WHAT ARE HIGH SCHOOL STUDENTS' PERCEPTIONS OF ENVIRONMENTAL PROBLEMS IN THEIR COMMUNITY?

THESIS

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Beth A. Cooper, B.A.

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CHAPTER 1

INTRODUCTION

This thesis includes an introduction in Chapter 1, background information about the theoretical basis for the research in Chapter 2, the methodology used in Chapter 3, an analysis of the data in Chapter 4, a discussion of the results in Chapter 5, and conclusion in Chapter 6 for a research study designed to answer the question: What are high school students' perceptions of environmental problems in their community? The survey research includes a total sample size of 217 9th and 12th grade students (108 9th grade and 109 12th grade) from two high schools located in Austin, Texas. The survey questions include one satisfaction rating question, one top five places listing task, one environmental problems open-ended question, one ranking of severity of environmental problems task, one ranking of knowledge source task, one money allotment task, and four environmental knowledge "test" questions to identify and better understand students' perceptions of their community's environmental problems. The survey generated both qualitative and quantitative data and the analysis includes descriptive statistics and correlational analysis. Asking the survey questions helps to better understand how students think about the environment of their community as an indication of their sense of place as well as their level of understanding of environmental issues. The sample

population includes students from two demographically diverse public schools in the Austin Independent School District in Austin, Texas.

CHAPTER 2

BACKGROUND

Introduction

What is the nature of children's spatial thinking, reasoning, and abilities and how do they change over time? This study focuses on acquiring a better understanding of children's perceptions of environmental problems in the Austin community as a case study that can provide information about commonalities or differences according to gender, age, ethnicity and length of residence in the community. Considering Ninth and 12th grade students helps to find out if changes in learning, abilities, reasoning, spatial thinking, or perception occur over time.

The results of this research shed light on a variety of aspects associated with students' perceptions of the environment in their community. It is important to understand students' perceptions of the environment in their community in order to evaluate the success of environmental education programs and present a picture of what the next generation of citizens and leaders are currently thinking with regards to their community's environment. Information about commonalities or differences among different demographic groups can be used to improve environmental education and provide insight as to future actions those students will take based on their perception. In order to consider how children perceive their environment, or their 'sense of place', and

how their descriptions differ according to demographic characteristics, it is necessary to consider what is already known in the field of environmental perception as well as geographic education. Both areas incorporate ideas from a wide range of fields that include education, psychology, sociology, and geography, as well as other specific fields depending on the particular attribute of the environment one is considering.

Literature Review

Perceptions of the Environment

Researchers from different fields have taken different approaches to study perceptions of environments. These different approaches to landscape perception, evaluation, and preference that derive from separate disciplines seek to understand the relationship between person and environment (Brierley Newell, 1997). Many have chosen to evaluate their findings in order to try to explain commonalities of how we perceive places. This study investigates whether commonalities or differences relate to demographic characteristics among students and how they perceive the environmental problems in their community. Those perceptions of their environment are linked to their feelings as well as knowledge about their community and may be an indication of future actions in that community.

Past studies reveal participants' feelings and intentions about certain environments and produced results consistent with Lynch's (1960) suggestions that setting, landscape, and personal experiences are linked together to create a single environmental image that is solid (Abu-Ghazzeh, 1999). Other studies describe environments according to general evaluative (beautiful/ugly), scale or size (big/small),

and coherence or order (tidy/untidy) (Mercer et al., 2001). The general evaluative factor is a distinct variable from the other because it includes objective and subjective perceptions of an environment; judgments include both the aesthetic (beautiful/ugly) and psychological (cheerful/depressing) as well as the objective physical aspects (age/cleanliness) (Mercer et al., 2001). Thus, it makes sense that students' perceptions in this study would be influenced by their total perceptions of the environment in their community with respect to aesthetic, psychological, and objective aspects of the community's environment. Abu-Ghazzeh (1999) suggests that people's perceptions of a place, or place meaning, depend on three types of knowledge including (1) the place's attributes, (2) affective quality, and (3) the behaviors that occur there. This suggests that students' thoughts about their community's attributes, affective qualities and behaviors that they engage in within their community in turn affect their perceptions of their community's environment.

Place Attachment

The students' level of attachment to their community plays a role in how they perceive the environment and how they act currently and in the future with respect to that particular place. People develop a positive emotional bond to an environment known as place attachment (Altman & Low, 1992; Mesch & Manor, 1998). That place can create a state of psychological wellbeing if accessible or distress if remote (Giuliani, 1991; Mesch & Manor, 1998).

People become attached to different types of places within the environment and those attachments can be based on both social and economic factors according to Mesch

and Manor (1998). For example, neighborhood attachment is thought to be affected by home ownership, length of residence, individual's stage in the life cycle, and locally based social relationships (Mesch & Manor, 1998). In my study it is important to consider demographic characteristics that include ethnicity, gender, age, and length of residence in the community because they may affect students' attachment to their environment, in turn affecting their perceptions of the environmental problems within that community. Students with differing economic levels are also included in this study, but I cannot specifically link the data to those differing groups, because it is not appropriate to ask for any economic related information on the survey. Nevertheless, it is a factor that is considered in the discussion of the results.

In current research there are differing opinions about whether people are attached to place in a modern society or have been 'liberated' from place attachment. The *liberated community model* suggests that the community has been liberated from place attachment as a result of people's greater geographical mobility (Wellman, 1988; Wellman & Leighton, 1979; Mesch & Manor, 1998). On the other hand, Feldman (1990) suggests that a positive evaluation of the neighborhood's physical and social environment helps people create a positive bond to a place, have greater sense of attachment to it, and remain there (Mesch & Manor, 1998). Mesch and Manor (1998) found that "both locally based social relationships and satisfaction with the environment are related to the development of place attachment." Furthermore, Stedman (2002) suggests that symbolic meanings are important in place satisfaction and attachment because they "all affect willingness to engage in behaviors that maintain or enhance valued attributes of the setting." I believe that place attachment is important in this study because it is likely that

students have developed place attachment to their community since it is probably the only community they know at this point in their lives. The question about length of residence in Austin is included in the survey in order to consider this as a factor. Finding student attachment to their community, indicates a willingness for students to act upon their perceptions of that community.

Sense of Place

Sense of place is a concept that is relevant to this study as well. There are subconscious, subjective judgments that shape reactions and feelings about certain landscapes, features or developments that perceptions influence (Moore-Colyer, 1999; Scott, 2002). "The psychology of seeing, and attaching value and meaning, to a landscape influences where people choose to live, how and where they work, their sense of well being and their sense of place" (Appleton, 1996; Scott, 2002). In this study students' senses of place seem to affect their perceptions. Prediction of their actions based on their perceptions uncovered in this study are related within the context of the sense of place they may or may not have with regards to their community.

Factors Affecting Perceptions

People's perceptions of the same landscape (Brabyn, 1996; Scott, 2002) or preference for certain landscapes can differ. Perceptions are subjective and differ according to race, age, and stage in the life cycle (Lee, Oropesa, & Kanan, 1994; Mesch & Manor, 1998) and values, past experiences and socio-cultural conditioning of the observer as well as the physical landscape (Scott, 2002). Studies show cultural/race

differences between blacks' and whites' preferences for certain types of places (Dwyer, Hutchinson & Wendling, 1981; Peterson, 1977; Brierley Newell, 1997) and differences based on personal background between rural and urban students' abilities to give descriptions of landscapes (Abu-Ghazzeh, 1999). Brierley Newell (1997) suggests that "it is easier to find similarities in place preferences than to find differences." Although this research focuses on place preferences, it is relevant to this study of students' environmental perceptions of a place. This research provides reason for requesting demographic information about ethnicity and age in the survey.

Children's Perceptions

Because this study focuses on children ages 13 through 19, it is necessary to consider research about children's perceptions and their relationship with the environment specifically to better understand how to discuss the results of this study. It is necessary to consider what abilities children have, what has been discovered in the past with children's perceptions with respect to environmental issues and how results of studies done with adults can be applied to children to better understand how to evaluate children's perceptions of the environment. Studies with children not only provide insight into children's perceptions, but also how people in general learn information and how knowledge develops over time. When a learner learns something new, the new information interacts with the information already available in the learner's knowledge base. Gaps in the knowledge base can lead to unsuccessful learning (Vosniadou, 1991). It is unclear which perceptions are learned and how they are learned, however recent

research with children in Brierley Newell's study (1997) suggests the possibility of a learned aspect of preference for a certain landscape feature.

The objective of this study is to better describe students' specific learned knowledge of the Austin environment (through the 'test' questions) and their perceptions of environmental problems (through the ranking task and open-ended question) with respect to pollution, endangered species and resource shortages. This study compares 9th and 12th grade students' perceptions of the environment in an attempt to determine similarities or differences. Similarities and differences found indicate the possibility that further learning took place or loss of information took place in classes beyond 9th grade, misconceptions exist for one or both of the grade level groups, and commonalities occur among high school students.

Some studies address children's understanding of formation of features in the environment and whether direct experience plays a role in their understanding and the extent to which children may hold alternative conceptions prior to formal education (Cin & Yazici, 2002). Other studies address children's understanding of what geography as a term means to them (Catling, 2001), their understanding of places in the 'world' (Eicher and Wood, 2001), and when and why spring begins (Chipeniuk, 1998). All of these studies reveal some geographic misunderstandings among children. In my research, I hoped to disprove some aspects of these findings by showing that children actually do understand certain geographic concepts fairly well.

In my research, the data are acquired in three forms; each form helps determine the validity of the data from each of the other forms. Previous research relying on only one open-ended question or a few open-ended questions with an interview to validate the

findings places too much emphasis on students' recall to assess understanding. In my study, I attempted to lessen the effects of recall limitations by using an open-ended question, a ranking task, and a money allotment task that asked students to indicate which environmental problems they considered more severe than others. In addition to these three tasks, 'test' questions allowed students the opportunity to consider environmental issues that they may have left out in the initial open-ended response and show their understanding of environmental information. In the discussion of the results I need not assume that lack of inclusion of information in the open-ended response means lack of understanding, rather I investigate their environmental knowledge further and describe any differences shown by later questions and reveal a more accurate description of students' understandings. The methodology in this study is a different approach that includes more varied data and opportunities for analysis than those methodologies used in previous studies.

Expected Findings

I expected to find differences across demographic characteristics, particularly with respect to gender in certain areas; for example, I expected females to have a higher environmental knowledge test score and be more satisfied with living in Austin. Overall, I expected students' ratings of their satisfaction with living in Austin to average about "3." I thought their top five places would likely include the Capitol, Zilker Park and the University of Texas.

Which category is considered the most severe environmental problem in Austin? I anticipated that either water or air pollution would be listed as most severe in the ranking

task. Students are likely aware of the Ozone Action days in Austin so I thought they would be able to link that problem to air pollution. Since the Barton Springs pool closes some days due to high bacteria levels, I expected water issues to be fresh in students' minds. Students are also likely aware of the endangered species in the Austin area such as the Barton Creek Salamander, so I thought they would list the loss of this endangered species as one of the most severe environmental problems when they answered the open-ended question or any of the other questions within that category. When students consider the problems in the ranking list, I predicted they would rank water pollution as most severe because it most directly affects their lives. Although students may know more about endangered species and like learning about them more, I predicted they would choose another environmental problem as more important when given a list to consider. Of course, it is the water pollution that affects the Barton Creek Salamander, so that is another reason I thought pollution might be listed as a more severe problem and seem more important because it is a more general topic that relates to a few more specific major problems.

Because students in 9th grade are younger than those in 12th grade, but have more recently studied geographic issues, I expected to find little difference in the problems listed as most severe or environmental knowledge accuracy on the test questions, but I predicted the 9th graders would be more likely to say that school was the most useful source for their knowledge of the environmental problems. In general, I predicted that the students would rank the schools and news media as more useful knowledge sources.

I expected students to "put their money where their mouth is" and allocate more money to the same problem they listed as most severe in the ranking task. I did not expect

this to be the same problem they mentioned in the open-ended response, because I figured that having a list of environmental problems would help them focus on only those five and not have to depend on recall. I expected to find similarities across all demographics, ages, and gender with respect to which problems were rated as most severe.

I was optimistic that students in Austin would show that they know more than many people think they do about environmental problems. Since the environmental knowledge "test" questions required students to consider information about their own community, were not based on recall alone, and could be answered by people who are aware of their surroundings (not solely based on school education on a topic), I expected them to be able to score an average of 50 -75% correct. In my experience, high school students seem to be interested in their community's environment more than a lot of other topics they learn about in school (like algebra or history). For this reason, I predicted students would be able to answer the environmental knowledge "test" questions fairly well even if they did not provide much information on the open-ended question. I also thought the ranking of severity of environmental problems would be fairly similar for most students. I did not expect a lot of "other (specify)" responses.

I expected the majority of the students to answer the Ozone Action and the endangered species questions correctly. For the source of Austin water and the environmental problem in Lake Travis, I expected fewer correct responses. Each school within the Austin Independent School District has a different demographic make-up. Some have more students who are from families with higher or lower income levels. This difference in income affects lifestyle and may in turn affect knowledge of the

environment. For example, students from families with lower income levels are probably less likely to go boating on Lake Travis, so I thought they would be less likely to know as much about that particular aspect of the environment. On the other hand, I thought those same students might be more likely to ride the city buses and would know more about the Ozone Action days. In addition, I thought they might be more likely to mention air pollution or consider it a more severe problem. Therefore, I thought that the students from a school that serves more lower income families would be more likely to mention air pollution as a more severe problem than students from a school that provides services to more higher income families.

I expected that the data would also likely differ for different subgroups of the population and for students who scored low on the environmental knowledge test questions. For example, I expected that students from a school that has more lower income families would score lower on the environmental test questions. I predicted the students with lower environmental knowledge "test" scores would be less likely to identify the news media or school as the places where they gained the most useful information about the environment.

Overall, I expected to find helpful and interesting information about student perceptions of environmental problems in Austin regardless of the outcome of the data analysis. Even if the data did not show significant correlations, I anticipated that it would still provide helpful information by suggesting there is little or no correlation among certain variables. Besides providing information about the topic at hand, I thought it would also provide information about how students' responses can show different

information based on the type of question that is used (open-ended, ranking, money allotment, or multiple-choice).

Since the focus of the study is students' environmental perceptions, I hoped that the data would shed light on students' understandings of the place in which they live and their environmental awareness. By understanding how students perceive their community's environment, we can get a better picture of what they don't know and need to learn and what knowledge they are using on which to base their decisions or actions. I thought that if this were found to be different among different demographic groups or for only certain environmental topics we would better know how to address those issues to expand environmental knowledge among all groups and all topics.

CHAPTER 3

METHODOLOGY

Site Description

Austin, Texas

The two schools where students were surveyed for this study are located in Austin, Texas. Austin is centrally located in Texas and is the state capital. The population is 53% White, 31% Hispanic, 10% Black, and 7% Asian/Other/Multi (About Austin, 2005). Some of the attractions listed on the downtown attractions include the Texas State Capitol Complex, University of Texas Campus, 6th Street, and Town Lake. Sixth Street is the entertainment district in a town that calls itself the "Live Music Capital of the World." Town Lake is located along the Colorado River and next to the nearby Zilker Park (About Austin, 2005). The city has a temperate year-round climate and many natural attractions. It is known as the gateway to the Texas Hill Country and the Highland Lakes (Austin Convention and Visitors Bureau, 2005).

The Highland Lakes are a chain of reservoirs on the Colorado River; the two largest reservoirs are Lake Buchanan and Lake Travis (Lower Colorado River Authority, 2005). Austinites get their water from three water treatment plants that use surface water from the Colorado River as it flows into Lake Austin and Town Lake (which are also part of the Highland Lakes) (Austin Water Utility, 2005). The Edward's Aquifer runs along

the Balcones Escarpment under the Central Texas cities between Austin and Uvalde. It supplies drinking water for 1.5 million people and is used for recreational, agricultural and industrial purposes for people in the region as well (Texas Parks and Wildlife, 2005). In January, 2005 there were reports in the news about the cause of a grassy smell and taste of Austin water. This effect was due to algae growth in the Colorado River. The increased algae growth is also evident in the Highland Lakes including Lake Travis and all the Highland Lakes (News Eight Austin, 2005). Lake Austin continues to have difficulty with overgrowth of hydrilla, a fast-growing aquatic plant that is non-native to Texas water. There have been recent reports in the news about its effects and efforts to curtail its growth (Lower Colorado River Authority, 2005). There have also been recent news reports of high bacteria levels in Austin waters due to runoff from flooding rains (Lower Colorado River Authority, 2005).

The Barton Springs Salamander is an endangered species that lives in the Central Texas region; the salamander's habitat is in the rubble in the spring outflow of Barton Springs in Austin, which is within Zilker Park (Texas Parks and Wildlife, 2005). The Tooth Cave Spider is a lesser known endangered species that also lives in the Austin area as well as other Texas cities (US Fish & Wildlife Service, 2005).

Another concern for Austinites is clean air. The CLEAN AIR Force is an independent, non-profit group consisting of Travis and Williamson county government, environmental and business organizations and agencies who have combined efforts to create educational programs to reduce air pollution. One of their initiatives is the Ozone Action Day program. On days when the ozone level is expected to be high, an Ozone Advisory is issued for the next day. The media notifies the public and people are

encouraged to voluntarily take actions to lessen the amount of pollution they produce. Free rides are available on all city buses by Capital Metro on Ozone Action Days (Clean Air Force, 2005).

Austin Independent School District

Austin Independent School District (AISD) has 13 high schools located in Austin, Texas. It is a public school district that has campuses extending in all directions from the city center. These schools are categorized as urban campuses and the student population reflects the population of the city of Austin, but the individual schools serve very different student populations depending on the location of the school and the school focus (whether it is or not a magnet school). The two campuses where students participated in the survey research are located in the south central part of Austin. Stephen F. Austin High School (AHS) is located less than one mile north of the Town Lake area of the Colorado River and about two miles west of Congress Ave. Congress Avenue is the street that runs north and south and leads to the Capitol building. William B. Travis High School (THS) is located approximately two miles east of Congress Avenue and one mile south of the Colorado River. Although these two schools are near each other, the student populations have different characteristics. THS has a large number of English as a Second Language students who have recently moved to the United States, serves students from lower income areas than AHS, and has a much larger Hispanic and much smaller White Non-Hispanic population than AHS.

Survey Data Collection

Survey Population and Demographic Information

All students in the selected classes were given a parental consent form to take home and return with a signature stating that his/her parent agreed to allow him/her to participate in the survey about the Austin community (see appendix A and B). The written surveys were distributed to the students who returned the parental consent forms, then the written survey was administered by the student's regular classroom teacher (see appendix C and D). They were given approximately fifteen minutes to complete the questions and asked to do the questions in order without going back to a previous question. First, students indicated their age, gender, years they've lived in Austin, course name, teacher, and ethnicity. Each of these variables was used to find commonalities or differences measured by correlation with responses on each of the other tasks and questions.

Satisfaction Rating Task

Students rated their satisfaction with living in the Austin community on a scale from one to five with one being very satisfied and five being very unsatisfied. This ordinal level data generated an overall satisfaction score to be used as one indicator of students' perceptions of their community, a characteristic of their "sense of place." This score was correlated to the demographic data.

Top Five Places Listing Task

Students listed the top five places that came to their minds when they thought of the Austin community. This was based on recall and created nominal level data that were organized into groups for qualitative and quantitative descriptive statistical analysis. This question provided another indication of students' perceptions of their community or their "sense of place."

Open-ended Question About Environmental Problems

The open-ended question was: What are the environmental problems in the Austin community? Content analysis was used to analyze the data from this question. The students' responses were categorized according to topic: water pollution, air pollution, endangered species loss, natural resource shortages, and other. Descriptive statistics were used to find categories listed with greatest frequency. This question generated nominal level data to gain a qualitative understanding of students' categorized perceptions of environmental problems in Austin. The question was open-ended so that responses would shed light on the major topics of concern to students based on recall. The overall time limit was given to obtain more focused answers that contained only main topics rather than specific situations and extensive descriptions. Students were directed to answer the questions in order without going back to a previous question so that their answers were not contaminated by information they read in later questions. The open-ended question was printed on the front of the paper so that students could not read the list of environmental problems that were used for the ranking task on the other side of the paper.

Environmental Problems Ranking Task

After completing the first open-ended question, students turned the paper over and completed a ranking task. Students ranked the environmental problems in the list according to their perceptions about the severity of each problem in the Austin community. The environmental problems in the list included (1) endangered species loss, (2) water pollution, (3) natural resource shortages, (4) air pollution and, (5) other. Correlational analysis was used to describe the relationship between the frequency of students mentioning a topic in the first question as the most severe environmental problem and the frequency of students ranking that same topic as the most severe environmental problem in the environmental problem ranking task and the money allotment task.

These ordinal level data are also qualitative in nature and were used to provide further insight on the information ascertained from the first open-ended question. Ranking the environmental problems according to severity required students to identify which problems are more severe than others. This was used as an indicator about whether the problems students mentioned in the open-ended question were also ranked as more severe or whether students could not recall certain problems, but considered them to be more severe than others that they mentioned when they were prompted to consider these problems.

Knowledge Source Ranking Task

Students ranked the usefulness from one to four for each of four knowledge sources that corresponded to each of the environmental problems in the previous ranking

task. The four knowledge sources included (1) school, (2) family, (3) news media, and (4) other. The ordinal level data were tested to find any relationships for the demographic data. This question provided insight as to the students' perceptions about where or who has provided them with knowledge about the environmental problems in their community. This serves as a possible indicator of the success or perceived success of environmental education initiatives within the schools in contrast with other sources of environmental education including the media and students' own families. It also suggests how or where students are learning about their own community.

Money Allotment Task

The money allotment task required students to choose how they would like $100, 000 of government money to be spent on solving the environmental problems in Austin. They were given the same five categories of environmental problems as listed in the environmental problems ranking task. This generated ratio level data. The three different strategies (open-ended, ranking, and money allotment) of gaining information about students' perceptions of the most severe environmental problems in Austin allowed for triangulation so that three types of data were generated and compared, thus improving the validity of the findings.

Environmental Knowledge Test Questions

Four multiple-choice "test" questions were used to identify a student's "environmental knowledge" level. These four questions determined a level, or score, for each student. The quantitative, ratio scale data for students with certain scores were

analyzed through correlational analysis to determine any relationships between knowledge and how environmental problems are ranked, how knowledge sources are ranked, and satisfaction of living in Austin. Students' knowledge scores were also analyzed according to demographic characteristics.

Being able to determine each student's level of environmental knowledge about the Austin community provided a context in which to place the findings from the other questions. This not only helped determine how to better understand and discuss the findings from the first two survey questions, but also provided interesting information by itself. To discuss the results, it is important to know whether students know what they are talking about, that is, are they using accurate information about the Austin environment on which to base their perceptions?

CHAPTER 4

RESULTS

Overview

Previous studies have asked only one open-ended question to find out student knowledge of an environmental issue or a topic related to geography and the analyses were limited to using only descriptive statistics. This survey included multiple variables to provide a complex picture of students' perceptions or "sense" of their community. The survey questions included open-ended, ranking, and multiple choice (see Table 1).

Table 1. Survey Question Types

Question	Response Type
Satisfaction Rate	rated from 1-5
Top Five Places List	open-ended
List of Main Environmental Problems	open-ended
Ranking of Most Severe Environmental Problems	ranked from 1-5
Environmental Knowledge Source Ranking	ranked from 1-4
Money Allotment Ranking for Environmental Problems	$100,000 spent in all
Environmental Knowledge Multiple Choice Test Questions	4 answer choices

The data analysis generated a satisfaction rating, top five places list, most severe environmental problems ranking in five categories (see table 2), environmental knowledge source ranking, money allotment ranking according to environmental problem category, and environmental knowledge test score. All of these variables were evaluated for demographic characteristics (see table 3). The data generated from this survey were analyzed with descriptive statistics and correlational analysis for the most severe environmental problems by category. The results were grouped according to overall results for the entire sample population and specific results for individual demographic groups based on the aforementioned demographic characteristics. Using triangulation as a survey question design technique to improve validity was also assessed.

Table 2. Categories of Environmental Problems

Category
Endangered Species Loss
Water Pollution
Natural Resource Shortages
Air Pollution
Other

Table 3. Demographic Characteristics

Category
Length of Residency
Gender
Ethnicity
Grade Level
School
Course Level
Teacher

Sample Population Characteristics

Schools, Grade Level, Course Level, and Teacher

Two hundred seventeen students from two high schools in the Austin Independent School District returned their parental consent forms and completed surveys for this study. Fifty-three percent of the students surveyed were from AHS and 48% were from THS (see table 4).

At AHS, there were four 9th grade classes (two with one teacher and two with another teacher) and four 12th grade classes (all with the same teacher) that participated. Two of the 9th grade classes were advanced level classes and one of the 12th grade classes was advanced. At THS, there were four 9th grade classes who all had the same world geography teacher and four12th grade classes who all had the same government teacher. Two of the 9th grade classes were advanced level classes, but none of the 12th grade classes were advanced. There were almost equal numbers of 9th graders and 12th graders who participated, but more of the12th graders were from THS and more of the 9th graders were from AHS (see table 4).

Overall for the sample from both schools, 32% of the students were enrolled in an advanced class and 68% were not. More of the 9th grade students who participated in the survey were enrolled in an advanced level class than the 12th grade students who participated in the survey. Half of the students were taking a 9th grade world geography class and the other half of the students were taking a 12th grade economics or government class. Information about school, grade level, course level, and teacher was available for 100% of the students in the sample population (see table 4).

Table 4. Sample Population by School and Course Level

	N	Overall		AHS		THS	
		9th	12th	9th	12th	9th	12th
	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Advanced	31.8	22.5	9.2	11.1	9.2	11.5	0.0
Regular	68.2	27.2	41.0	17.9	14.3	9.2	26.7
Total (adv, reg)	100.0	49.7	50.2	29.0	23.5	20.7	26.7
Total (overall, AHS, THS)		99.9		52.5		47.4	

Note: Percentages are based on a total sample population where $N = 217$.

Gender and Ethnicity

Of those students who were surveyed, 100% of the students indicated their gender and all but one student indicated his ethnicity. Of the sample population overall 59% were females and 41% were males. There were many more males from AHS that completed the survey than at THS, but only slightly fewer females completed the survey at AHS than at THS. The mean age of females and mean number of years they have lived in Austin were both slightly lower than the males' means (see table 5).

Table 5. Gender by School, Age and Length of Residency

	N	AHS (%)	THS (%)	*N*	Age (mean years)	Residency (mean years)
Females	128	46.9	53.1	128	15.8	11.8
Males	89	60.7	39.3	88	16.4	12.7
Total (both)	217	52.5	47.5	216	16.0	12.2

The majority of the students indicated that they were Hispanic (58%). The next largest ethnic group was White, Non-Hispanic (32%), then African American (6%), Other (3%), and Pacific Islander (1%) and Native American (1%). Out of the number of students who completed the survey, Hispanic students were in the majority at both schools, but were a much higher portion of the population at THS than at AHS. About one third of the students who participated from AHS were White, Non-Hispanic, whereas less than one tenth of the students who participated were White, Non-Hispanic at THS. At THS, there were slightly more African American students surveyed than at AHS. The sample population of students who categorized themselves as African American, Native American, Pacific Islander, or Other was very small (see table 6).

Table 6. Ethnicity by School

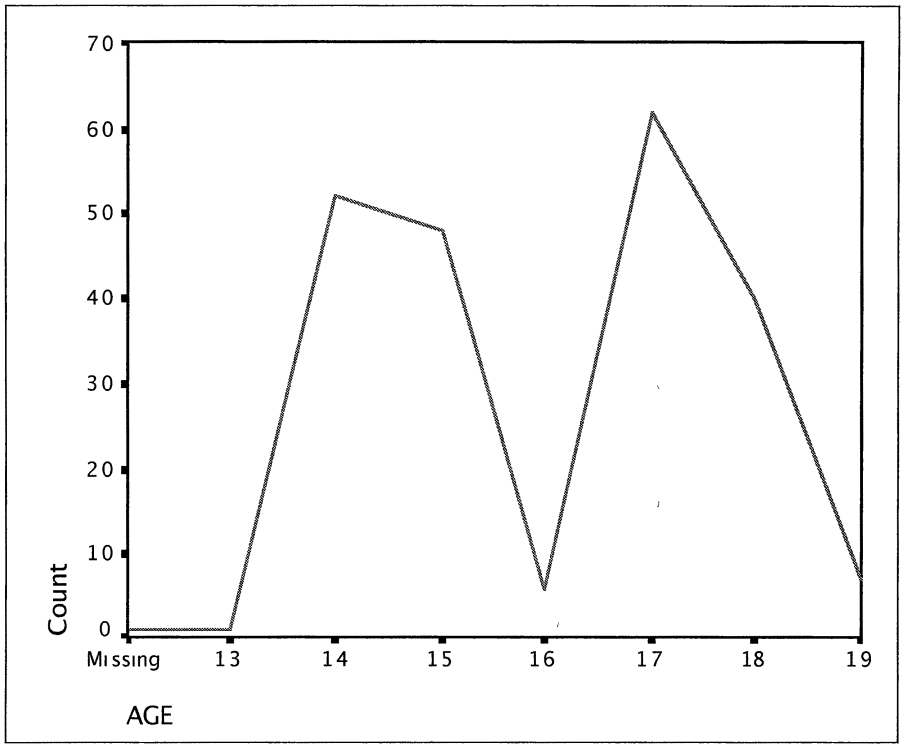
		School		
		AHS	THS	Total
Ethnicity	Count	- -	1	1
	% within Ethnicity	- -	100.0	100.0
	% within School	- -	1.0	.5
African American	Count	3	10	13
	% within Ethnicity	23.1	76.9	100.0
	% within School	2.6	9.7	6.0
Hispanic	Count	40	85	125
	% within Ethnicity	32.0	68.0	100.0
	% within School	35.1	82.5	57.6
Native American	Count	1	- -	1
	% within Ethnicity	100.0	- -	100.0
	% within School	.9		.5
Other	Count	6	1	7
	% within Ethnicity	85.7	14.3	100.0
	% within School	5.3	1.0	3.2
Pacific Islander	Count	1	- -	1
	% within Ethnicity	100.0	- -	100.0
	% within School	.9		.5
White	Count	63	6	69
	% within Ethnicity	91.3	8.7	100.0
	% within School	55.3	5.8	31.8
Total	Count	114	103	217
	% within Ethnicity	52.5	47.5	100.0
	% within School	100.0	100.0	100.0

Note: Total $N = 216$.

Age and Length of Residency

All of the surveyed students indicated the number of years they have lived in Austin and all but one indicated his age. The mean age of the students was 16 years; however, there was a bimodal distribution with peaks at age 14 to 15 and 17 to 18. The median age of 9th graders was 14.6 and the median for 12th graders was 17.5 (see figure 1). More 9th graders were from AHS, but more of the 12th graders were from THS. Accordingly, the mean age of students from THS was slightly higher than the mean age of students from AHS, but the mean number of years students have lived in Austin was higher for the AHS students versus the THS students (see table 7).

Figure 1. Bimodal Distribution by Age



Note: Count represents number of students. $N = 216$.

Table 7. Age and Length of Residency by School and Grade

	N	Age		*N*	Length of Residency	
		Mean (years)	Median (years)		Mean (years)	Median (years)
Total						
All	216	16.0	17	217	12.2	14
9th	108	14.6	15	108	11.2	14
12th	108	17.6	17	109	13.1	17
AHS						
All	113	15.8	15	114	13.4	14
9th	63	14.5	14	63	12.0	14
12th	50	17.4	17	51	15.1	17
THS						
All	103	16.3	17	103	10.8	11
9th	45	14.6	15	45	10.2	12
12th	58	17.6	17	58	11.3	11

Note: Total *N* =217.

The mean number of years students have lived in Austin is 12. The length of residency for students was grouped into four categories: 0-4 years, 5-9 years, 10-13 years, and 14-19 years. The majority of 9th graders (59%) and 12th graders (58%) in the sample population indicated that they have lived in Austin for 14 to 19 years, which is most of their lives (see figure 2). The median number of years that students have lived in Austin was 14 years for 9th graders and 17 years for 12th graders (see table 7). There was little difference in the mean age of students according to ethnicity, but the mean length of residency for students was longer by approximately two years for White, Non-Hispanic students than for Hispanic students (see table 8).

Figure 2. Length of Residency by Grade

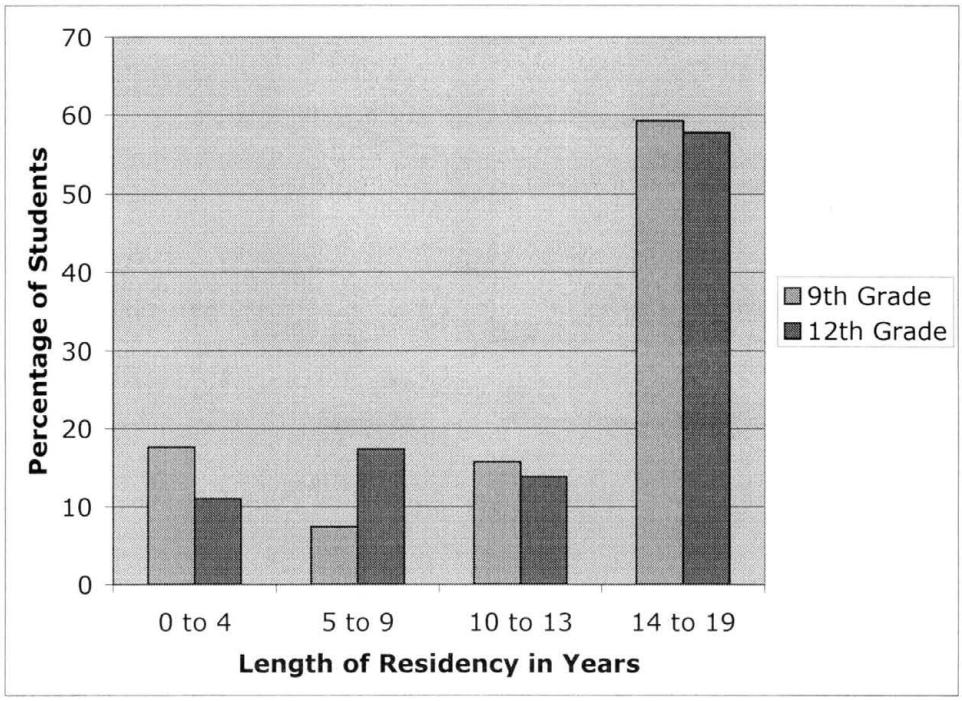


Table 8. Ethnicity by Length of Residency and Age

Ethnicity	*N*	Mean Length of Residency	*N*	Mean Age
African American	13	12.7	13	15.8
Hispanic	125	11.5	125	16.1
Native American	1	14.0	1	14.0
Other	7	9.3	6	16.0
Pacific Islander	1	11.0	1	15.0
White, Non-Hispanic	69	13.4	69	16.0

Note: Total $N = 217$.

Overall Results

Descriptive Statistics

Satisfaction Rating Task

The mean satisfaction rating on a scale from one to five with one being very satisfied and five being very unsatisfied was 2.5. All of the students except one completed this question on the survey, so the sample size for this task was $N = 216$. The standard deviation was 1.3.

Top Five Places Listing Task

The capitol was the most frequently mentioned place in Austin; 44% of the students who responded to this question listed the capitol in their top five places list. Written answers of the capitol and the capital were included in this category. Students also frequently mentioned UT (the University of Texas), Sixth Street, Zilker Park, the mall, and the student's own school. The mall category included written answers of Barton Creek Mall, Lakeline Mall, and the mall. AHS, THS and school were included in the same group because it was considered that all of these answers referred to the student's own school (see table 9). Overall, the percentage of students who answered this question was 95%. Five blanks were on the survey questionnaire, but some of the students listed fewer than five places (see table 10).

Table 9. Top Five Places in the Austin Community

Place	Other Accepted Forms	Percentage of Respondents Who Listed the Place
1. The Capitol	capital	43.9
2. University of Texas	UT	31.7
3. 6th Street		25.9
4. Zilker Park	Zilker	23.4
5. The Mall	Barton Creek Mall, Lakeline Mall	21.0
6. School	AHS, THS	20.5

Note: $N = 205$.

Table 10. Minimum Number of Places and Environmental Problems Listed by Percentage of Respondents

	Top Five Places (% of Respondents)	Environmental Problems (% of Respondents)
N	205	205
Minimum Number of Places Listed		
1	100.0	100.0
2	98.0	98.0
3	90.7	94.6
4	89.8	90.7
5	85.9	86.3

Note: Total $N = 217$.

Open-ended Question About Environmental Problems

The most frequently mentioned topics were (1) air pollution, (2) pollution, (3) water pollution, (4) traffic and (5) trash/litter (see table 11). Content analysis was used to organize these topics into the same five categories that were listed for the environmental problems ranking task and the money allotment task (see table 2). When categorized this way, most (62%) of the responses fell into the "other" category. The second highest number of responses fell into the category of pollution. Thirty percent of the respondents mentioned air pollution specifically and 24% mentioned water pollution specifically. Another 24% mentioned pollution in general. Topics such as tree loss and natural habitat loss were the most commonly mentioned examples that were included in the natural resource shortages category; 11% of the respondents mentioned topics in that category. Only 8% mentioned topics in the endangered species category; the Barton Springs Salamander was the most common topic in that category (see table 11). Overall, 95% of the students listed at least one environmental problem for this question, but fewer and fewer listed at least two, three, four or five or more environmental problems (see table 10).

Table 11. Most Severe Environmental Problems in Open-Ended Question by Specific Response and Category

Most Severe Environmental Problems			
By Specific Response	Percentage of Respondents	By Category	Percentage of Respondents
1. Air Pollution	30.2	1. Other	62.0
2. Pollution	23.9	2. Air Pollution	30.2
3. Water Pollution	23.9	3. Water Pollution	23.9
4. Traffic	9.0	4. Pollution	23.9
5. Trash/Litter	17.1	5. Natural Resource Shortages	11.2
6. Endangered Species Loss	8.3	6. Endangered Species Loss	8.3

Note: $N = 205$.

Environmental Problems Ranking Task

Students ranked air pollution as the most severe environmental problem in the Austin community; the mean rank for air pollution was 2.0 on a scale from one to five with one being the most severe problem. Water pollution ranked a close second with a mean rank of 2.1, natural resource shortages was third with a mean rank of 3.0, endangered species loss was fourth with a mean rank of 3.6, and other was fifth with a mean rank of 4.2. Most students (72%) responded to this question and followed the directions correctly by only ranking one problem with a "1" and so on. Some students ranked the problems correctly, but left some categories like "other" with no ranking, therefore, the sample size varied for each category (see table 12).

Table 12. Environmental Problems Ranking Task and Knowledge Source Ranking Task by Mean Rank

Environmental Problem	*N*	Mean Rank	Knowledge Source	*N*	Mean Rank
Air Pollution	197	2.0			
			News Media	109	1.7
			School	109	2.1
			Family	107	2.7
			Other	90	3.3
Water Pollution	193	2.1			
			News Media	110	1.8
			School	108	2.0
			Family	108	2.6
			Other	91	3.3
Natural Resource Shortages	195	3.0			
			News Media	109	1.8
			School	107	2.1
			Family	108	2.6
			Other	92	3.2
Endangered Species Loss	197	3.6			
			News Media	133	1.9
			School	137	2.0
			Family	131	2.7
			Other	114	3.3
Other	156	4.2			
			News Media	79	2.0
			School	77	2.3
			Family	76	2.7
			Other	78	2.8

Knowledge Source Ranking Task

Students were directed to rank the usefulness from one to four with one being the most useful source that has helped them gain knowledge about each of the environmental problems in each of the five environmental problems ranking categories. For every category the students' mean rankings for the most useful sources was in the same order: (1) news, (2) school, (3) family, and (4) other (see table 12). Overall, the mean for news was 1.9, school was 2.0, family was 2.7 and other was 3.3.

Money Allotment Task

When the means for dollars spent in each category out of a total of $100,000 were compared, the highest mean dollar amount spent was in the air pollution category, then water pollution, natural resource shortages, endangered species loss and other. The top two categories had very close means with $26,317 for air pollution and $25,924 for water pollution. Not all students responded to this question correctly; some students' total dollars spent had a sum that was more or less than $100,000. The number of students who correctly responded to this question on any one of the categories ranged from 51% to 69% (see table 13).

Table 13. Money Allotment for Solving Environmental Problems

Environmental Problem	*N*	*N* (% of 217)	Mean ($)
Air Pollution	148	68.2	26,317
Water Pollution	150	69.1	25,924
Natural Resource Shortages	149	68.7	21,307
Endangered Species Loss	147	67.7	17,029
Other	111	51.2	16,894

Environmental Knowledge Test Questions

The mean overall score for the four environmental test questions was 74% correct answers. For some of the questions, there was more than one answer that was counted as correct. Unanswered questions were counted as wrong answers. The first question about the environmental problem that led to Ozone Action Days in Austin had only one correct answer: air pollution. Eighty-two percent of students answered that question correctly. The second question asked about a type of species that is endangered and lives in the Austin area. This question had two correct answers: a spider or a salamander. Sixty-one percent of students answered this question correctly; most chose "salamander", but a few chose spider. The third question asked about a recent environmental problem in Lake Travis. There were three correct answers: bacteria, algae, and hydrilla. Eighty-three percent answered this question correctly. A large number of students chose each of the three correct answers. Thirty-one percent chose bacteria, 28% chose algae, and 25% chose hydrilla. The last question asked about the water source for the majority of Austinites. Both "the Edward's Aquifer" and "Town Lake" were counted as correct answers; 72% chose one of the two correct answers. The majority (59%) chose "the Edward's Aquifer" and only 13% chose "Town Lake" (see Table 14).

Table 14. Environmental Knowledge Scores on Test Questions

Question	% Correct	*N*	Answer Distribution: Correct	(%)	Incorrect
Environmental Problem in Lake Travis	83.0	207			
			Bacteria	30.4	
			Algae	28.1	
			Hydrilla	24.5	
				12.4	Water Fowl
Cause for Ozone Action Days	82.0	205			
			Air Pollution	82.0	
				5.1	Nuclear Radiation
				5.1	Water Pollution
				2.3	Endangered Species
Water Source for Austinites	71.9	202			
			Edward's Aquifer	58.5	
			TownLake	13.4	
				18.9	LakeTravis
				2.3	Ogallala Aquifer
Endangered Species in Austin	60.8	207			
			salamander	56.7	
			spider	4.1	
				19.8	fox
				14.7	fish

Note: No response was counted as an incorrect response. All percentages were calculated using N =217.

Correlational Analysis

There was no significant relationship found between the grade level of the course the student was taking and his score on the environmental knowledge test questions. A T-test showed that 9th graders did not score significantly different from12th graders on the four multiple choice environmental test questions. All 217 of the students in the sample population were included in this test, since the grade level of the course each student was taking was known and students who did not answer the test questions received a score of "0" (see tables 15, 16, and17).

Table 15. Environmental Knowledge Score and Grade by Group Statistics

Group Statistics	Grade	*N*	Mean	Standard Deviation	Standard Error of Mean
Environmental Knowledge	9	108	73.4	25.892	2.491
	12	109	75.0	30.807	2.951

Table 16. Environmental Knowledge Score and Grade by Levene's Test for Equality of Variances

		F	Significance
Environmental Knowledge	Equal Variances Assumed	1.604	.207

Table 17. Environmental Knowledge Score and Grade by T-test for Equality of Means

	t	df	Sig. (2-tailed)	Mean Difference	Standard Error
Environmental Knowledge					
Equal Variances Assumed	-.299	215	.765	-1.16	3.865
Equal Variances Not Assumed	-.300	209.4	.765	-1.16	3.862

A student's environmental knowledge score on the four multiple choice test questions was not found to be significantly related to the student's mean ranking he gave to each of the four sources of environmental knowledge: news, school, family, and other. A One-way Anova was used to determine whether a relationship existed between the number of items a student answered correctly on the four environmental test questions (0,1,2,3 or 4) and the mean ranking the student gave to each of the four sources of his environmental knowledge (school, news media, family, other). For the means where the significance was less than 0.05 (homogeneous variances), results from the Post Hoc Tukey test were considered. For the means where the significance was greater than 0.05 (non-homogeneous variances across groups), then results from the Post Hoc T2 tests were considered. Neither set of tests showed a significant relationship between a student's environmental knowledge score and any of the four sources of environmental knowledge.

Triangulation Method

The method of triangulation tested the consistency of student responses on three different question types. Information from each of three questions was compared in order to ascertain a student's degree of consistency in his answers about the severity of environmental problems according to five categories: (1) endangered species loss, (2) water pollution, (3) natural resource shortages, (4) air pollution, and (5) other. The first question included in this part of the analysis was the open-ended question about environmental problems in the Austin area that asked students to list the most severe environmental problems. The second question included was the environmental problems ranking task that asked the students to rank the environmental problems in a given list in

order of severity. The third question used was the money allotment question where students were asked to allot $100,000 to use to solve five environmental problems in the Austin area. The questions asked in the third question used categories that were the same as those listed in the environmental ranking task and the same as those categories used for analyzing the content in the open-ended environmental problems question.

The environmental problem listed as most severe in the open-ended question was compared to the problem the student ranked as most severe in the environmental problems ranking list. Only 44% of the students who responded to both of these questions ranked the problem they had listed as most severe in the open-ended question as most severe when given a list of environmental problems in the ranking task. Eighty-one percent of students answered both of these questions and could be included in the sample (see table 18).

Table 18. Compared Responses on Environmental Problems Questions

Compared Questions			Top Problem Matches	Top Problem Does Not Match
First Question	Second Question	*N*	(%)	(%)
Open-Ended	Problems Rank	175	43.4	56.6
Problems Rank	Money Allottment	184	70.1 (17.4)	29.9
Open-Ended	Money Allottment	178	45.0 (16.3)	55.0

Note: Figures in parenthesis are percentages of respondents who allocated equal dollar amounts to all problems.

Next, the problem the student ranked as most severe in the environmental problems ranking list was compared to the problem to which the student allotted the most money in the money allotment question. More than half (53%) of the students were consistent in their responses; they allotted the most money to solving the environmental problem that they had also ranked as most severe in the environmental problems ranking list question. Some of the students allotted an equal amount of money to each of the environmental problems listed in the money allotment question. When these students are included, the sum grows to 70%. Eighty-five percent of students responded to both of these questions and were included in the sample (see table 18).

The third comparison used in the triangulation method was a comparison of the environmental problem that the student listed as most severe in the open-ended question with the problem to which the student had allotted the most money in the money allotment question. Only 29% of students were consistent in their responses and allotted the most money to the problem they had listed as most severe in the open-ended question. Some of the students allotted an equal amount of money to each question. When their scores are included it raises the amount of consistent responses to 45%. For this sample 82% of the surveys were included (see table 18).

Grouped Results

Length of Residency

The number of years students indicated that they had lived in Austin were grouped into four categories: (1) 0-4 years, (2) 5-9 years, (3) 10-13 years, and (4) 14-19 years. These groups were chosen so that students who had lived in Austin all of their

lives, whether they were 9th graders or 12th graders, would all fall into the last group because they would have lived in Austin from 14-19 years.

Students in each of the four length of residency categories ranked the severity of natural resource shortages and "other" environmental problems in a similar way. There were slight differences in how they ranked the severity of the other environmental problems. Group 1 (0-4 years residency) ranked endangered species loss, water pollution, and air pollution as being less severe than the other three groups ranked them. The sample size by groups was too small to compare results for environmental knowledge source mean scores. Group 3 (10-13 years residency) rated their satisfaction of living in Austin as the lowest out of the four groups, but group 4 (14-19 years residency) rated it the highest compared to the other groups (see table 19).

Table 19. Environmental Problems Mean Rank by Length of Residency Groups

Length of Residency Group	Environmental Problems				
	Air Pollution mean	Water Pollution mean	Natural Resource Shortages mean	Endangered Species Loss mean	Other mean
0-4 years	2.3	2.4	2.9	3.4	4.0
	(29)	(27)	(27)	(27)	(22)
5-9 years	2.1	2.0	2.9	3.8	4.2
	(24)	(23)	(24)	(24)	(16)
10-13 years	2.0	2.2	3.2	3.5	4.0
	(29)	(29)	(29)	(30)	(22)
14-19 years	1.9	2.0	3.0	3.7	4.3
	(115)	(114)	(115)	(116)	(96)

Note: Figures in parentheses are base *N*s for the above percentages. Total $N = 217$.

The mean environmental knowledge score was much lower for group 1 (0-4 years residency) than the other three groups' scores. Group 1 scored the lowest on each of the four environmental knowledge test questions. All three of the other groups had more similar mean scores on each of the four environmental test questions (see table 20).

Table 20. Environmental Knowledge by Length of Residency Groups

Environmental Knowledge Scores	Length of Residency Groups (1) 0-4 years	(2) 5-9 years	(3) 10-13 years	(4) 14-19 years
N	31	27	32	127
Overall	56.5	72.2	80.4	76.6
Individual Questions				
Cause for Ozone Action Days	71.0	81.5	87.5	83.5
Environmental Problem in Lake Travis	71.0	81.4	84.4	85.0
Water Source for Austinites	58.1	74.0	75.0	74.0
Endangered Species in Austin	35.5	51.8	71.9	62.2

More of the students in groups 1, 2, and 3 attend THS than attend AHS. 65% of the group 4 students attend AHS. The distribution of students enrolled in advanced or regular level courses differed little according to length of residency groups. There were differences according to ethnicity; a larger majority of the White, Non-Hispanic students were in group 4 (14-19 years residency) than Hispanics and African Americans (see table 21).

Table 21. Length of Residency by School, Course Level, and Ethnicity

		Length of Residency Groups			
		(1) 0-4 years (%)	(2) 5-9 years (%)	(3) 10-13 years (%)	(4) 14-19 years (%)
	N				
School					
AHS	114	8.8	7.0	11.4	72.8
THS	103	20.4	18.4	18.4	42.7
Course Level					
Advanced	69	15.9	8.7	17.4	58.0
Regular	148	13.5	14.2	13.5	58.8
Ethnicity					
African American	13	7.7	23.1	7.7	61.5
Hispanic	125	16.8	15.2	16.8	51.2
Native American	1	100.0	- -	- -	- -
Other	7	42.9	- -	14.3	42.9
Pacific Islander	1	100.0	- -	- -	- -
White Non-Hispanic	69	8.7	7.2	11.6	72.5

Gender

There were more females who completed the surveys than males. More of the females were in 9th grade and more were from THS. Females had similar mean scores as compared with males for level of satisfaction with living in Austin and severity of environmental problems in all four categories including endangered species loss, water pollution, natural resource shortages, air pollution, and other. Both genders also had similar mean scores for usefulness of environmental knowledge sources in all four categories including school, family, news media, and other (see table 22).

Table 22. Survey Response Similarities by Gender

	N	Females (mean)	*N*	Males (mean)
Satisfaction Rating (Scale from 1-5 with 1 being very satisfied)	122	2.5	87	2.5
Environmental Problems Rank (Scale from 1-5 with 1 being most severe)				
Air Pollution	121	2.0	76	1.9
Water Pollution	121	2.1	72	2.1
Natural Resource Shortages	121	3.0	74	2.9
Endangered Species Loss	122	3.6	75	3.8
Other	98	4.2	58	4.2
Environmental Knowledge Source (Scale from 1-4 with 1 being most useful)				
News Media	49	1.9	28	2.0
School	47	2.1	29	2.2
Family	48	2.8	28	2.6
Other	45	3.2	25	3.5

Gender differences were found for environmental knowledge scores and each of the individual knowledge questions used to obtain the environmental knowledge score. Males scored 6% higher on their overall environmental knowledge and scored higher on each of the four questions used to calculate the overall environmental knowledge score. The biggest difference was found on the question that asked students to choose which animal was an endangered species in the Austin community. The smallest difference was found on the question that asked students to choose the source of water for the majority of the Austin community (see table 23).

Table 23. Survey Response Differences by Gender

	Females		Males	
	N	(% correct)	*N*	(% correct)
Environmental Knowledge Score				
Overall	128	71.9	89	78.1
Individual Questions				
Endangered Species in Austin	128	79.7	89	85.4
Environmental Problems in Lake Travis	128	80.5	89	86.5
Cause for Ozone Action Days	128	79.7	89	85.4
Water Source for Austinites	128	71.1	89	73.0

Ethnicity

Students indicated their ethnicity according to the categories (1) African American, (2) Hispanic, (3) Pacific Islander, (4) White, Non-Hispanic, (5) Native American, or (6) other. The sample sizes for Hispanic and White, Non-Hispanic were large ($N > 68$), but the sample sizes for African American, Pacific Islander, Native American and Other were very small ($N < 15$). The majority of African Americans (77%) and Hispanics (64%)were female, but a slight majority of White, Non-Hispanics (54%) were male. Students in the three largest ethnic groups of the sample population (Hispanic, White, Non-Hispanic, and African American) ranked the severity of water pollution, natural resource shortages, and the environmental knowledge sources of school and news media similarly (see table 24.)

Table 24. Environmental Problems Severity and Knowledge Source Rank by Ethnicity

	African American (mean rank)	Hispanic (mean rank)	Native American (mean rank)	Other (mean rank)	Pacific Islander (mean rank)	White, Non-Hispanic (mean rank)
Environmental Problems						
Air Pollution	1.9 (11)	1.9 (111)	1.0 (1)	2.3 (6)	1.0 (1)	2.2 (66)
Water Pollution	1.9 (11)	2.1 (108)	3.0 (1)	1.8 (6)	3.0 (1)	2.1 (65)
Natural Resource Shortages	2.8 (11)	3.0 (109)	5.0 (1)	3.7 (6)	2.0 (1)	3.0 (66)
Endangered Species Loss	4.1 (11)	3.7 (111)	2.0 (1)	2.5 (6)	4.0 (1)	3.5 (66)
Other	4.2 (10)	4.1 (87)	4.0 (1)	4.3 (4)	-- --	4.3 (53)
Usefulness of Knowledge Source						
News Media	2.0 (6)	1.9 (48)	-- --	1.0 (3)	-- --	1.9 (19)
School	2.1 (6)	2.0 (47)	-- --	3.9 (3)	-- --	2.1 (19)
Family	2.5 (6)	2.9 (47)	-- --	2.7 (3)	-- --	2.5 (19)
Other	3.4 (6)	3.2 (43)	-- --	3.5 (3)	-- --	3.5 (17)

Note: Figures in parentheses are base *N*s for the above means.

Slight differences were found for satisfaction ratings, rankings of severity of endangered species loss and air pollution, and usefulness of family and other as a source of environmental knowledge. White, Non-Hispanics rated their satisfaction with living in Austin as slightly more satisfied and African Americans rated it lower than White, Non-Hispanics and Hispanics: the mean satisfaction ratings by African Americans, Hispanics, and White-Non-Hispanics were 2.7, 2.5, and 2.4 respectively. In the same fashion, White, Non-Hispanics ranked severity of endangered species loss as a slightly more severe problem than African Americans and Hispanics did; the mean rank for endangered species loss by African Americans, Hispanics, and White-Non-Hispanics were 4.1, 3.7, and 3.5 respectively. White, Non-Hispanics also ranked air pollution as slightly less severe than the other two ethnic groups ranked it; the rankings were 1.9, 1.9, and 2.2 for African Americans, Hispanics, and White, Non-Hispanics respectively. Both White, Non-Hispanics and African Americans ranked family as a more useful source of environmental knowledge than Hispanics did. Those same two ethnic groups also ranked "other" as slightly less useful than Hispanics did (see table 24).

Almost twice as many White, Non-Hispanic students in the sample population were enrolled in an advanced level course as compared to Hispanic and African American students; 45% of White, Non-Hispanic, 25% of Hispanic, and 23% of African American students were enrolled in an advanced level course. Large differences among African Americans, Hispanics, and White, Non-Hispanics were found in environmental knowledge scores and each of the questions used to calculate the environmental knowledge score. White, Non-Hispanics' mean scores for environmental knowledge were 18% higher than Hispanics' scores and 14% higher than African Americans' scores. The

biggest difference was the number of students who correctly answered the question that asked students to identify an endangered species in the Austin community; White, Non-Hispanics had a mean score that was 38% higher (more people answered it correctly) than African Americans and 21% higher than Hispanics. For the question about Austinites' water source, White, Non-Hispanics had a mean score that was 21% higher than Hispanics and 16% higher than African Americans. A smaller difference was found for the question about the cause of Ozone Action days in Austin; White, Non-Hispanics scored 12% higher than Hispanics and 5% higher than African Americans. Both African Americans and White, Non-Hispanics had higher mean scores than Hispanics by approximately 15% for the question about the recent environmental problem in Lake Travis (see table 25).

Table 25. Environmental Knowledge Scores by Ethnicity

	African American (%)	Hispanic (%)	Native American (%)	Other (%)	Pacific Islander (%)	White, Non-Hispanic (%)
Environmental Knowledge						
N	13	125	1	7	1	69
Overall	73.1	68.8	100.0	50.0	75.0	86.6
Individual Questions						
Endangered Species in Austin	38.5	56.0	100.0	28.6	100.0	76.8
Water Source for Austinites	69.3	64.8	100.0	57.2	100.0	85.5
Environmental Problems in Lake Travis	92.3	77.6	100.0	57.2	100.0	91.3
Cause for Ozone Action Days	84.6	78.4	100.0	57.1	100.0	89.9

Grade Level

Half of the sample population was enrolled in a 9th grade level course and the other half was enrolled in a 12th grade level course. Both groups rated their satisfaction with living in Austin similarly; 9th graders rated it with a mean score as only 0.2 less satisfied than 12th graders rated it. Mean rankings for severity of environmental problems of endangered species loss, natural resource shortages, and air pollution were also ranked in the same manner by both groups; the mean rankings differed by 0.1 or not at all for each of the aforementioned environmental problems. Ninth graders ranked water pollution and "other" as slightly more severe environmental problems than 12th graders did. The difference in mean ranks for water pollution was 0.3 and for "other" was 0.4.

Grade level did not play a role in how students ranked the usefulness of family, news media or other as source of environmental knowledge either; each of the mean usefulness rankings for family, news media, and other differed by only 0.1. School as a source of environmental knowledge was ranked as 0.4 more useful by 9th graders. Both groups had similar mean scores for the number of questions answered correctly out of the four environmental knowledge test questions; the mean scores for 9th and 12th graders differed by only 1.2%.

Although the mean score for percentage of questions answered correctly on the environmental knowledge test questions was very similar for 9th and 12th graders, which questions they answered correctly were not. Ninth graders had higher mean scores on the questions about Ozone Action days and endangered species in Austin, but 12th graders had higher scores on environmental problems in Lake Travis and the source of water for Austinites (see table 26).

Table 26. Environmental Knowledge by Grade Level and School

Environmental Knowledge	Grade Level		School	
	9th (%)	12th (%)	AHS (%)	THS (%)
N	108	109	114	103
Overall Score	73.8	75.0	77.0	71.6
Individual Questions				
Environmental Problems in Lake Travis	85.2	80.8	87.8	77.6
Water Source for Austinites	76.8	66.9	76.3	67.0
Endangered Species in Austin	53.7	67.9	63.2	58.3
Cause for Ozone Action Days	79.6	84.4	79.8	84.5

School

About half of students that completed the surveys were from AHS ($N = 114$) and the other half were from THS ($N = 103$). Students at both schools ranked four of the environmental problems of endangered species loss, water pollution, air pollution, and other very similarly; for each of the environmental problems, mean rankings differed by only 0.1. Students at both schools ranked the usefulness of "other" as an environmental knowledge source equally. Rankings for usefulness of school and family differed by 0.1 and 0.2 respectively. The mean scores for satisfaction with living in Austin were also similar; the AHS students had a mean score only 0.2 more satisfied than the THS students.

Mean scores for number of questions answered correctly on the environmental test questions were slightly different. AHS students had a higher mean score by about 5%. AHS students scored about 5% higher on the question about an endangered species in Austin, but THS students scored about 5% higher on the question about Ozone Action days in Austin (see table 26). Also, the THS students ranked news as a slightly more important source of environmental knowledge than AHS students ranked it; the difference was 0.3.

A bigger difference was found in how students from the two schools ranked the severity of natural resource shortages and how they scored on two of the environmental knowledge test questions. AHS students ranked the severity of the environmental problem of natural resource shortages as more severe than THS students by 0.5. More of the AHS students correctly answered the questions about the environmental problems in Lake Travis and the source of water for the Austin community than the THS students (see

table 26). They also differed on which correct answers they chose for these two questions. Many more AHS students chose hydrilla as the environmental problem in Lake Travis than THS students; 33% of AHS students chose hydrilla, whereas only 16% of THS students chose it. More THS students chose Town Lake as the water source for Austin than AHS students; the difference was 11.5%.

Course Level

Students who were enrolled in an advanced level course ranked the environmental problems of water pollution equally to the rankings by students who were enrolled in regular level courses. Mean rankings for endangered species loss, natural resource shortages, and air pollution differed according to course level by only 0.2. Both groups also ranked the usefulness of school and family as sources of environmental knowledge similarly; family was ranked equally and school rank differed by only 0.1.

The regular level students indicated that they were slightly more satisfied with living in Austin, "other" was a less severe environmental problem, and news was a more important source of environmental knowledge. The difference in satisfaction ratings was 0.3. The environmental problem of "other" was ranked as 0.4 less severe by the regular level students than it was by the advanced level students. News as a source of environmental knowledge was ranked as 0.3 more useful by regular level students than its ranking by the advanced level students. The students who were in regular level courses also indicated that they had been living in Austin for a slightly higher mean number of years (11.8 versus 12.3 years).

In both regular and advanced courses the majority of the students who completed the surveys were females. Sixty-four percent of students who completed the surveys in the advanced courses were females and 57% of the students who completed the surveys in the regular level courses were females.

Not surprisingly, the advanced level students answered more of the environmental knowledge test questions correctly. Their mean environmental knowledge score was 10% higher than the regular level students' mean score. Their scores on each question were higher. The biggest difference was found on the endangered species question where the advanced level students scored 13% higher than the regular level students. They scored 12% higher on the Ozone Action question, 8% higher on the Lake Travis question, and 5% higher on the water source question. Interestingly, twice as many of the regular level students put the correct answer of Town Lake as the source of water for Austin rather than the correct answer of Edward's Aquifer. Another difference was the fact that the advanced students ranked "other" as a more useful source of environmental knowledge and many of those specified "friends" as the other source; "other" was ranked as 0.5 more useful by advanced level students than how it was ranked by regular level students.

Teacher

There were five teachers who distributed surveys to their students. In order to maintain the anonymity of the teachers, they were given a pseudonym of Teacher A, B, C, D, or E. Teachers A, B, and E teach at AHS and Teachers C and D teach at THS. Teachers A and C teach 12th graders and the others teach 9thgraders. Teachers A, D, and E teach all or some advanced level students and the other teachers teach only regular

level students. The results showed many differences in responses by students from classes taught by different teachers. Ranking of the severity of the environmental problem of air pollution was the only close similarity for all of the students of Teachers A, B, C, D, and E (see table 27).

Table 27. Environmental Problems Rankings by Teacher

Environmental Problems	Teacher A (mean)	B (mean)	C (mean)	D (mean)	E (mean)
Air Pollution	2.1 (43)	1.9 (35)	1.8 (53)	2.2 (42)	1.9 (24)
Water Pollution	2.1 (43)	2.7 (34)	1.9 (51)	2.1 (41)	1.8 (24)
Natural Resource Shortages	3.0 (43)	2.5 (35)	3.0 (51)	3.2 (42)	3.1 (24)
Endangered Species Loss	3.5 (43)	3.8 (37)	3.8 (51)	3.5 (42)	3.4 (24)

Note: Figures in parentheses are base *N*s for the above means.

There were slight differences as to how students in the classes rated their satisfaction with living in Austin. Students in Teacher D and E's classes rated their satisfaction lower than the students in the other classes. The mean satisfaction ratings by students in Teacher A and B's classes were 2.3, Teacher C's was 2.5, Teacher D's was 2.8, and Teacher E's was 2.7. All of the students who took the surveys in Teachers D and E's classes were in 9th grade. Other slight differences included students in Teachers B and C's classes ranking endangered species loss as less severe than those in the other classes. Also, Teacher C's classes ranked "other" as a less severe problem than the students in the other classes (see table 27).

Only Teacher B's classes ranked the severity of water pollution as much less severe and natural resource shortages as much more severe than the students in the other classes (see table 27). When the sample population was broken down into five teacher groups, the sample size for each teacher for the number of students who answered the environmental knowledge source questions was too small to make comparisons; all but one of the teachers had 16 or fewer students who answered the environmental knowledge source questions.

Large differences were found for mean environmental knowledge scores and mean correct answer scores for each of the four environmental knowledge test questions. Teacher E's students scored a mean of 88% for the environmental knowledge score which was 10% higher than the next highest teachers students' mean score. Teacher E's students scored the highest on three of the four questions. Those questions included the topics of Ozone Action days, Lake Travis problems, and Austinites' water source. Teacher A's students scored the highest on the endangered species question with Teacher B's students

scoring a close second. Teacher C's students had the lowest environmental knowledge score with a mean of 75.9%. They scored the lowest of all the classes on the questions about Ozone Action days, endangered species, and water source, but scored higher on the question about Lake Travis's environmental problems than two other teachers' classes (see table 28).

Table 28. Environmental Knowledge by Teacher

Environmental Knowledge Questions	Teacher A (%)	B (%)	C (%)	D (%)	E (%)
N	51	39	58	45	24
Overall Score	77.9	69.2	72.4	70.6	87.5
Individual Questions					
Cause for Ozone Action Days	80.4	69.2	87.9	80.0	95.8
Environmental Problem in Lake Travis	86.4	82.0	75.9	80.0	100.0
Endangered Species in Austin	74.5	43.6	62.0	53.4	70.9
Water Source for Austinites	70.6	79.5	63.8	71.1	83.4

CHAPTER 5

DISCUSSION

Introduction

The survey used in this research served as a tool for students to communicate their perceptions about their community. The included questions were designed to gather information that shed light on students' sense of place, perceptions and knowledge of environmental issues in that place, the source of that knowledge and how they would like the government to spend money to address environmental problems. The survey also showed that the questioning method of triangulation is useful in gaining more complex information about a topic and that it improves validity of the information that is acquired. The characteristics of the sample population play a key role in the interpretation of the results. Some of the variables cannot be considered in isolation, but rather as indicators of other possible underlying variables that are more closely connected to student perceptions or knowledge.

The demographic information about length of residency, gender, ethnicity, grade level, school, course level, and teacher provided insight as to commonalities or differences in student perceptions according to each of these variables. The results showed that there were many commonalities as expected. Brierley-Newell (1997) indicated that it is easier to find commonalities in place preference than it is to find differences. Nevertheless, there were some differences found for each of the variables as

well. Many of the results do suggest connections that are consistent with expected findings and findings in prior research and "make sense" within the context of sense of place, place attachment, and learning theories.

Overall Results

The ungrouped, overall results for sample population provide information about Austin students' perceptions of their community. The questions about level of satisfaction and top five places indicated students' sense of place as well as level of attachment (now or in the future) to that place. The mean score for satisfaction with living in Austin was a bit better (more satisfied) than expected at 2.5 out of 5. I would not expect this to be the case for students in all cities, but Austin has many desirable characteristics including the temperate climate, many parks and lots of cultural and entertainment activities and it has had a rapidly growing population for the last couple of decades.

The most frequently mentioned top five places in Austin were consistent with expectations, because students listed the Capitol, UT and Zilker Park. The Capitol is a major landmark and Zilker Park is a major attraction in Austin, plus, both schools are located within five miles of either site, so it was not surprising that these were the top two places. Sixth Street and the mall are popular places for students to "hang out," so these were not surprising results either. Previous research has suggested that attachment to a place is based on social and economic factors, so it fits that these "hang out" places would make the top five places list (Mesch and Manor, 1998). School is also the center of students' social lives and is the one place they spend most of their time other than home, so it also fits that this was frequently mentioned.

The students mentioned pollution frequently in the open-ended question, which is consistent with expected findings, but the frequency of topics mentioned that were categorized into the "other" category was very high. This can be a drawback of the open-ended question--not finding the information about the topic that was desired. On the other hand, the open-ended environmental question allowed students the opportunity to mention environmental topics that they thought were severe problems based purely on personal contemplation. Without this question, it would not have been found that students thought traffic and trash were severe environmental problems in their community. Nevertheless, many students did not mention environmental problems that they later ranked as most severe. An open-ended question can be more challenging for students because it is based purely on recall, so it does not necessarily indicate lack of knowledge when an item is omitted. It only indicates the topic that comes to mind right now as most severe. This could easily be influenced by topics the student is currently studying or what happened on their way to school that day. Traffic is a daily hassle, but air pollution, water pollution, natural resource shortages, or endangered species loss are not something that one directly encounters and has to think about on a daily basis. Had it been an Ozone Action day in Austin on the day of the survey, air pollution might have been an even more prevalent answer. Rather, it was January and the students had not experienced an Ozone Action day for months.

Some research suggests that we are liberated from place attachment due to greater mobility (Wellman, 1988; Wellman and Leighton, 1979; Mesch and Manor, 1998). If traffic is on their minds when students think of a community problem, then it seems connected to sense of place and attachment to that place. Lynch (1960) suggests that we

link setting, landscape, and personal experiences to create a single environmental image. It appears that students consider traffic that they encounter to be part of that image.

The students ranked the environmental problems of air and water pollution as expected--more severe than the other problems. This suggests that students may have learned about these problems in school or on the news and do consider them more severe than the problem of endangered species loss, natural resource shortages, and other topics (such as traffic, which was frequently mentioned). Both air and water pollution affect personal health in a more direct way than the topics in the other categories, so this could also be the reason they were ranked as more severe.

It is important to note that the order that the environmental problems were listed did not bias the results. If it had, the expectation would be that the problem ranked first would have been given the most severe or least severe ranking, but this was not the case. Endangered species loss was listed first, but had a mean rank that was fourth.

The amount of money students chose to allot to each environmental problem was consistent with their rankings of the severity of the environmental problems. As expected, students allotted more money to air and water pollution than the other problems. This type of question appeared to be more challenging for students; some were unable to divide the money and still have the total equal $100,000. The only question where students answered the question incorrectly (did not follow directions) more frequently was the environmental knowledge source ranking for each environmental problem.

News and school were ranked as more useful sources than family and "other" by students. This is positive news for educators; students say they are getting information about the environment at school or from the news.

Students' mean score of 74% was slightly better than expected for the environmental knowledge test questions. The questions about the environmental problem in Lake Travis and the cause of Ozone Action days were the questions that more students answered correctly. The fact that these are questions related to air and water issues, and air and water pollution were also ranked as most severe by students in the other questions, suggests again that students are getting information about the air and water from school or the news.

It is somewhat surprising that only 72% of students knew the source of water for Austinites. On the other hand, Austin is a city with multiple lakes, an aquifer, and a river so there are many choices as to where the water could come from, plus, the most common wrong answer was one of the Austin lakes and not the Ogallala Aquifer which is not in Austin. The best answer was Town Lake and not the Edwards Aquifer, because drinking water for Austinites comes directly from Town Lake or Lake Austin (not a choice on the test question). Edward's aquifer was included as an answer, because it is something students learn about in school and it is not a wrong answer. Many students chose Edward's Aquifer, this suggests that they are getting information about the aquifer and it's importance to the water supply in school. It also suggests that they are not getting specific information about the water supply and possibly related issues about water treatment and how the water gets to their homes. One of the teachers (whose classes participated in the study) mentioned that she was disappointed in how many of her students incorrectly

answered "Town Lake." Since Town Lake was the correct answer, this suggests the teacher did not know the correct information either.

Apparently the endangered species in Austin is not a well known and maybe not a well-covered topic in school with students. Only 61% knew about the Barton Springs Salamander, even though THS and AHS are located within 5 miles of the habitat for the Barton Springs Salamander. Perhaps this topic is not covered in high school geography classes or it could have been discussed in classes when students were younger, but they have since forgotten. Is the salamander not directly affecting their lives? Are students not having direct experiences where they learn about it? According to Cin and Yazici (2002), direct experiences play a role in students' understanding. Barton Springs was mentioned a fair number of times in the top five places question, so it is surprising that more students did not know about the salamander that lives there. Protection of the salamander's habitat is often the reason that the Barton Springs pool is closed.

Grouped Results

The grouped results shed light on commonalities and differences among each of the demographic variables of length of residency, gender, ethnicity, grade level, school, course level, and teacher. For each of these variables many commonalities but also some interesting differences did arise. Possible explanations for those differences can be linked to theories of place attachment, sense of place, and previous research findings about factors related to perceptions.

Local based social relationships and a person's satisfaction with the environment are thought to be related to the development of place attachment (Mesch and Manor,

1998). Thus, it seems likely that the longer a person resides in a community, the more likely he is to be attached to it, the more experiences he would have there that connected him to it and the more he would know about it. Therefore, length of residency was expected to have an impact on survey results and it did for certain questions. The findings suggest longer residency leads to greater environmental knowledge of the community; students who have lived in Austin from 5-19 years scored at least 15% higher on the environmental knowledge test questions. Also, the group that has lived in Austin for 14-19 years (most of their lives) had the highest (more satisfied) satisfaction rating.

The environmental knowledge score was the only major difference linked to gender. Males scored 6% higher overall on the environmental knowledge test questions. This occurred even though about 6% more of the female students were enrolled in the advanced level courses. The question with the biggest discrepancy in results based on gender was the endangered species question (9% difference) and the question with the smallest difference was the water source question (only 2% difference). This suggests that gender does play a role in environmental knowledge, but not necessarily in environmental perceptions.

Research has indicated that race, age, and stage in the life cycle are factors that affect perceptions (Lee, Oropesa, and Kanan, 1994). On the surface, results of this study support that notion, but it is impossible to tell if ethnicity alone is the key factor. Slight differences were found for satisfaction ratings and rank of a couple of the environmental problems and a couple of the environmental knowledge source categories, but the biggest differences were found for environmental knowledge scores. White, Non-Hispanic students scored at least 14% higher than two of the other ethnic groups (African

Americans and Hispanics). The question where both African Americans and White, Non-Hispanic students both scored higher than Hispanics was the question about the environmental problem in Lake Travis. These differences do not tell the whole story though. Since the two schools were different demographically, there are other variables that may be the underlying factor that caused one ethnic group to score higher than two of the other groups. School, teacher, and length of residency all likely play a role that is connected to ethnicity. At THS there are more Hispanic and African American students, more students who have a shorter length of residency, and more students who were in the class that had a teacher whose students scored the lowest on the environmental test questions. Therefore, ethnicity cannot be considered as a contributing factor in isolation.

The students' grade level appears to have had an effect on which questions students answered correctly and the importance of school as a source of environmental knowledge. This suggests that the information students are learning in 9th grade classes may have an impact on their knowledge, even though there was no significant correlation found between grade level and environmental knowledge or mean rank for environmental knowledge source. Students in 9th grade scored better on the Ozone Action days question and the Endangered Species in Austin, so that might indicate that they have recently studied it or that it is studied in 9th grade classes now, but was not when the 12th graders were in 9th grade. Since past research suggests that perceptions differ by age (Lee, Oropesa, and Kanan, 1994), it could be that it is the students' age and experiences he has at that age that were the reason the 9th graders knew certain questions better than the 12th graders. For example, 9th graders are more likely to take the bus, since they don't have their driver's licenses yet, so maybe they are more familiar with Ozone Action days.

School is a variable that indicates more information about an individual than just where he attends school. It also suggests information about where he lives and the average income level. Both of these factors as well as which school the student attends could be contributing factors that affect environmental perceptions. The AHS students scored 5% higher on the environmental test questions overall, but THS students scored higher on the Ozone Action days question. AHS students have a higher mean length of residency and a higher mean income level. They may engage in different activities than the THS students. More of the AHS probably drive cars than the THS students, therefore, the THS students know more about the Ozone Action days. The AHS students scored higher on the Lake Travis question; they probably go to Lake Travis more because they are more likely to be part of a family that owns a boat. The key factor may not really be school, but the characteristics of students that go to that school.

Like school, the student's teacher likely has an effect on the results, but it does not tell the whole story. If a teacher has emphasized specific environmental issues, then the teacher would likely play a role in their students' environmental knowledge scores, environmental problems rankings, open-ended answers, and money allotment, and environmental knowledge source. In this study, one teacher's students ranked water pollution as less severe and natural resource shortages as more severe than the other four teachers' students, which makes it seem likely that the teacher discussed or did not discuss some related topics. The teacher whose students scored much higher on the environmental knowledge test questions was also teaching advanced level students at AHS, so either of those factors might have contributed to the increased score besides the topics the teacher had covered.

CHAPTER 6

CONCLUSION

The results of this study suggest that school related and personal factors affect perceptions of the environment in which one lives and knowledge of that environment. It does not show that any one of those factors is definitively the cause or independently connected to students' perceptions. This research does provide results consistent with some previous research about place attachment, sense of place, perceptions of the environment, and factors that affect perceptions. Length of residency, gender, ethnicity, grade level, school, course level and teacher all likely play a role in a person's environmental perceptions of their community. Each of these variables plays a role in perceptions to the extent that it is connected to how a person develops his sense of place or views the place, his level of attachment to that place, or the psychological, emotional aspect of his perceptions.

These results also suggest that students are learning certain topics and are not learning other topics related to their environment in school or through the news. Some of this learning may be forgotten or be overshadowed by other direct experiences students encounter by the time they reach grade 12 or the content of geography courses may be changing. Nevertheless, the results do not suggest a difference in environmental

knowledge level overall for students in 9th grade versus 12th grade, but that students' know about the same amount of information, but know it about slightly different topics.

Further research should include more in-depth research about any one of the variables including length of residency, gender, ethnicity, school, grade level (age), course level, or teacher that might be related to student perceptions or environmental knowledge. The method of triangulation should be incorporated in research that seeks to improve validity of findings or broaden information collected by including both qualitative and quantitative questions and varied question types for improved validity of any one measure.

More research is needed in environmental perception with regards to perception and specifically student perception and learning. In order to improve environmental education for all students, evidence supporting the need, by showing the places where it is lacking, is necessary, as well as information about how students perceive topics and the world around them. By knowing more about what they know or how they perceive the world around them, curriculum can better address deficiencies and provide experiences that will improve student learning and knowledge overall.

APPENDIX A

ENGLISH PARENTAL CONSENT FORM

Student Survey About the Austin Community

Your child has the opportunity to participate in a research study by a Texas State University graduate student. Some of the students in 9th and 12th grade social studies classes at three AISD high schools will be given a written survey during class asking for their thoughts about the environment in the Austin community. It will take approximately 10 minutes to complete. The information will be used for research in geographic education. The teachers of participating classes will be given a report of the findings and have the opportunity to share the information with their students.

Parental Consent Form

My signature below indicates that I have read the information provided and have decided to allow my child to participate in the study entitled "High School Students' Perceptions of Environmental Problems in their Community" to be conducted at my child's school. I understand that the principal's and classroom teacher's signatures below indicate that they have agreed to participate in this research project.

I also agree to the conditions listed below with the understanding that I can withdraw my child at any time should I choose to discontinue the participation.

1. Classroom surveys will be administered during a convenient time during social studies classes during the months of September or October and information provided on those surveys will be collected as part of this research. The students will be asked to identify their gender, age, number of years they've lived in Austin, and ethnicity. The survey questions include questions about their thoughts on the Austin community's environment.

2. The identity of the subjects will be protected. Student names will not be written on the survey forms, the classroom teacher will not be taking a grade on the task and the Director of the Study will not know the names of the students who provided the information.

3. The potential benefits to the children involve improvement of education in social studies in the area of civic responsibility and understanding local community

environmental issues as well as better understanding of student decision-making and learning.

4. The information gathered will be used for a thesis research project in the field of Geographic Education at Texas State University. The results will be published in the thesis and orally presented to faculty and students at Texas State University.

5. There are no foreseeable inconveniences or risks involved to my child participating in the study.

6. My participation is optional. My decision whether or not to participate will not prejudice my future relations with Texas State University, the school or teacher. If I decide to participate, I am free to discontinue participation at any time without prejudice. If I do participate I can obtain information about the findings by contacting my child's teacher or the Geography Department at Texas State University.

7. If I agree to participate, a copy of this form will remain in my child's permanent school folder.

Parent's signature _____Date _____

Principal's signature _____Date _____

Classroom Teacher's signature _____Date _____

APPENDIX B

SPANISH PARENTAL CONSENT FORM

Encuesta para estudiantes sobre la comunidad de Austin

Su hijo tiene la oportunidad de participar en un estudio de investigación realizado por un estudiante de la escuela de graduados de la Universidad Estatal de Texas. A algunos de los estudiantes de 9º. y 12º. grados que toman clases de estudios sociales en tres preparatorias del Distrito escolar independiente de Austin se les dará un cuestionario escrito durante la clase en el que se les pregunta su opinión sobre el medio ambiente de la comunidad de Austin. Tomará alrededor de 10 minutos contestarlo. La información se usará para investigación en educación geográfica. A los maestros de las clases participantes se les dará un informe de los resultados y tendrán la oportunidad de compartir la información con sus estudiantes.

Formulario de consentimiento de los padres

Mi firma al pie de página indica que he leído la información provista y he decidido permitir que mi hijo participe en el estudio titulado "Percepciones de los estudiantes de preparatoria sobre los problemas del medio ambiente en su comunidad" que se llevará a cabo en la escuela de mi hijo. Entiendo que las firmas del director y del maestro del salón al pie de página indican que han acordado participar en este proyecto de investigación.

Estoy de acuerdo también con las condiciones indicadas a continuación con el entendimiento de que puedo interrumpir la participación de mi hijo en cualquier momento en caso de que así lo decida.

1. Los cuestionarios del salón de clase se administrarán a una hora conveniente durante las clases de estudios sociales en los meses de septiembre u octubre, y la información provista en los cuestionarios se reunirá como parte de esta investigación. Se pedirá a los estudiantes que indiquen su sexo, edad, número de años que han vivido en Austin y su grupo étnico. En la encuesta se incluyen preguntas sobre sus opiniones sobre el medio ambiente de la comunidad de Austin.

2. Se protegerá la identidad de los entrevistados. No se escribirán los nombres de los estudiantes en los cuestionarios de la encuesta, el maestro del salón no calificará la actividad y el Director del estudio no sabrá los nombres de los estudiantes que proporcionen la información.

3. Los beneficios potenciales para los jóvenes incluyen la mejora de educación en estudios sociales en el área de responsabilidad cívica y comprensión de los problemas del medio ambiente de la comunidad local, así como un mejor entendimiento de la toma de decisiones y el aprendizaje de los estudiantes.

4. La información que se reúna se usará para el proyecto de investigación de una tesis en el área de Educación geográfica en la Universidad Estatal de Texas. Los resultados se publicarán en la tesis y se presentarán oralmente a la cátedra y a los estudiantes de la Universidad Estatal de Texas.

5. No hay ninguna inconveniencia ni riesgos predecibles involucrados en la participación de mi hijo en el estudio.

6. Mi participación es opcional. Mi decisión de participar o no hacerlo no perjudicará mis relaciones futuras con la Universidad Estatal de Texas, con la escuela ni con el maestro. Si decido participar, tengo la libertad de interrumpir mi participación en cualquier momento sin ningún daño o perjuicio. Si participo, puedo obtener información sobre los resultados comunicándome con el maestro de mi hijo o con el Departamento de Geografía de la Universidad Estatal de Texas.

7. Si acuerdo participar, se conservará una copia de este formulario en el expediente permanente de la escuela de mi hijo.

Firma del padre _____ Fecha _____

Firma del director _____ Fecha _____

Firma del maestro del salón de clase _____ Fecha _____

APPENDIX C

STUDENT SURVEY ABOUT THE AUSTIN COMMUNITY

Dear Students and Teachers,

Thank you for participating in this research study by a Texas State University graduate student. Please answer all of the questions based on your own knowledge. It is not necessary for you to write your name on this survey. **Please do the questions in order without going back** to a previous question once you have answered it.

Write your answer in the blank for questions #1-4.

1. Your age in years: _____

2. Your gender (male or female): _____

3. Number of years you've lived in Austin: _____

4. Name of the social studies course you are currently taking _____

5. **Circle** your primary ethnicity.

   a. African American
   b. Hispanic
   c. Pacific Islander
   d. White, Non-Hispanic
   e. Native American
   f. Other (specify) _____

6. **Rate** your satisfaction of living in the Austin community with **1 being very satisfied to 5 being very unsatisfied.** Circle one number. 1 2 3 4 5

7. Name the top 5 places that come to your mind when you think of the Austin community.

   1._____ 4._____

   2. _____ 5._____

   3. _____

8. List the main environmental problems in the Austin community. Write the problems in order of importance with the **most important problem at the top**.

9. **Rank** the environmental problems in the list according to their severity in the Austin community from 1 to 5 with **1 being the most severe** and 5 being the least severe problem.	10. **Rank** the usefulness from 1-4 with **1 being the most useful source** that has helped you gain knowledge about each of the environmental problems listed to the left. (news media refers to newspapers, TV, radio, internet sites, etc.) For other, please specify.
a. endangered species loss	school _ family _ news media _other_
b. water pollution	school _ family _ news media _ other_
c. natural resource shortages	school _ family _ news media _ other_
d. air pollution	school _ family _ news media _ other_
e. other (describe below)	school _ family _ news media _ other_

11. If the government had already collected $100,000 to be spent on solving environmental problems within the Austin community, how would you like it to be spent?

    Please **write the $ amount** that you would like spent on each of the following problems. You may only spend $100,000 in total. Write a $ amount in each blank.

    a. endangered species loss _____

    b. water pollution _____

    c. natural resource shortages _____

    d. air pollution _____

    e. other (please describe below) _____

Please choose only one answer for the following questions.

12. Ozone Action days in Austin are an action taken due to the environmental problem of

    a. air pollution
    b. water pollution
    c. endangered species loss
    d. nuclear radiation

13. A type of species that is considered threatened or endangered and lives in the Austin area is a

    a. fox
    b. fish
    c. salamander
    d. spider

14. An environmental problem in Lake Travis that has occurred during the past year is due to

    a. bacteria
    b. hydrilla
    c. algae
    d. water fowl

15. The majority of people in the city of Austin get their water from

    a. Town Lake
    b. Lake Travis
    c. the Edward's Aquifer
    d. the Ogallala Aquifer

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VITA

Beth Cooper was born in Indianapolis, Indiana, on October 13, 1969. She earned her Bachelor of Arts degree in Psychology at Indiana University, Bloomington, Indiana, in 1992. She completed a teacher certification program in secondary social studies education at Indiana University in 1993. Following graduation from Indiana University, she moved to Austin, Texas, where she began teaching secondary level students in the Austin public schools. She spent seven years teaching social studies and math students in the Austin Independent School District and four years teaching students at The University of Texas at Austin, University Charter School. In 2001, she entered the Graduate College of Texas State University-San Marcos, while she continued to teach at The University of Texas at Austin, University Charter School. In 2004, she began working as a secondary math curriculum specialist for The University of Texas at Austin, University Charter School.

Permanent Address: 1705 South 5th Street

Austin, Texas 78704

This thesis was typed by Beth Cooper.