Education Program*, field trips take place exclusively at the nature sites in the Calumet region as opposed to taking place at the Field Museum. However, this does not mean that the Field Museum has not been involved with the program since the initial planning phase. The Field Museum provides professional development materials and resources for teachers involved with the program. There are six staff members at the Field Museum constantly providing program support – two staff members working with

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<sup>135</sup> Ross, Taylor, and West, "A Model for Science Learning," 8-9.

<sup>136</sup> "CIMBY Summer Internships and the Ford Environmental Leadership Internship," The Field Museum, last modified 2012, accessed March 3, 2012, <http://fieldmuseum.org/explore/department/ecco/CIMBYSummerInternships>.

*Mighty Acorns*, two staff members working with *Earth Force*, and two staff members working with *Calumet is My Backyard*. Additionally the work done by the students in the program is constantly being connected to science research at the Field Museum and vice versa. All across the museum, scientists use the measurements and data collected by the students to further research and conservation efforts. In this way the program not only benefits the students but the museum, states Taylor, “Students work in high priority conservation areas.”<sup>137</sup>

In addition to this apparent impact on both the museum and program participants, an evaluation was done on the pilot schools of the *Calumet Environmental Education Program* over the course of the first three years of the program. Five research questions to address in a questionnaire were designed by the TNI Consulting group to address the teachers’ understanding and teaching of environmental knowledge, the curriculum, and the students’ understanding and willingness to take action. Pre-test questionnaires were given to teachers at the summer institute and to students prior to the beginning of the program. Post-test questionnaires were given at the end of the school year upon culmination of the program.<sup>138</sup> Student grades were never included in the evaluation as there was never a control group to indicate if improvement of grades was directly connected to the implementation of the program. Rather student understanding of concepts taught in the program was the focus of evaluation.<sup>139</sup> A total of one-hundred and eleven students participated in all three year of the pilot program.<sup>140</sup>

Significant changes in both students and teacher understanding of environmental concepts was indicated at all three levels of the program. Students were given the same test at the beginning and end of the program each year. The changes in percentage of correct responses

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<sup>137</sup> Taylor, interview, February 15, 2012.

<sup>138</sup> Terrie Nolinske, “Evaluation Report Calumet Environmental Education Program 2003-2004,” Evaluation Report (TNI Consultants, 2004), 2.

<sup>139</sup> See note 137 above.

<sup>140</sup> Ross, Taylor, and West, “A Model for Science Learning,” 9.

on the test were analyzed. For the *Mighty Acorns* program the most significant changes in responses ranged anywhere from twenty percent to forty percent, indicating that twenty to forty percent of students participating in the program gained certain knowledge from their experience.<sup>141</sup>

Changes in the *Earth Force* program were not as considerable: the most significant increase in correct responses was eighteen percent in year two.<sup>142</sup> However this could be due to the fact that some *Earth Force* participants had also participated in *Mighty Acorns* and had retained prior knowledge from their involvement in the earlier program. Regardless of this, evaluators did see an increase in correct responses on eleven out of twelve question posed to the students on the tests.<sup>143</sup>

Because only one high school was included in the pilot program, as opposed to the eight feeder schools, the evaluation of *Calumet is My Backyard* (called *UrbanWatch* all through the pilot program) had even more limitations. The high school aspect of the program only had fifty-eight participants in its first year and only sixty-four students in the second year. Because of this, the most significant findings on the administered surveys indicated only a ten percent increase in correct response.<sup>144</sup> In order to remedy these limitations high school students were put into small focus groups to discuss their learning experience and participation in the program. The discussions touched on all aspects of science learning and program curriculum. One such student spoke about data collection saying,

“We gathered data on species diversity in the test area. We’d square off the areas and every ten meters we’d count the different types of species. Then we’d use

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<sup>141</sup> Nolinke, “Evaluation Report Calumet Environmental Education Program 2003-2004,” Evaluation Report, 8-9.

<sup>142</sup> *Ibid.*, 10.

<sup>143</sup> Ross, Taylor, and West, “A Model for Science Learning,” 11.

<sup>144</sup> Nolinke, “Evaluation Report Calumet Environmental Education Program 2003-2004,” Evaluation Report, 11.

equations to calculate diversity in the area...the whole experience made me want to learn about the environment.”<sup>145</sup>

Another student discussed identification and classification,

“We made beetle traps so we could identify types of beetles in the area. We cored two trees to determine their age. We used a GPS to mark locations where we worked and mapped them. That way we can locate every species of tree and see how many there are. We learned to identify trees just by looking at the leaf. That was pretty cool.”<sup>146</sup>

Through these focus groups it can be seen that students are gaining scientific knowledge as well as having memorable experiences from their participation in the program.

In addition to establishing the impact on students, evaluations indicated that teachers also gained considerable knowledge and confidence from their involvement in the *Calumet Environmental Education Program*. Increases in teacher knowledge were higher than those of students with the number of correct responses on the tests increasing by eighty-seven percent in some cases. Additionally confidence in teaching environmental science was greatly increased by the end of the three year pilot period with a forty-two percent increase in understanding and confidence teaching general environmental issues, and a ninety-six percent increase in understanding and in teaching environmental issues pertaining to the Calumet region.<sup>147</sup> One teacher stated,

“In grade school, I thought that science was boring and dull. I hated it. All I remember from science is reading the lesson and answering questions and then studying for a test. I was never a science person. But when I went to the

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<sup>145</sup> Ross, Taylor, and West, “A Model for Science Learning,” 11.

<sup>146</sup> Ibid., 11.

<sup>147</sup> Ibid., 13.

[*Calumet Environmental Education Program*] summer training and field trips, science was enhanced – more hands-on. I look forward to teaching it to students.”<sup>148</sup>

Overall these evaluations indicate that the program provides a rich and meaningful experience for science teachers as well as the students.

Although student grades were not considered in the evaluation of the program, improvements in standardized test scores were examined. Test scores for participating students at the Gallistel Language Academy were looked at for evaluation purposes. In 2005, fifty-nine percent of students across the school met or exceeded science standards on the Illinois Standard Achievement Test. This number indicated a five percent increase from 2004 and a thirteen percent increase from 2003.<sup>149</sup> Despite the fact that not all students at the school participate in the *Calumet Environmental Education Program*, Patrick MacMahon, the principal, says, “The ‘hands-on’ aspect of the program...has had a positive impact on our standardized test scores.”<sup>150</sup>

#### IV. Conclusion

At present the *Calumet Environmental Education Program* involves 4,700 students, and one-hundred and thirty-six teachers at forty-four schools in southeast Illinois and northwest Indiana. These participants work with seventeen natural areas in the Calumet region and conduct nine major conservation projects in a given year.<sup>151</sup> It is clear from evaluations that both the students and the teachers benefit academically from their involvement in the program. Additionally their experience provides vital information to local scientists, and volunteer who seek to conserve the Calumet region. But more importantly, those involved with the *Calumet*

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<sup>148</sup> Ross, Taylor, and West, “A Model for Science Learning,” 12.

<sup>149</sup> *Ibid.*, 12.

<sup>150</sup> *Ibid.*, 12.

<sup>151</sup> Taylor, interview, February 15, 2012.

*Environmental Education Program* gain something greater than the scientific knowledge of the region. They gain a sense of stewardship and desire to continue the work they begun while a part of the program. One teacher states,

“By our third trip to Eggers Woods, my class was feeling that the area was ‘their’ area. When they saw the mustard grass had grown all of a sudden, they had a lot of gusto pulling it out. A few of my students were upset to leave any of these plants and were very concerned that the other two classes had removed every single plant after we had gone.”<sup>152</sup>

In addition to increasing the knowledge of the students involved, this program changes their attitudes toward the environment and instills in them the awareness and desire to take action in their own environment. This outcome is far more valuable than any test score. In a day and age when the information about our world is constantly being added to, it is the duty of all educators, both in schools and in museums, to provide students with the ability to protect this world from its inhabitants and the *Calumet Environmental Education Program* does so brilliantly through science education. By providing students with the knowledge and hands-on scientific experiences, this program gives students a better chance at facing environmental problems of all kinds. This is the true benefit of the program, because as one student observes, “We shouldn’t be the problem, but the solution.”<sup>153</sup>

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<sup>152</sup> Nolinke, “Evaluation Report Calumet Environmental Education Program 2003-2004,” Evaluation Report, 13.

<sup>153</sup> *Ibid.*, 13.



### *Watsonville Area Teens Conserving Habitats*

One of the challenges of science classes is that they can seem routine. It is so easy to talk about experiments and procedures and results, but replicating them can be a challenge, requiring equipment and resources. However, hands-on, inquiry-based science can bring classes to life and spark an interest that some students might not know exists. Furthermore letting students participate in hands-on science in their local environment allows them to take ownership of their learning in an area with which they are already familiar. Opportunities such this can benefit students in so many ways, and that is exactly what is being done through the *Watsonville Area Teens Conserving Habitats* program at the Monterey Bay Aquarium, in Monterey, California.

#### I. Origins: A Partnership in the Making

Pajaro Valley High School is located in Watsonville, California. The town borders on one-hundred acres of freshwater wetlands known as the Watsonville Sloughs. The Watsonville Sloughs are among the largest remaining freshwater marshlands along the California coast, and provide refuge for the wildlife and filtering water that drains into Monterey Bay. Development throughout California has devastated the wetlands, destroying ninety percent of the natural wetlands across the state.<sup>154</sup> As such the building of the new Pajaro Valley High School in 2003 did not help the surrounding Sloughs, and environmental concerns along with zoning issues inevitably arose. To solve the problem, the new school was devoted to environmental education, with the goal of helping its students become stewards of their community.<sup>155</sup>

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<sup>154</sup> "Teaching Teens to WATCH the Environment," Institute of Museum and Library Services, last modified August 2010, accessed February 27, 2012, [http://www.imls.gov/august\\_2010\\_teaching\\_teens\\_to\\_watch\\_the\\_environment.aspx](http://www.imls.gov/august_2010_teaching_teens_to_watch_the_environment.aspx).

<sup>155</sup> Wendy Wheeler, "More than Just a Fieldtrip: Monterey Bay Aquarium's WATCH Program," Innovation Center for Community and Youth Development, last modified October 29, 2009, accessed February 26, 2012, <http://www.theinnovationcenter.org/blog/more-just-fieldtrip-monterey-bay-aquariums-watch-program>.

In 2005, a year after Pajaro Valley High School opened its doors, the Monterey Bay Aquarium was going through a strategic planning phase to refocus its educational programming. Although the aquarium has over 80,000 student visitors a year in field trips, its educators wanted to focus on a community. Watsonville, California seemed an ideal choice. “We were rethinking the aquarium’s education program. We liked the model of offering direct experience for kids, parents, teachers, and the community as a whole... We decided to focus our efforts on a single geographic area,” says Rita Bell, education program manager of the Monterey Bay Aquarium.<sup>156</sup> According to Kim Swan, director of teen programs at the Monterey Bay Aquarium, a majority of the population in Watsonville is under the age of eighteen. This, added to environmental goals of the new high school in the community and the apparent need for high school programming at the museum, provided the perfect opportunity for the Monterey Bay Aquarium and Pajaro Valley High School to join forces.<sup>157</sup>

The *Watsonville Area Teens Conserving Habitats* program was the result of this partnership between the Monterey Bay Aquarium and Pajaro Valley High School. The pilot program began in 2006 with twenty-five students at Pajaro Valley High School. The first cohort for this after-school program included sophomore, junior, and senior students.<sup>158</sup> A year later, the pilot program was expanded with the financial aid of a *Museums for America* grant from the Institute of Museum and Library Services. This grant, totaling \$149,947, enabled the aquarium to open the program to the entire school and allowed for the program to transition from an after-school program to one offered in the classroom.<sup>159</sup>

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<sup>156</sup> Wheeler, "More than Just a Fieldtrip," <http://www.theinnovationcenter.org/blog/more-just-fieldtrip-monterey-bay-aquariums-watch-program>.

<sup>157</sup> Kim Swan, interview by author, February 13, 2012.

<sup>158</sup> Ibid.

<sup>159</sup> "Teaching Teens to WATCH the Environment," [http://www.ims.gov/august\\_2010\\_teaching\\_teens\\_to\\_watch\\_the\\_environment.aspx](http://www.ims.gov/august_2010_teaching_teens_to_watch_the_environment.aspx).

In 2009 the *Watsonville Area Teens Conserving Habitats* program was implemented at Watsonville High School. Since then, the students from the two schools have been kept in separate programs, although Swan acknowledges that the aquarium has considered merging the programs so that students from differing schools could interact with one another. According to Swan, merging the programs may be reconsidered if another school is added.<sup>160</sup>

Also in 2009, the Monterey Bay Aquarium received a three year grant from Nokia. The \$772,000 grant provided funding and equipment to continue the program. Today the program reaches more than 1,200 students and has received additional grants from Bank of America and the California Coastal Commission's Whale Tail Grant Program.<sup>161</sup> According to Swan, the program relies primarily on grants for funding and is often pursuing grants. The museum will not cut the program in the event of losing a grant. Fortunately grants and funding from donors has enabled the program to continue.<sup>162</sup>

## II. Structure: Environmental Focus

The *Watsonville Area Teens Conserving Habitats* program originally began as an after-school elective exclusively for sophomore, junior, and senior students at Pajaro Valley High School. A summer session started the program. For three weeks, students would study habitats in the local wetlands area and also complete restoration projects. These projects were completed during the school year. The yearlong class, called the WATCH Environmental Science Elective, met three times a week after school for a total of about four and a half hours per week and was taught by teachers from Pajaro Valley High School as well as staff from the Monterey Bay

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<sup>160</sup> Swan, interview, February 13, 2011.

<sup>161</sup> Angela Hains, "Monterey Bay Aquarium Receives a Three Year, \$772,000 Grant From Nokia," Zoo and Aquarium Visitor, last modified June 29, 2009, accessed February 26, 2012, [http://www.zandavisitor.com/newsarticle-1727-Monterey\\_Bay\\_Aquarium\\_Receives\\_a\\_Three-year\\_\\$772.000\\_Grant\\_From\\_Nokia](http://www.zandavisitor.com/newsarticle-1727-Monterey_Bay_Aquarium_Receives_a_Three-year_$772.000_Grant_From_Nokia).

<sup>162</sup> See note 160 above.

Aquarium. The class also had a field aspect which met on the weekends. During the weekend meetings, students would collect data for their projects with the help of Monterey Bay Aquarium educators. The final aspect of this early program also incorporated a freshman event at the Monterey Bay Aquarium. This two-day event took place in February and was an attempt to share the experience offered by the elective class. During the event the entire freshman class of three-hundred and fifty students would visit the aquarium and three program alumni would present their projects.<sup>163</sup>

Since the initial pilot period, there have been many changes to the structure of the *Watsonville Area Teens Conserving Habitats* program. Now that the program is open to all students at Pajaro Valley School and also at Watsonville High School, teachers recommend students for the program and these students must meet certain requirements in order to begin the class. Students must be on track for graduation and in good standing with the school; they must also be able to participate in the summer session. According to Swan, recruitment for the class varies at the different schools. Swan states that it has taken a while to build a culture around the class as many students view it as an especially difficult elective. She says that, while the program often receives more applicants than it can accommodate, the class is never filled. In a given year thirty-six students can be accepted into the program, but thus far there has never been a year with thirty-six students who meet the prerequisites to enter the class.<sup>164</sup>

Once the pilot program for the *Watsonville Area Teens Conserving Habitats* program was completed, the summer session was scaled back. Now the summer session takes place over the course of two weeks instead of three. The purpose of the summer session is to increase the students' understanding of environmental science by exposing them to the natural areas in their

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<sup>163</sup> "Teaching Teens to WATCH the Environment,"

[http://www.imls.gov/august\\_2010\\_teaching\\_teens\\_to\\_watch\\_the\\_environment.aspx](http://www.imls.gov/august_2010_teaching_teens_to_watch_the_environment.aspx).

<sup>164</sup> Swan, interview, February 13, 2012.

own community. During the summer session the students focus on the ecosystem of the local watershed and other such endangered areas.<sup>165</sup> The summer session provides a mix of team building activities, field research, restoration projects, and exploration in different areas. Various team building activities allow for students to learn how to communicate and work together which will help them as they conduct group projects during the school year. They meet with scientists at local institutions while on field trips to places such as the Monterey Bay Aquarium and also the Monterey Bay Area Research Institute. Students also explore the different types of natural areas – wetlands, dunes, river, etc. – which they will be studying through various different field trips. These trips, which vary from days at the beach to kayaking in Elkhorn Slough, offer an element of fun as well as learning.<sup>166</sup>

The *Watsonville Area Teens Conserving Habitats* program began being offered as a class during the school day in 2007 with the help of the Museums for America grant from the Institute of Museum and Library Services. The class is co-taught by teachers at the schools and two educators from the Monterey Bay Aquarium. These educators, although employed by the aquarium, have an office on site at the school and are at the school full-time. They also lead the summer session in addition to co-teaching the class during the school year.<sup>167</sup>

Students also complete group projects over the course of the year. On average there are six projects per class and these projects range from evaluating the impact of marine debris on Monterey Bay to assessing how humans influence sea otter behavior.<sup>168</sup> The students pick a topic with a testable question and then collect usable data in the natural areas surrounding the

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<sup>165</sup> Swan, interview, February 13, 2012.

<sup>166</sup> Chris Parsons, "Watsonville Area Teens Conserving Habitats (WATCH) Connecting with Their Community's Watershed," *Children, Youth and Environments* 21, no.1 (2011): 215.

<sup>167</sup> See note 165 above.

<sup>168</sup> "Teaching Teens to WATCH the Environment," [http://www.ims.gov/august\\_2010\\_teaching\\_teens\\_to\\_watch\\_the\\_environment.aspx](http://www.ims.gov/august_2010_teaching_teens_to_watch_the_environment.aspx).

school. The yearlong class, called Environmental Science at Pajaro Valley High School and Marine Biology at Watsonville High School, meets three times a week and also includes four Saturday field experiences. During these weekend field sessions, students continue the restoration work they began in the summer session in addition to taking and analyzing data for their group projects.<sup>169</sup>

Each project is also assigned a project advisor and a science mentor. Project advisors are teachers on-site at the high school and are available to help students with the structure of the project. They assist students with the formatting and organization of the project during the year. The advisors, who also help with the summer session, don't necessarily have a science background but they have an interest in the program. Science mentors come from local science institutions, such as the Monterey Bay Aquarium or local colleges and universities. Because these science mentors typically have a science background they are available to assist students with the science aspect of the project during the year.<sup>170</sup>

At the end of the school year, students present their projects at an end-of-year seminar. Also as the culmination of the class, each student who successfully completes the *Watsonville Area Teens Conserving Habitats* program receives a \$1,000 scholarship toward college or some other post-secondary training institution provided that the student has already been accepted.<sup>171</sup>

The apparent impact of the *Watsonville Area Teens Conserving Habitats* program on student attitudes toward the local watershed has led to further expansion of the program. The Monterey Bay aquarium is looking to include a second year of programming focusing on economic issues tied to environmentalism. This second class, also a science elective offered during school, deals primarily with environmental conservation and preservation at the policy

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<sup>169</sup> Parsons, "Watsonville Area Teens Conserving Habitats (WATCH)," 215.

<sup>170</sup> Swan, interview, February 13, 2012.

<sup>171</sup> Ibid.

level. Students learn about ways in which their local, state, and national governments impact the natural areas in the community and also how policy decisions can both help and hurt the environment. Kim Swan says, “Right now, the kids are doing things directly within their sphere of influence, like authoring a brochure on environmental debris. But with this economic component, they’ll be looking at things that drive change within the community. The question for them is ‘How can the change I make become systemic?’ It’ll be very hands on!”<sup>172</sup> By incorporating this new approach to environmental science, the program is now multi-dimensional attracting students who have a strong interest in science as well as students with a strong interest in politics and governmental issues.

Professional development is also an important aspect of the *Watsonville Area Teens Conserving Habitats* program. Teachers from Pajaro Valley High School and Watsonville high School participate in a yearly science teacher institute, where they are trained in inquiry-based science. During this training, teachers participate as if they are a cohort of students going through the program and complete many of the activities the students complete during the summer session of the program. During the school year, teachers involved with the program meet monthly to continue this professional development. Swan states that working with the teachers was an important aspect of the partnership between the Monterey Bay Aquarium and the schools. The difficulty for the teachers in regards to doing inquiry-based science is the lack of resources, which the aquarium was able to provide through the program. “[There was a] structure we could easily fall into,” says Swan.<sup>173</sup>

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<sup>172</sup> Wheeler, "More than Just a Fieldtrip," <http://www.theinnovationcenter.org/blog/more-just-fieldtrip-monterey-bay-aquariums-watch-program>.

<sup>173</sup> Swan, interview, February 13, 2012.

### III. Impact: Growth and Success

The impact of the *Watsonville Area Teens Conserving Habitats* program is apparent even before any formal evaluation is done. In many cases student groups continue their projects beyond the end of the school year. One such group project led to the implementation of a permanent recycling program at Pajaro Valley High School, while another led to the creation of an organic community garden, also at the school.<sup>174</sup>

Additionally, evaluation has been an important component of the *Watsonville Area Teens Conserving Habitats* program since the beginning. The focus of evaluation was not students' grades. Because there was no control group for grades in science evaluation focused on variables which the program could control. The evaluation took a more qualitative approach tracking the students' longitudinal behavior, apparent connection to nature, environmental concerns, etc.<sup>175</sup>

Multiple methods were used to evaluate the program. Participating students were asked to complete a survey at the beginning and end of the summer session. This survey included closed response questions, such as scales and multiple choice questions, as well as open-ended questions. The survey also included an Inclusion of Other in Self Scale (see Appendix C), where the students indicate their relationship with the natural environment and also their local community by identifying with one of seven images of overlapping circles. The final component of the survey is a concept map (see Appendix C) with the Pajaro River Watershed as the main concept.<sup>176</sup>

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<sup>174</sup> "Teaching Teens to WATCH the Environment," [http://www.ims.gov/august\\_2010\\_teaching\\_teens\\_to\\_watch\\_the\\_environment.aspx](http://www.ims.gov/august_2010_teaching_teens_to_watch_the_environment.aspx).

<sup>175</sup> Swan, interview, February 13, 2012.

<sup>176</sup> Parsons, "Watsonville Area Teens Conserving Habitats (WATCH)," 218.



At the end of the school year component of the program, students are again asked to complete the survey to see how attitudes changed again from involvement during the school year. However, after a few years it became apparent that this post-post survey seemed repetitive, and many students were reluctant to take it a second time. As a result this post-post survey was changed in 2010, eliminating the concept map and incorporating a retrospective storyboard (see Appendix C). This three scene storyboard is completed in groups and asks students to illustrate what their attitudes toward the environment were before, during, and after their involvement with the *Watsonville Area Teens Conserving Habitats* program.<sup>177</sup>

Two other methods have been employed to evaluate the *Watsonville Area Teens Conserving Habitats* program. As of 2009, there is an online rubric completed by project advisors every month which helps to track the progress of each project through the year and also assesses interaction between student groups and project advisors. Evaluators also developed a periodic survey to be completed by alumni of the *Watsonville Area Teens Conserving Habitats* program and other aquarium teen programs so as to assess the overall impact.<sup>178</sup> Additionally Swan states that the first cohort of the program will be graduating from college soon and there is a plan to evaluate those students to see how their involvement in the program impacted their course of study beyond high school.<sup>179</sup>

Analysis of the data indicated that student attitudes changed significantly as a result of participation in the *Watsonville Area Teens Conserving Habitats* program. Many students indicate that their reason for joining the program is superficial with typically seventy-five percent of students joining to have fun, fifty-five percent joining to meet people and make friends, and fifty-five percent joining because they like nature or the ocean. However surveys

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<sup>177</sup> Parsons, "Watsonville Area Teens Conserving Habitats (WATCH)," 220.

<sup>178</sup> Ibid.

<sup>179</sup> Swan, interview, February 13, 2012.

also indicate that between ninety and one-hundred percent of students are changed by their participation, either by becoming more aware of their natural environment, issues surrounding it, or their impact on it. One student comments on the 2010 survey,

“I would recommend this program because it really does open your eyes to problems in our world. It is a great experience and a great chance to have fun outdoors and try new things that can help you grow as a person.”<sup>180</sup>

The Inclusion of Other in Self scale has limitations with regards to objective analysis because every student starts at a different place on the scale. However it is clear from the analysis that there is a considerable increase in the students’ connection to their local environment. Thus far no evaluation has indicated a decrease on the Inclusion of Other in Self scale. Additionally analysis of concept maps demonstrates a similar consistent increase in students’ knowledge of the local watershed. Examination of retrospective storyboards showed that the student groups followed three themes while completing that aspect of the survey – personal changes, such as going from being shy to meeting people and working together to making friends; conservation behavior changes, such as going from littering and not caring about the environment to actively recycling and encouraging others to do the same; and knowledge gains, such as going from knowing only a little about the environment to learning and eventually seeing the wetlands as “cool.”<sup>181</sup>

Although the evaluation of the surveys provided positive results, there were certain limitations that could not be overlooked. For instance, changes between the pre-survey and the first post-survey were significant, the changes between the first post survey, administered at the end of the summer session, and the second post-survey, administered at the end of the school

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<sup>180</sup> Parsons, "Watsonville Area Teens Conserving Habitats (WATCH)," 222.

<sup>181</sup> Ibid., 223.

year were less significant. This is possibly due to the change in focus between the summer session and the school year. The summer session of the program centers on teamwork and learning about the local natural areas which sets students up for the school year aspect. The class during the school year centers more on application of knowledge and skills through the group projects.<sup>182</sup>

Additionally the omission of certain topics on the concept maps brought to light other possible limitations and flaws in the *Watsonville Area Teens Conserving Habitats* program. Many students assume that the watershed does not go to the ocean and do not consider themselves as living in the watershed, two key elements that students should understand by the time they have finished the program. Also there was a tendency for students to focus on negative aspects of environmentalism, such as pollution, rather than the positive aspects, such as restoration. The teachers and aquarium staff members have already begun to address these limitations and flaws in the content of the program.<sup>183</sup>

The 2009 alumni survey showed that the *Watsonville Area Teens Conserving Habitats* program has a higher impact on its alumni than other aquarium teen programs especially in regards to attending college. The surveys indicated that sixty-two percent of *Watsonville Area teens Conserving Habitats* program alumni cite the program as directly influencing their decision to go to college as opposed to forty-five percent of alumni from other aquarium teen programs. One student commented,

“Before participating in the [*Watsonville Area Teens Conserving Habitats*] program, the environment had already been of importance to me, but I never really thought of it consciously. [*Watsonville Area Teens Conserving Habitats*]

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<sup>182</sup> Parsons, "Watsonville Area Teens Conserving Habitats (WATCH)," 225.

<sup>183</sup> Ibid., 225.

helped further my factual knowledge of environmental and ocean conservation, but more importantly, it made me ACTIVELY AWARE of the natural environments around me.”<sup>184</sup>

Overall evaluations of both students and program alumni indicates that the *Watsonville Area Teens Conserving Habitats* program does have positive impact on its participants, be it by changing their attitude towards their local environment or influencing their college decisions. In both regards the program can definitely be viewed as a success.

#### IV. Conclusion

The *Watsonville Area Teens Conserving Habitats* program was started to serve both the Monterey Bay Aquarium in its attempt to restructure and focus its educational programming, and also Pajaro Valley High School in its aim to be environmentally focused on the natural area surrounding it. The program turns the local environment into a classroom and then combines hands-on inquiry based science with environmental restoration to build a curriculum.

Like many educational programs around the country, *Watsonville Area Teens Conserving Habitats* attempts to make a connection between what is taught in the science class and what students encounter in their everyday lives. This is not a difficult task, as many of the students taking the class at Pajaro Valley High School, and now Watsonville High School, live among the natural areas that form the focus of the class. The program gives students the opportunity to work in what is essentially their own backyard, allowing them to take ownership of the environment and invest a bit of themselves into the natural areas.

The *Watsonville Area Teens Conserving Habitats* program may not have definitive proof that involvement in the program has a direct effect on student grades or test scores. But

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<sup>184</sup> Parsons, "Watsonville Area Teens Conserving Habitats (WATCH)," 226.

extensive evaluation of the program has shown that there is a definite influence on the students' attitudes towards their local community and the environment in general. This shift in student attitudes, in itself, is an indicator of the success of the program. Furthermore the dedication to the students both academically, and financially (through the scholarship provided to students upon completion), as well as the determination to continue to program even in the event of cuts in funding demonstrate that this program is a priority to the Monterey Bay Aquarium as well as the schools involved.

This kind of partnership could revolutionize science education. It makes the students, rather than the standards and test scores a top priority while taking advantage of the local community. It shows students that they matter and enables them to do something worthwhile in an area with which they are familiar. This structure makes science something they do, not just something they learn, and has already demonstrated that it can change attitudes. Surely a change in grades and test scores are not far behind.

#### **Part IV: After School**

Most students are under the impression that learning is over once class gets out. Statements made by teachers that learning never ends seem more ominous rather than optimistic. But regardless of the perception, the statement rings true... learning never ends. And in that statement is the idea behind after-school programming.

Informal institutions, such as museums, are not always at the mercy of the rules that govern education, and as such have the opportunity to disguise learning as fun. Without the pressure of grades and test scores, after-school programming can provide the same quality learning experience and see students excel. These types of programs at museums, science centers, zoos, aquariums and other such institutions can provide a gateway to education by giving students more freedom and control over what they learn, while still helping students meet the standards set before them in school.

Additionally after-school programs provide informal institutions the opportunity to interact and influence students more than a single field trip, by allowing for repeat interactions. In this way after-school programs can hone skills that a student might not realize he or she has.

Around the country after-school programs are becoming more focused and aim at becoming a supplement to schools rather than just something to do after school is out. Students are benefiting from these after-school programs and schools are partnering with museums to help these programs continue... which is exactly what is happening through *Quasars to Sea Stars* program at the Santa Barbara Museum of Natural History in Santa Barbara, California.

## *Quasars to Sea Stars*

While field trips are still the main means to deliver museum education, they are not always feasible. Declines in funding and rising concerns regarding standardized tests have certainly taken their toll on field trips around the country. After-school programs in museums provide a means of engaging students outside of the field trip. Most often these programs are structured as volunteer programs and are viewed as community service opportunities rather than a way of augmenting what is learned in schools. But what could be achieved if an after-school program served as an extension of the classroom? The *Quasars to Sea Stars* program at the Santa Barbara Museum of Natural History seeks to explore this possibility.

### I. Origins: Reaching the Students

The city of Santa Barbara, California boasts a population of nearly ninety-thousand people. Of that population approximately eleven percent are in the thirteen to seventeen age range.<sup>185</sup> According to Monica Ballon-Kalinowski, manager of teen programs at the Santa Barbara Museum of Natural History, this population was not reached prior to the start of the *Quasars to Sea Stars* program.<sup>186</sup>

*Quasars to Sea Stars* has been in existence for almost twenty years. It began as an attempt to reach out to the local population. In an interview with the author, Monica Ballon-Kalinowski of the Santa Barbara Museum of Natural History stated that the museum recognized that the area in which it was located was largely made up of families and realized that it was not engaging the teenagers. “We wanted to re-engage that population,” says Ballon-Kalinowski who

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<sup>185</sup> U.S. Census Bureau, “Profile of General Population and Housing Characteristics: 2010 - Santa Barbara City, California,” U.S. Census Bureau, 2012.

<sup>186</sup> Monica Ballon-Kalinowski, interview by the author, December 12, 2011.

also stated that the students, especially minority students, are underrepresented in science.<sup>187</sup> As a response to this growing need the museum decided to start a summer volunteer program aimed at engaging teens. The initial program format remained in place for nearly ten years, at which time the possibility of doing more to engage the students was explored.

In 2000, the James Irvine Foundation provided funding to ten museums throughout the state of California to participate in the Museum Youth Initiative. The funding provided to the ten museums was for the purpose of developing after-school programming for young people over the course of four years. The Santa Barbara Museum of Natural History was one of these museums and it used the funding to restructure the *Quasars to Sea Stars* program that was already in existence at the time. The funding allowed the program to expand from a summer volunteer program to a year-round educational program for students. Although support from the James Irvine Foundation only extended through 2004, the new format for *Quasars to Sea Stars* has remained for the past ten years, thanks to other grants and donors, and is still currently in place.<sup>188</sup>

## II. Structure: Creating Opportunities

In 2000, *Quasars to Sea Stars* shifted from a summer volunteer program for teens to a year-round program. Through this new format, teens participate in the program almost every day during the summer and around two to three days a week during the school year. Currently there are seventeen students involved in the program, all of whom are in high school. The program is a multi-year program with students ideally remaining involved throughout all four years of high school.

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<sup>187</sup> Ballon-Kalinowski, interview, December 12, 2011.

<sup>188</sup> “Museums After School: How Museums Are Reaching Kids, Partnering with Schools, and Making a Difference,” Evaluation Report (James Irvine Foundation, 2005), 1.



Recruitment for the *Quasars to Sea Stars* program is a three to four month process that begins in winter. Shortly after the winter break museum staff contacts teachers, administrators, and counselors at the four middle schools in the Santa Barbara Unified School District. Access to the schools and partnering with the teachers is crucial during this time as museum staff and current program participants do presentations in eighth grade science classes. These half hour presentations are the main advertising and recruitment effort for *Quasars to Sea Stars* and provide prospective students with an overview of the program. Ballon-Kalinowski states that the museum has access to about ninety-five percent of the classrooms with the main reason for reluctance to classroom access being the exclusivity of the program.<sup>189</sup> This reluctance is not unfounded. Of the seven-hundred to eight-hundred students that are reached during these presentations only five are accepted into the program each year.

Applications are due one month after these in-class presentations. The application includes a standard form, essays, and parental permission to participate in the program. According to Ballon-Kalinowski, the need for parental permission is due to the length of the program. The museum wants parents to understand that their students are committing to a multi-year program. Approximately eighty applications are received and these are narrowed down to twenty applicants who move on to the interview phase. In addition to a standard individual interview, families are also included in the interview process as the participation of a student inevitably will necessitate parental involvement. After the interviews five students are selected for participation.<sup>190</sup>

Once accepted into *Quasars to Sea Stars*, the students are committed for four years and are expected to meet the minimum grade requirements throughout that time. The requirement

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<sup>189</sup> Ballon-Kalinowski, interview, December 12, 2011.

<sup>190</sup> Ibid.

for students to maintain a 2.5 grade point average not only keeps the students academically focused while participating in the program but also helps to ensure this level of performance in school. Monthly meetings allow for the tracking of the students' grade point average. Should a student's performance fall below the required grade point average, a meeting with the student's parents is called and the student faces a one month suspension from the *Quasars to Sea Stars* program in order to bring the grade point average back up to the required level. The student remains suspended from the program if the grades do not come back up. In the event of a student being unable to reach a 2.5 grade point average after three months of suspension, the student is asked to leave the program, although this is rare. "School is the most important thing," says Ballon-Kalinowski, who states that the program is not serving its purpose if it gets in the way of school.<sup>191</sup>

The *Quasars to Sea Stars* program is divided into two components, summer and the school year. From June to August students spend around thirty-five hours per week in the program over the course of eight weeks, taking classes and doing various projects that culminate in a final presentation at the end of the summer.

The classes change year to year. The summer after eighth grade serves as an introduction to the museum itself. The newest students in the program learn about a different museum department each week, including meeting the staff. At the end of the summer the students create their ideal museum as a final project. They create a model of the building and figure the budgets for each department.

In the second summer of the program, the students take a class that introduces them to science education. They learn methodology of how people learn science as well as the pedagogy

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<sup>191</sup> Ballon-Kalinowski, interview, December 12, 2011.

behind teaching various scientific subjects. They spend the summer getting to know one scientist and do a report on what that scientist does for their final project.

During the third summer of the program students begin field research. Each student works with one of the science departments at the museum and does field research within that department. At the end of the summer the student presents on the research they have completed.

In the final summer of the program the student does independent research. Based on the previous three years of participation, the student works with one scientist at the museum and chooses their own project to be completed with the help of that scientist. This final project is not only a culmination of the work in the final summer but also of all that the student has learned over the previous three years.

In addition to these classes, all students in the program take classes together a few times a week. The topics of these general classes vary from heavy scientific topics to acquiring job skills. Students take trips to different institutions in the area as well as colleges. The program also invites local scientists and other guests to speak to the students.<sup>192</sup>

The structure of the *Quasars to Sea Stars* program is quite different during the school year. Students in the program spend only twenty hours per month participating in the program during the school year, as opposed to the thirty-five hours per week during the summer. During this time students use what they have learned in the summer classes to do science demonstrations for museum visitors and continue to work with museum staff on research. After the first three months of this work, students are paid for their time. This aspect of *Quasars to Sea Stars* helps the students financially by providing them with a part time job, in addition to a strong academic focus.

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<sup>192</sup> Ballon-Kalinowski, interview, December 12, 2011.

Also throughout the school year students continue to participate in field trips, guest lectures, and other such activities which aim to prepare the students for college. These trips and lectures discuss such things as financial literacy, time management, study habits, and other topics which will benefit the students once they enter college.<sup>193</sup> They put these newly acquired skills into practice by serving on different committees. While on these committees they hone their leadership and teambuilding by helping to plan events and trips for the program and also by creating the program newsletter, *Quasar Quest*, which includes articles about research being conducted by the students and also participant and alumni profiles.

The *Quasars to Sea Stars* program involves the students' families from the beginning. In addition to being included in the recruitment process for the program, the first summer of participation starts with a family welcome dinner. This provides an opportunity for the families to connect to other families whose students have taken on the same commitment of being involved in the program. Each family is also given an annual membership to the Santa Barbara Museum of Natural History, allowing them access to the museum. Parent meetings are held every two to three months so that they will be aware of the progress their child is making while in the *Quasars to Sea Stars*. The parents also receive a newsletter regarding all that is currently going on with the program. According to Ballon-Kalinowski it is important that the parents and families of the program participants are involved because they take on as big a commitment as the students do. Indeed, parents are just as responsible as the students when it comes to submitting the monthly grade checks. Finally, many of the parents help with lectures and field trips, says Ballon-Kalinowski, by carpooling students to and from these events.<sup>194</sup>

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<sup>193</sup> Ballon-Kalinowski, interview, December 12, 2011.

<sup>194</sup> Ibid.

Providing opportunities is at the heart of the *Quasars to Sea Stars* program. Although the students receive no academic credit for their participation in the program formally, *Quasars to Sea Stars* is recognized locally as a work-study program. However while there seems to be little incentive for the students to participate, few leave the program. Students build a relationship with museum staff and also with each other, which encourages them to stay active in the program, even if it means commuting. The main reason students leave is due to a family move, states Ballon-Kalinowski, and even then the students sometimes commute to continue participation.<sup>195</sup> Should a student leave for whatever reason, the student's spot is not filled. Because of the extended format of the program, a new student beginning midway through the program or even midway through the first year would not benefit fully from all that *Quasars to Sea Stars* has to offer. Because of this policy of not replacing students that leave, the number of program participants fluctuates year to year. Currently there are seventeen students participating in the program.

### III. Impact: Growth and Success

Evaluation has been somewhat of a challenge for the *Quasars to Sea Stars* program. From 2000 to 2004, the James C. Irvine Foundation provided funding for evaluation to all the institutions participating in the *Museum Youth Insights* program, including *Quasars to Sea Stars*. Museum Management Consultants, Inc. was contracted by the James C. Irvine Foundation to do an evaluation of all programs participating in *Museum Youth Insights* over the course of four years. This evaluation was done by means of site visits to all programs, interviews of participating students and their families, and interviews of museum staff, as well as analysis of

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<sup>195</sup> Ballon-Kalinowski, interview, December 12, 2011.

student performance in schools.<sup>196</sup> The findings indicated that while these programs do enhance student behavior and thinking skills, there was little impact on school performance across the board.<sup>197</sup>

Although the overall data from the Museum Youth Insights evaluation indicated mediocre results, staff at the Santa Barbara Museum of Natural History measures the success of *Quasars to Sea Stars* in other ways. “Many of the students we selected did not all expect to go to college when we first selected them,” says Karl Hutterer, executive director of the Santa Barbara Museum of Natural History, “they were going to be glad to finish high school. But now all participating students are going to college.”<sup>198</sup>

Additionally, Monica Ballon-Kalinowski states that the monthly checks on each student’s grade point average serves as a measure of the effect on in-school performance. According to Ballon-Kalinowski the grade point average requirement for the program and monthly grade checks helps roughly seventy-five percent of the students maintain good grades. The other twenty-five percent are typically college prep students or are pushed by their parents and are capable of maintaining the grade without being required to by their participation in the program. This is seen through fluctuations in grades month to month.<sup>199</sup>

And there are other indicators of the success of the *Quasars to Sea Stars* program. An increase in visitation by participant families and friends has definitely been seen since the start of the program. Many of these students and their families are new to the Santa Barbara Museum of Natural History, seeing it for the first time when they go for the program interview. “[*Quasars to Sea Stars*] has been successful in bringing in this population and their families,” says Ballon-

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<sup>196</sup> “Museums After School,” 3.

<sup>197</sup> Ibid., 4.

<sup>198</sup> Ibid., 10.

<sup>199</sup> Ballon-Kalinowski, interview, December 12, 2011.

Kalinowski, “the way [the students] see museums is different... they want to bring their friends.”<sup>200</sup> Another indication of success is seen in the continued participation of students who move. In a few cases, students whose families have moved have chosen to commute in order to remain active in the program rather than drop out. This demonstrates that students not only benefit from the program, but that they enjoy it as well, which is just as important.

Finally, the participation of museum staff members serves as an indication of program success. The mentor-mentee relationship between students and museum staff is one thing that makes the *Quasars to Sea Stars* program so unique and successful. An increase in the number of participating staff members not only demonstrates that the program is enjoyable and beneficial to the students, but to museum staff as well. What began with the involvement of only two to three of the staff members has grown to a participation of over eighty-five percent of the museum staff in *Quasars to Sea Stars*.<sup>201</sup> This indicates that it is not only the students who get something out of the program, but museum staff members as well, which is crucial for the program to continue.

#### IV. Conclusion

The *Quasars to Sea Stars* program is all about opportunity. Opportunities such as working one-on-one with a museum scientist or going to a lecture at the University of California-Santa Barbara make this program both unique and beneficial for students in the Santa Barbara area. “Students discover in themselves responsibilities and capabilities they hadn’t before imagined,” says Hutterer.<sup>202</sup> Although formal evaluation of the program has not clearly proven that there is a significant impact on students’ academic performance, the success of *Quasars to Sea Stars* can be seen in nearly every aspect of the program, from the involvement of the staff

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<sup>200</sup> Ballon-Kalinowski, interview, December 12, 2011.

<sup>201</sup> Ibid.

<sup>202</sup> “Museums After School,” 10.

members at the Santa Barbara Museum of Natural History, to the commitment of the families of participating students, even in the Facebook page dedicated to program alumni. Although not taking place in a classroom or during school hours, it is clear that this program thrives on the cooperation of the local schools. Without the opportunity to go into classrooms and encourage students to take on such a huge commitment this program might not exist. And in return the students who participate perform much better when they return to the classroom. In this way *Quasars to Sea Stars* is so much more than an after-school program. It shows students all they can achieve when given the opportunity to do so.



## Conclusion

Schools and museums share a common goal, to educate. In light of this it seems that the two would naturally work together. But while field trips are definitely important in the museum world, it is rare to see a more in-depth interaction between museums and schools.

The programs explored in this paper have dared to go beyond the field trip and have taken programming a step further. Though difficult to fully and holistically evaluate, there are many indicators of the success of these programs:

- Meeting the standards – The *Urban Advantage National Network* began with the goal of helping students meet specific standards. Eighth grade students in New York City produce a much higher quality science exit project as a result of involvement with *Urban Advantage*.
- Impact on grades and test scores – Schools involved with both the *Urban Advantage National Network*, and the *Calumet Environmental Education Program* have seen an increase in standardized test scores at the state level. These schools also see a higher percentage of students demonstrate proficiency in science topics as a result of involvement with their respective programs.
- Changes in student attitude – Students in all four programs say that their involvement in these programs has led to a better understanding of, as well as a greater interest in, science. Students involved in the *Calumet Environmental Education Program* and the *Watsonville Area Teens Conserving Habitats* program also stated that their involvement urged them to take environmental action in their community beyond the program.
- Changes in teacher attitude – Teachers involved in the *Urban Advantage National Network* as well as the *Calumet Environmental Education Program* demonstrated a better

understanding of science in addition to a higher confidence level when teaching the subject as a result of their involvement with their respective program.

- Increase in college enrollment – A majority of students who complete the *Quasars to Sea Stars* program cite their involvement as having directly influenced the decision to attend college. The *Watsonville Area Teens Conserving Habitats* program provides financial aid to participating students to enroll at a college or university.
- Usable Research – Group projects created by students involved with the *Calumet Environmental Education Program* and the *Watsonville Area Teens Conserving Habitats* program have led to the existence of usable datasets which can benefit the work of environmental scientists and conservators working in the Calumet and Watsonville regions.

While partnerships between museums and schools can be challenging and demanding both in terms of time and finances, the benefits are well worth the effort. Not only do students and teachers benefit from their involvement with these programs, but so do the institutions involved. At the Santa Barbara Museum of Natural History, nearly eighty-five percent of their staff is involved with *Quasars to Sea Stars*.<sup>203</sup> Scientists and researchers at the Field Museum use the data collected by students participating in the *Calumet Environmental Education Program*.<sup>204</sup>

These partnerships demonstrate all that can be achieved when schools and museums join forces to work toward their common goal. Through them all parties involved have a richer, more meaningful science experience demonstrated. Field trips will always remain as the simplest and

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<sup>203</sup> Ballon-Kalinowski, interview, December 12, 2011.

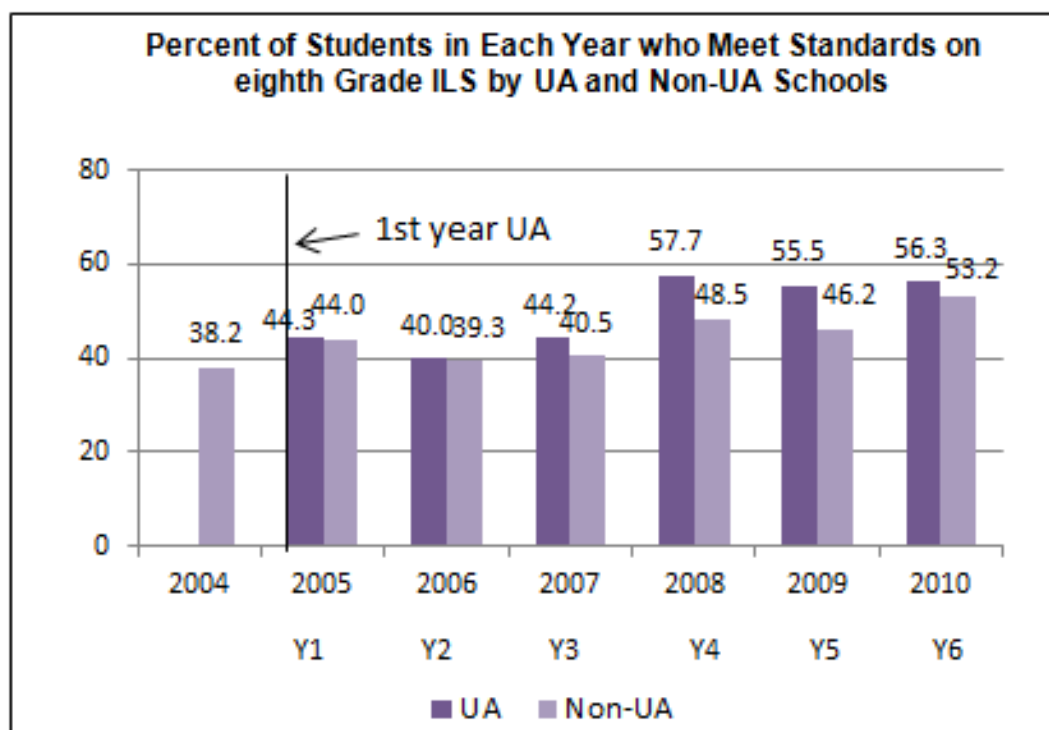
<sup>204</sup> Taylor, interview, February 15, 2012.

most common interaction between museums and schools. But the partnerships explored in this paper provide a glimpse of the benefits that may be gained by going beyond the field trip.

## Appendix A

### Data for *Urban Advantage: New York City*<sup>205</sup>

	2005	2006	2007	2008	2009	2010
	Y1	Y2	Y3	Y4	Y5	Y6
<b># UA Students</b>	5,500	18,722	21,016	27,541	24,793	37,582
<b># UA Schools</b>	31	111	129	156	147	174
<b># UA Teachers</b>	62	195	210	256	257	386



<sup>205</sup> Reprinted with permission from Emilyn Ruble and Meryle Weinstein, "IESP Policy Brief: Can Formal-Informal Collaborations Improve Science Literacy in Urban Middle Schools? The Impact of Urban Advantage," Institute for Education and Social Policy, published June 2011, accessed December 5, 2011, [http://steinhardt.nyu.edu/scmsAdmin/media/users/spa2/Policy\\_Brief\\_UA\\_03\\_11\\_June\\_2011.pdf](http://steinhardt.nyu.edu/scmsAdmin/media/users/spa2/Policy_Brief_UA_03_11_June_2011.pdf).

Mean Characteristics of UA and Non-UA Schools, Year Prior to Joining UA												
N of Schools	2004		2005		2006		2007		2008		2009	
	UA	Non-UA	UA	Non-UA	UA	Non-UA	UA	Non-UA	UA	Non-UA	UA	Non-UA
	31	289	61	291	43	366	42	244	7	227	24	238
Total Enrollment	<b>1079</b>	<b>851</b>	851	784	611	586	580	539	738	667	519	621
	<b>(434)</b>	<b>(468)</b>	(500)	(439)	(426)	(425)	(439)	(390)	(647)	(373)	(328)	(375)
% Black	41.84	36.47	34.05	38.67	37.65	38.95	36.95	39.41	33.89	38.52	35.74	38.17
	(28.1)	(28.1)	(26.2)	(29.5)	(29.3)	(28.9)	(29.4)	(29.3)	(34.0)	(29.3)	(26.7)	(29.4)
% Hispanic	35.10	39.91	42.81	39.56	42.21	40.45	43.27	40.48	35.56	41.18	46.87	40.74
	(22.9)	(25.4)	(26.3)	(25.7)	(27.5)	(26.0)	(25.4)	(26.4)	(23.2)	(26.4)	(23.0)	(25.9)
% Asian/Other	13.26	9.67	10.20	9.42	7.16	8.77	10.32	8.61	12.56	9.14	7.13	10.37
	(19.6)	(12.1)	(12.9)	(13.0)	(12.0)	(13.3)	(14.2)	(13.4)	(14.5)	(14.1)	(9.7)	(14.9)
% White	9.82	13.96	12.94	12.34	12.53	11.18	8.87	10.95	17.78	10.71	10.48	10.64
	(18.2)	(19.6)	(19.3)	(19.1)	(22.1)	(18.0)	(13.3)	(18.5)	(19.1)	(18.0)	(14.4)	(17.7)
% ELL	10.26	10.60	11.68	10.59	10.79	10.80	11.29	10.74	9.67	11.23	10.56	12.02
	(7.8)	(10.6)	(10.7)	(10.4)	(9.9)	(11.1)	(10.2)	(12.7)	(4.2)	(11.7)	(10.1)	(11.7)
% Free Lunch	75.37	71.10	69.20	68.66	63.30	69.90	64.76	66.29	55.89	66.30	72.48	69.98
	(21.8)	(23.5)	(21.7)	(22.5)	(23.1)	(23.3)	(30.2)	(27.1)	(31.5)	(25.8)	(15.8)	(20.4)
% Prof. ELA	33.17	39.42	50.94	46.94	36.11	40.14	42.32	42.37	58.41	48.75	43.17	41.71
	(16.6)	(20.5)	(19.9)	(21.3)	(20.4)	(21.3)	(19.1)	(21.6)	(18.9)	(21.6)	(22.1)	(20.2)
% Prof. Math	38.10	43.63	48.49	45.07	36.34	43.08	53.53	50.71	73.27	62.42	48.64	48.77
	(17.4)	(20.6)	(21.7)	(22.3)	(23.2)	(22.2)	(21.2)	(23.6)	(18.7)	(23.5)	(25.6)	(22.3)
% Prof. Science	38.23	45.03	46.88	45.17	36.61	39.52	43.00	42.05	47.57	50.16	45.34	47.86
	(20.9)	(24.8)	(23.9)	(23.8)	(23.0)	(24.0)	(19.6)	(24.6)	(27.7)	(22.7)	(28.4)	(23.0)

Standard deviations are in parentheses  
 Bold indicates differences are statistically significant at .05 level or less  
 % Proficient is the percent scoring in levels 3 or 4

## Appendix B

*Miami Urban Advantage Impact for Three Years*<sup>206</sup>

	Zoo Miami	Fairchild Tropical Botanic Gardens	Miami Science Museum
Y1	<p><b>Field Investigations</b> 600 students School #1 (300 6<sup>th</sup> gr.) School #2 (300 6<sup>th</sup> gr.)</p> <p><b>Family Event</b> 1800 participants 600 students + 2 family members</p>	<p><b>Field Investigations</b> 600 students School #3 (300 6<sup>th</sup> gr.) School #4 (300 6<sup>th</sup> gr.)</p> <p><b>Family Event</b> 1800 participants 600 students + 2 family members</p>	<p><b>Field Investigations</b> 600 students School #5 (300 6<sup>th</sup> gr.) School #6 (300 6<sup>th</sup> gr.)</p> <p><b>Family Event</b> 1800 participants 600 students + 2 family members</p>
Y2	<p><b>Field Investigations</b> 600 students School #5 (300 7<sup>th</sup> gr.) School #6 (300 7<sup>th</sup> gr.)</p> <p><b>Family Event</b> 1800 participants 600 students + 2 family members</p>	<p><b>Field Investigations</b> 600 students School #1 (300 7<sup>th</sup> gr.) School #2 (300 7<sup>th</sup> gr.)</p> <p><b>Family Event</b> 1800 participants 600 students + 2 family members</p>	<p><b>Field Investigations</b> 600 students School #3 (300 7<sup>th</sup> gr.) School #4 (300 7<sup>th</sup> gr.)</p> <p><b>Family Event</b> 1800 participants 600 students + 2 family members</p>
Y3	<p><b>Field Investigations</b> 600 students School #3 (300 8<sup>th</sup> gr.) School #4 (300 8<sup>th</sup> gr.)</p> <p><b>Family Event</b> 1800 participants 600 students + 2 family members</p>	<p><b>Field Investigations</b> 600 students School #5 (300 8<sup>th</sup> gr.) School #6 (300 8<sup>th</sup> gr.)</p> <p><b>Family Event</b> 1800 participants 600 students + 2 family members</p>	<p><b>Field Investigations</b> 600 students School #1 (300 8<sup>th</sup> gr.) School #2 (300 8<sup>th</sup> gr.)</p> <p><b>Family Event</b> 1800 participants 600 students + 2 family members</p>
<p>Field Investigations: Each institution will serve a total of 1800 students over three years (600 /year x 3 years = 1800)</p> <p>Family Events: Each institution will serve 5,400 participants over three years (1800/year x 3 years = 5,400)</p> <p>Total project impact = 5,400 student encounters + 16,200 student/family encounters = 21,600</p>			

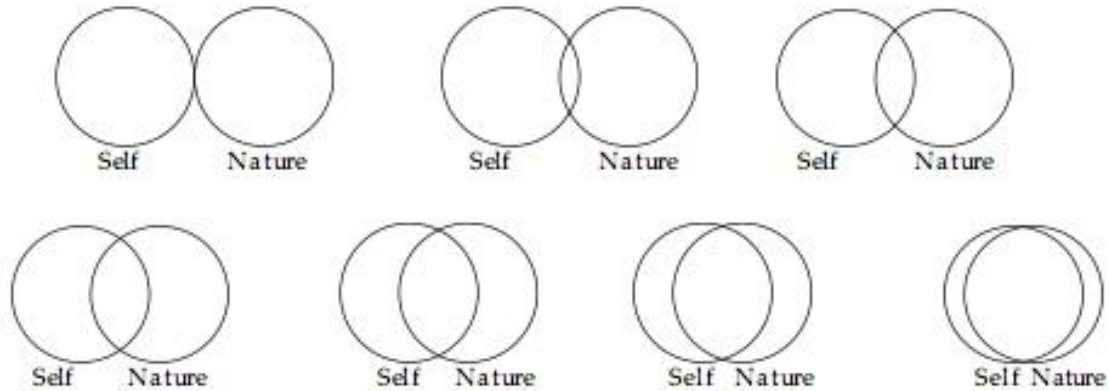
<sup>206</sup> Reprinted with permission from Zoo Miami Education department. Originally received from Nancy Wielert, email message to author, December 14, 2011.

## Appendix C

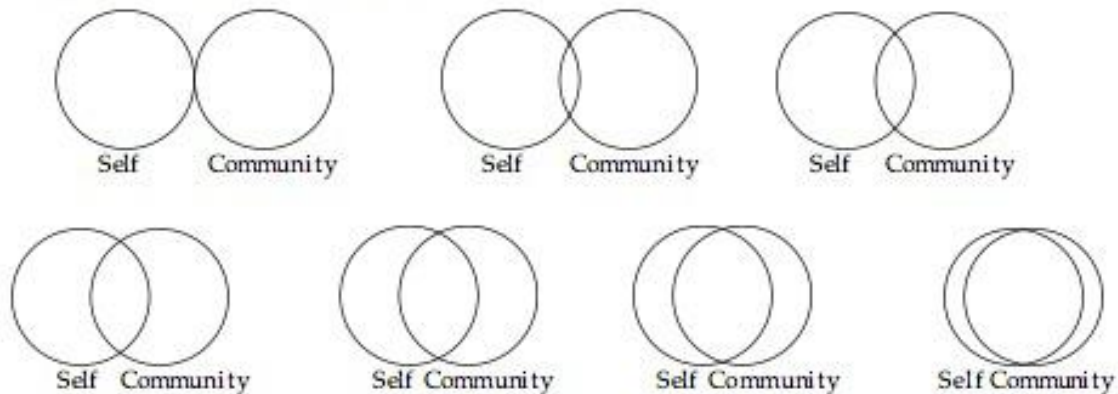
### Evaluation Materials for *Watsonville Area Teens Conserving Habitats*<sup>207</sup>

#### Inclusion of Others in Self scale

2. Think about your relationship with the natural environment locally and circle one of the pictures below that best shows your relationship.

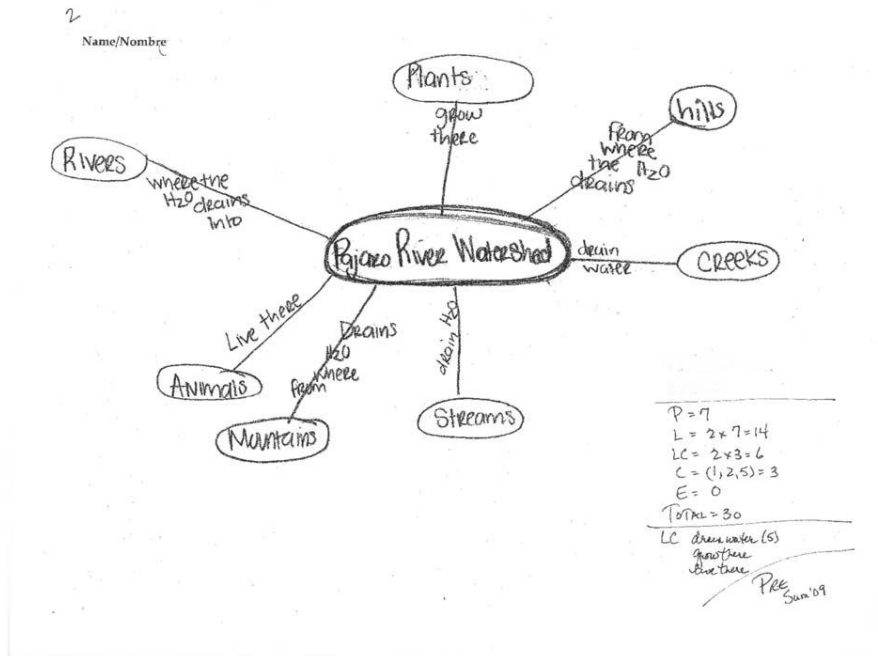


3. Think about your relationship with your local community and circle one of the pictures below that best shows your relationship.

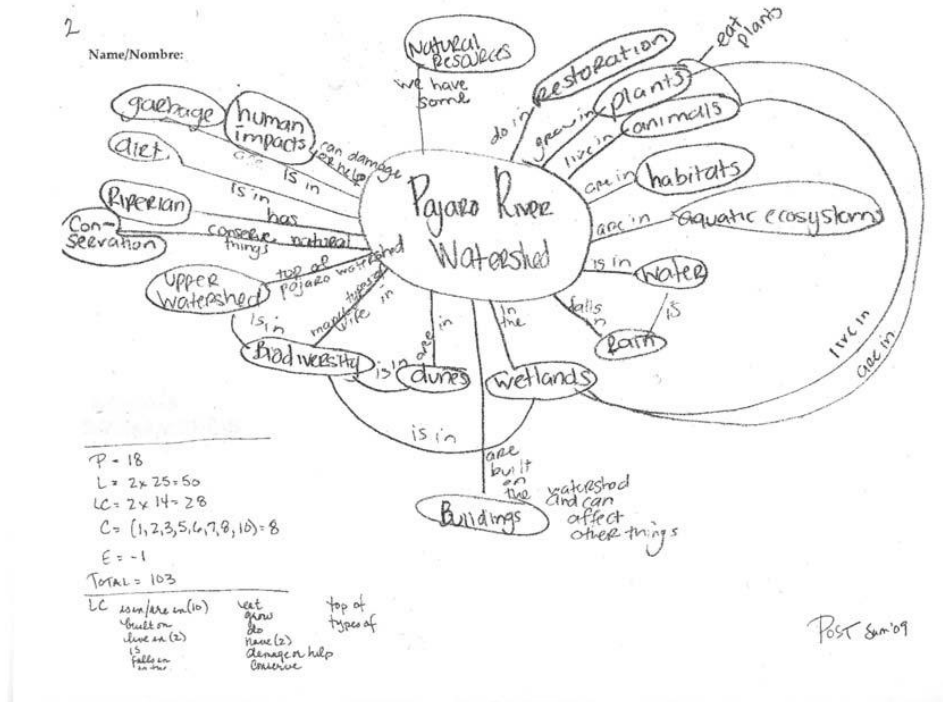


<sup>207</sup> Reprinted with permission from Chris Parsons, "Watsonville Area Teens Conserving Habitats (WATCH) Connecting with Their Community's Watershed," *Children, Youth and Environments* 21, no.1 (2011).

Pre-program concept map completed by student

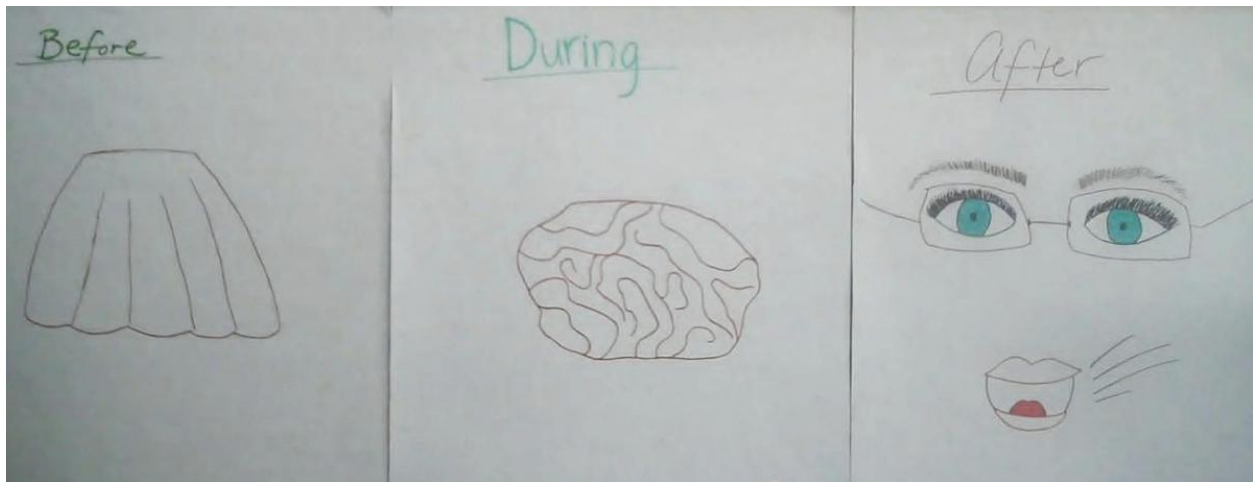


Post-program concept map completed by student





Retrospective storyboard completed by groups of students



Panel 1: Shell represents students as reserved and shy. *Watsonville Area Teens Conserving Habitats* helps students come out of their shell.

Panel 2: Brain represents that students are learning and their knowledge.

Panel 3: Eyes and mouth represent that students see the world in a different way after the program, and willing share what they know with others.

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