Effects of Standardized Test Scores on Environmental Education at the Elementary Level

Heather Belichesky

Abstract Elementary environmental education is important in order to nurture students' interest in the environment, and will promote environmentally positive actions later in life (California State Department of Education 1973). However, with the 2001 implementation of the No Child Left Behind Act, schools are evaluated according to their students' performances on standardized tests, which do not incorporate environmental education. In this study, the amount and quality of environmental education was assessed through teacher surveys and interviews. The results showed that schools with lower overall scores on standardized tests had less and lower quality environmental education. Interviews showed that teachers at schools with lower Academic Performance Index (API) scores, spent more time focusing on lessons to increase their students' test scores which limited time for environmental education, compared to teachers at schools with higher API scores. Teachers at schools with higher API scores were motivated to teach environmental lessons because of personal and student interest rather than regulations. These results imply a need to train teachers or create curriculum that incorporateso6 environmental education in a manner that is also conducive to increasing students' performance on standardized tests.

Introduction

In the past century there has been an increased concern about promoting positive environmental behaviors, which is widely thought to be best achieved through education (Bjornor 2004). The State of California included state legislation into the education code in 1968 stating that teachers need to include a segment of environmental education into their curriculum for primary and secondary levels (California State Department of Education 1973). However, this addition to the education code left the environmental curriculum up to the teachers, in order for them to "[suit it] to the specific needs of the students they serve" (California State Department of Education 1973). Thus, what types of environmental education, if any, are included at the elementary level is currently an issue of controversy. This study investigates the presence of environmental lessons by considering time spent on such lessons and the lesson quality from the teachers' perspective.

Environmental education is a multidisciplinary subject, making it extremely hard to quantify what exactly is included in the curriculum. Environmental education can be looked at as education related to the environment and education on sustainable development (Hart 2003). Environmental education at the elementary level should include lessons that allow for students to explore and interact with their environments. There have been studies done in order to formulate the ideal way to teach environmental education. This includes methods such as questioning and analysis, knowledge of environmental systems, addressing issues, and personal responsibly (Meredith et al., 2000). This outline for environmental education also includes the important aspect of teaching the students about their civic duty, as this aspect of the lesson will stay with them to create a lifelong learning environment (Santone 2003).

The complexity of the subject of environmental education creates a need for several different levels of teaching. Recent studies have stated that in elementary environmental education "what's important is that children have an opportunity to bond with the natural world, to learn to love it, before being asked to heal its wounds" (Sobel 1996). The stages of teaching environmental education at the primary level are different from the basic theories of environmental education. At the elementary level, teachers need to build on their students' innate curiosity about nature and turn that into a lesson on environmental issues (Blades 1989). An effective method for teaching science at the elementary school level is the "five E learning cycle" (Lauer 2003). This is a cyclic plan for lessons which rotates through five steps:

engagement, exploration, explanation, extension and evaluation. Such a method enables teachers to continuously build on their students' prior knowledge and interests in order to incorporate practical applications and more elaborate material. This method also enables teachers to have sections focusing on student analysis and environmental accountability. The "five E learning cycle" is important in fostering a strong environmental education program that will facilitate life long learning starting at the elementary level.

Environmental education at the elementary level is strongly dependent on the teachers' knowledge and capabilities to present such a diverse topic. Not only must a teacher know what kind of activities to plan, but also how to incorporate several different subjects into one lesson. Teachers must be able to spend the time to have students connect the science they learn in the classroom to social and political issues in the real world (UNESCO 1971). This is why it is extremely important to consider a teacher's training and experience when assessing their environmental lessons.

However, it is uncertain whether elementary educators are developing lessons that incorporate environmental issues in this manner. This is an important area to examine teachers' methods and commitment to teaching environmental education because the California Education Code's requires that teachers include such lessons bet the national No Child Left Behind Act does not. The main objective of this study is to investigate environmental education at the elementary school level, looking at potential correlations between time and quality compared to performance on standardized tests and teacher experience.

Methods

This study focuses on elementary teacher surveys (see appendix) and interviews. Teachers were chosen based on two parameters: school performance on standardized tests according to the Academic Performance Index (API), and location (San Francisco Bay Area). The surveyed teachers were identified based on their API scores, and were divided into high (scores from 10-6) and low (scores from 5-2) categories (Table 1).

Data was collected from teachers, in a survey, which addressed how many hours per quarter they spent teaching environmental education. To further investigate reasons why teachers spent the amount of time they did on environmental education interviews were conducted.

Table 1 Schools that had teachers surveyed, divided by API scores into high and low categories.

School	High API	School	Low API
Ocean View (Albany USD)	10	Rosa Parks (Berkeley USD)	3
Hillcrest (Oakland USD)	10	Prescott (Oakland USD)	2
Cragmont (Berkeley USD)	8	Emerson (Oakland USD)	2
Franklin (Oakland USD)	6		

Table 2 Numerical Rank used with lesson plan assessment.

Learning Cycle Step	**Rubric Value**
Engagement	1
Exploration	2
Explanation	3
Extension	4
Evaluation	5

To determine time spent on environmental education the survey asks how much time teachers spend on environmental education each quarter. The responses were simply analyzed by using the values provided by the teachers. To assess quality of environmental education, teachers were asked to describe a typical environmental lesson. The results from this question were assessed using a rubric derived from the learning cycle (see Table 2). The five step learning cycle allows for each lesson to be ranked numerically according to how much of the learning cycle the lesson completes.

This study also explores the effects of teacher experience on the levels of environmental education. Teachers were asked to state how many years they had been teaching and what kind of teacher training they had participated in relating to environmental education. The responses to experience were assigned a numerical rank according to years teaching. Another analysis was conducted using this numerical rank and adding one point per training program that a teacher had participated in (Table 3). These two analyses were performed to

Table 3 Numerical Rank used to assess teacher experience. One point was added for each training program that the teacher participated in.

Teacher Experience	**Rubric Value**
Less than 2 years	1
2-5 years	2
5-10 years	3
10-15 years	4
More than 15 years	5

see if a response bias in the question about training programs existed.

The data was analyzed using a non parametric correlation analysis, having the factors of time, quality and the 2004 score on the API exam. The teachers experience was also incorporated in a separate non parametric correlation analysis.

Results

The first part of this study looks at the potential correlation between API scores and hours spent per quarter on environmental education. If a school has a previously low API score then teachers would most likely have less time in the next year to concentrate on environmental lessons because of a need to focus on lessons that would increase those scores. From the interviews many teachers stated that they had to spend more time teaching test related material and less time on other subjects.

The data from the surveys was analyzed using a correlation analysis. This analysis did not show a significant correlation between time and API scores. The correlation analysis yielded a coefficient of correlation, r = .466 and a coefficient of determination, an r-squared value of .217. With a p-value <= -1.746 and a t-value of 1.178. These results are graphically displayed in figure 1.

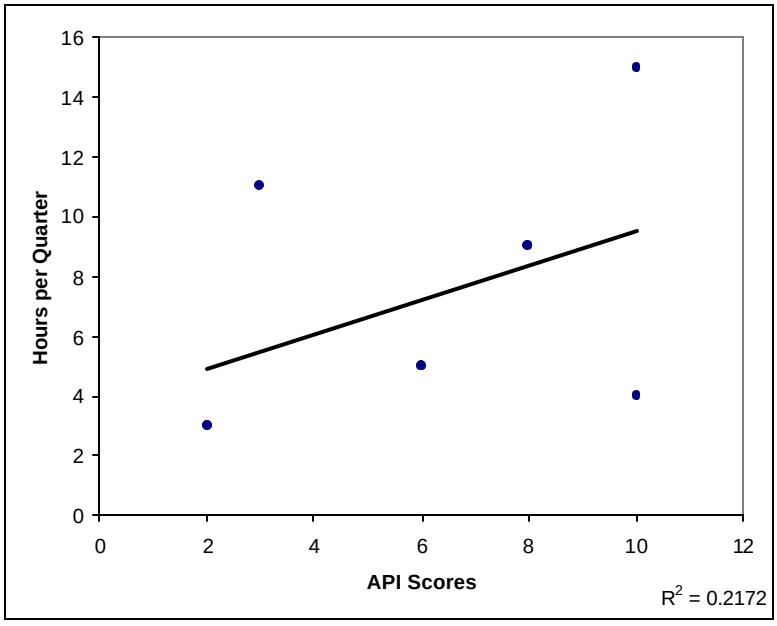

Figure 1 These results did not yield a significant correlation. Note that two data points are superimposed at API 2 and hours per quarter two.

A correlation between quantity of environmental education and teacher experience was also investigated using data provided from the survey. The more experience a teacher has in environmental education, the more likely they are to include environmental lessons. This data was analyzed using a correlation analysis which showed no significant correlation between time and teacher experience. The analysis yielded a coefficient of correlation, r = .5709 and a coefficient of determination, an r-squared value of .3259. With a p-value <= 1 and a t-value of 1.555. These results are graphically displayed in figure 2. When looking at years teaching and hours per quarter there was not a significant correlation, r = 0.0286 and a coefficient of determination, an r-squared value of 0.0008 with a p-value <= -3.909e^{08} and a t-value 0.0639.

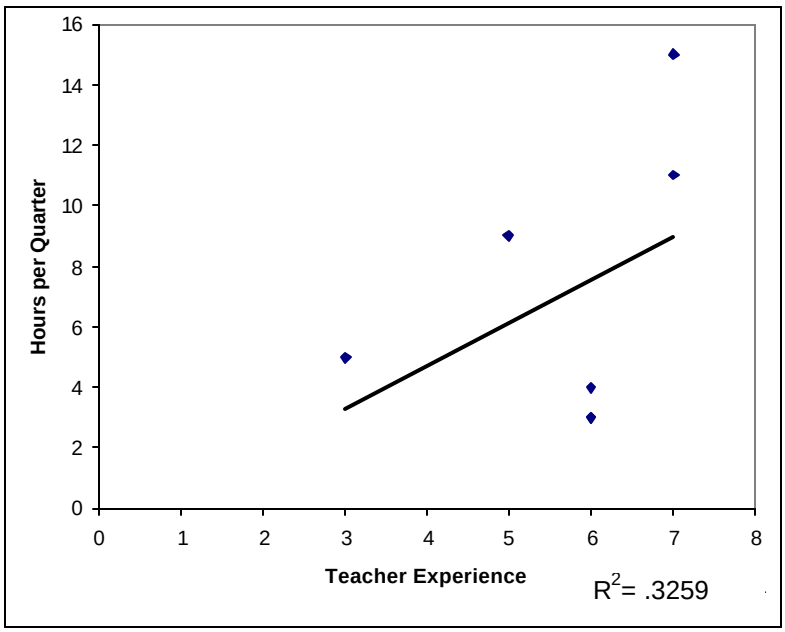

Figure 2 These results did not yield a significant correlation. Note that two data points are superimposed at teacher experience six and hours per quarter two

The second part of the study concentrated on the quality of environmental education present at the surveyed schools. The quality is thought to decrease along with API scores because of constraints on time and subject matter spent on test preparations. In the surveys teachers were asked to list lesson plans that they used or to describe lessons which they created. Most teachers replied that they completed standardized lesson plans. The lessons were analyzed using a rubric based on the five step learning cycle. Depending on how many steps the lesson completed each

lesson was assigned a numerical value ranging from 1-5. Teacher interviews also provided reasons as to what was holding back more in depth lessons.

The data from this part of the study was also analyzed using a correlation analysis. This showed a significant correlation between quality and API scores. This analysis gave a coefficient of correlation, r = .821 and a coefficient of determination, an r-squared value of .674, with a p-value <= 0.03 and a t-value 3.213. These results are graphically displayed in figure 3.

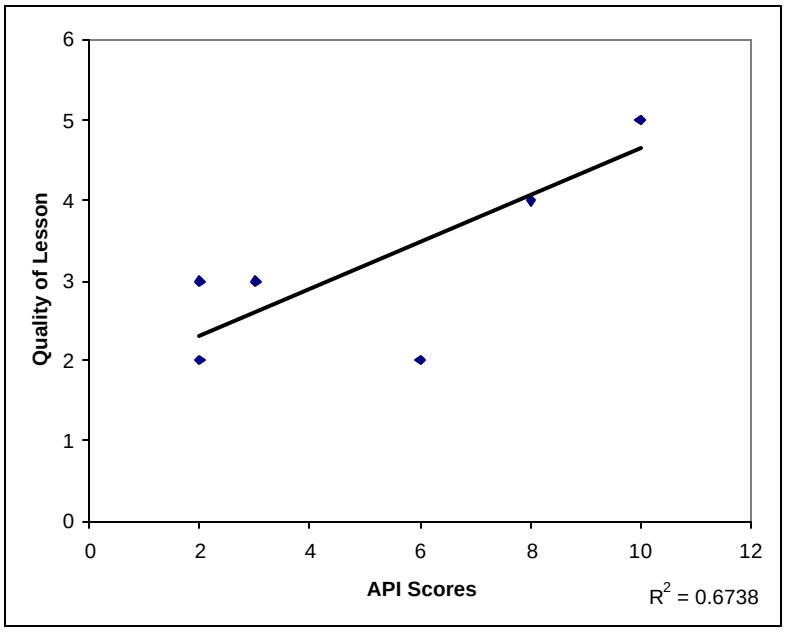

Figure 3 These results did yield a significant correlation. Note that two data points are superimposed at API 10 and quality of lesson five.

In addition, a correlation analysis was conducted comparing teacher experience to the quality of lessons. The more experience a teacher has, the more likely it is that that teacher's lesson will be of a higher quality. This aspect also yielded a significant correlation between quality and teacher experience. This analysis produced a coefficient of correlation, r = .727 and a coefficient of determination, an r-squared value of .5285, with a p-value <= 1 and a t-value 2.908. These results are graphically displayed in figure 4. When looking at years teaching and quality of lessons there was not a significant correlation, r = 0.262 and a coefficient of determination, an r-squared value of 0.068 with a p-value <= -321.8 and a t-value 0.606.

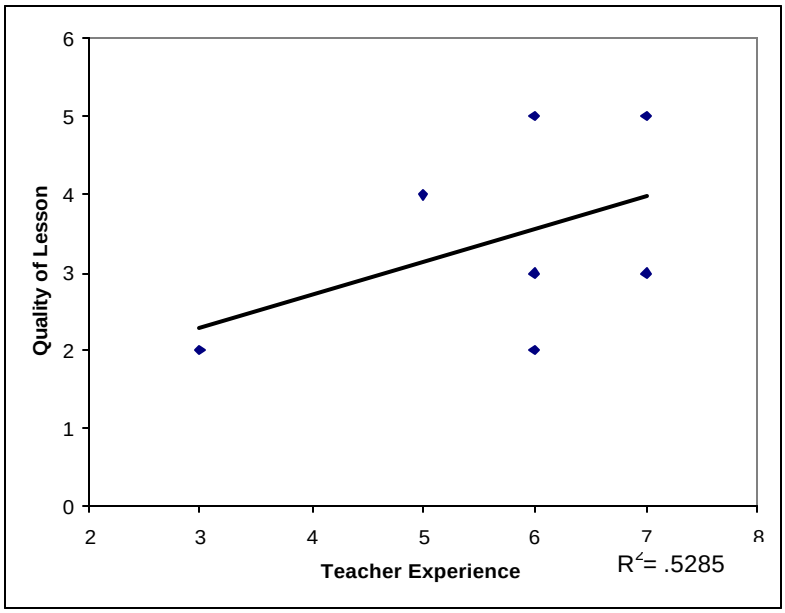

Figure 4 These results did not yield a significant correlation. Note that the x-axis scale changed.

Environmental education is a state mandated subject, which is why in the survey teachers were asked which factors motivated them to teach environmental lessons. The teachers were asked to list all that applied from a provided list. Table 4 shows the break down of what motivations teachers from schools with high and low API scores.

Table 4 Teacher reasons for providing environmental lessons. Shows which two categories teachers chose as most important reasons that they teach environmental lessons.

	State Regulation	Students Interest	Parent Interest	Teacher Importance	Administration regulations
High API	1	3	0	4	0
Low API	1	2	1	2	0

Discussion

This investigation into environmental education at the elementary level only showed a significant correlation between performance on standardized tests and overall teacher experience with the quality of environmental education present. However, significant results were not found

when looking at teacher experience compared to quantity, the API scores compared to quantity and years teaching with quantity and quality.

The quality of environmental education proved to be the best parameter to measure the level of environmental education present. The teachers were able to provide responses which were uniformly analyzed using the rubric which yielded comparable results. The correlation analysis showed that there are more in depth lessons being presented at schools with higher API scores. Teacher interviews exemplified that many teachers at lower performing schools felt that they did not have time to include lessons that were not relevant to the standardized tests. A teacher at Franklin Elementary (API 5) stated "I am very frustrated that it is very difficult for me to fit [environmental education] in to our weekly curriculum." When investigating the correlation between teacher experience and quality of lesson plans, there appeared to be a significant correlation. There was no significant correlation for years of experience. Noticeably, from interviews, teachers who had more training in environmental education emphasized a greater importance on teaching environmental education.

Quantity of environmental education did not yield significant correlations between API scores, years teaching or teacher experience. Teacher experience appeared to have a higher correlation to amount of time spent of environmental education, than API scores and years teaching did. However, all categories showed insignificant correlations, which do not provide support for the idea that a recent emphasis on increasing API scores is taking time away from environmental education levels. Interviews at low ranking API schools did provide a general sentiment form the teachers that constraints on time were preventing them from including environmental education. A teacher at Emerson Elementary (API 2) said "We are on track every day, every minute, following a scripted program…it is very challenging and rather rare for anyone to really develop meaningful units [in environmental education] that work in tandem." In addition this aspect of the study appeared to receive extremely inconsistent results from the teachers. This might have been due to the open response of this question in the survey. According to past research, such studies have not left questions as open, which has lead to more consistent results than seen in this particular study (Stokking 1997).

This study did investigate why teachers included environmental education into their curriculum. It was a general sentiment from all ranges of API scores and teacher experience that the main factors were teacher importance and student interest. From teacher interviews, several

thought that because of their students' interest, environmental education is a good way to introduce standard lessons. A teacher from Cragmont Elementary (API 8) stated "kids care about plants/animals and the place they thrive. Environmental education is an automatic in to science." Other teachers said that they taught environmental education because they felt that it is an important lesson for their students. A teacher at Rosa Parks Elementary (API 3) said "I incorporate environmental studies into my curriculum because I believe that it is as important as learning to read and write and do math." This part of the study showed that no matter API or teacher experience the teachers felt that there was a need to teach environmental education in their classrooms. It is very interesting to see that environmental education is being taught in elementary schools because teachers and students find it important not just because of state regulations.

The sample size of this study was extremely low, which limited the overall scope of the investigation. The low sample size was mainly due to a lack of responses from teachers. This bias was self selecting against teachers at schools with lower API scores who might not have wanted to discuss their schools teaching requirements. This bias may have been perpetuated due to the electronic version of the survey, which might have received more responses if delivered in a hard copy format. This is because teachers might have been more welcoming to a more personable approach. However, this was not possible due to difficulties in gaining access to schools because of district regulations.

This study has provided a sample of possible reasons for lower quantity and quality environmental education at the elementary school level. The results exemplify that the best parameter to measure environmental education is quality of lesson plans, while both API scores and teacher experience have affects on this parameter. The study shows that pressure to increase API scores may have a negative affect on the quality of educational lessons dealing with topics not covered by standardized tests. Future research should use a larger sample size in order to solidify findings, which maybe could include classroom observation and student assessments. Hopefully, because of this project and others, programs in training teachers to incorporate environmental lessons in a manner that will also improve test scores will be developed and implemented.

Acknowledgments

Thanks to Catherine Halverson for providing teacher contacts and guidance, the ES 196 team for their helpful advice and the teachers who made this study possible.

References

Basile, C. In Press. Environmental education as a catalyst for transfer. Journal of Environmental Education.

Basile, C., Robinson, S., and White, C. 2000. Awarness to Citizenship: Environmental Literacy for the Elementary Child. University Press of America.

Bjorner, TB., Hansen, L., and Russell, CS. 2004. Environmental Labeling and consumers' choice—an empirical analysis of the effect of the Nordic Swan. Journal of Environmental Economics and Management **47** (3): 411-434.

Blades, M. 1989. Children's ability to learn about the environment from direct experience and spatial representations. Children's Environments Quarterly **6** (2/3) : 4-14.

Braus, J. 1999. Powerful Pedagogy: Using EE to achieve your education goals. EEducator **1** (1): 17-25.

California State Department of Education. 1973. A Guide for the Development of an Interdisciplinary Environmental Education Curriculum. Sacramento, CA: Office of State Printing.

Davis, J. 1998. Young Children, Environmental Education and the Future. Early Childhood Education Jounral **26** (2): 117-123.

Filho, W. 1997. Lifelong Learninng and Environmental Education. New York, NY: Peter Lang publishing.

Flanagan, R. 1999. Education and the Environment: Partners for Change. EEducator **1** (1): 4-13.

Hart, P. 2003. Teacher's Thinking in Environmental Education. New York, NY: Peter Lang Publishing.

Lauer, T. 2003. Conceptualizing Ecology: A Learning Cycle Approach. The American Biology Teacher **65** (7): 518-22.

Meredith, J., Cantrell, D., Conner, M., Evener, B., Hunn, D., and Spector, P. 2000. Best practices for environmental education: Guidelines for success. Columbus, OH: Ohio EE 2000.

Posner, D. What's wrong with Teaching to the Test? Phi Delta Kappan **85** (10): 749-51.

Rothman, Hal.2002. Conceptualizing the Real: Environmental History and American Studies. American Quarterly **54** (3): 485 -497.

Santone, S. 2003. Education for Sustainability. Educational Leadership **61** (4): 60-63.

Sobel, D. 1996. Beyond ecophobia. Great Barrington, MA. The Orion Society and The Myrin Institute.

Stokking, H., van Aert, L., Meijberg, W., and Kaskans, A. 1997. Evaluating Environmental Education. Gland, Switzerland. International Union for conservation of Nature and Natural Resources.

UNESCO. 1977. Trends in Environmental Education. Belgium

US Department of Education. Choices for Parents. 2005

Appendix

Environmental Education Survey

1. How many years have you been teaching at the elementary level:

Less than 2 2-5 5-10 10-15 More than 15

2. What grade level are you currently teaching?

Kindergarten First Second Third Fourth Fifth

3. Which subjects do you teach to your class:

All Subjects Single Subject: _____

Multiple (but not all):_____

4. Do you teach environmental lessons each quarter?

Yes No

[If yes to #4] Approximately how many hours per quarter do you spend on environmental education:

5. What curriculum programs have you used in your classroom pertaining to environmental education?

6. What teacher training have you participated in, pertaining to environmental education?

7. Please list some examples of environmental curriculum that you use. If you could describe how far in the lesson you teach up to or attach copies of the lesson plan.

8. Why do you teach environmental education? (please check two most important)
__ State regulations
__ Students interest
__ Parent interest
__ Teacher importance
__ Administration regulations
__Other:

If you do not incorporate environmental education, please explain why not: