

## **The Perspectives and Experiences of High School Students towards the Environment –The Case of North Alabama**

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### **Abstract**

*The study explored high school students' knowledge, behaviours, perspectives, and participation in environmental protection and outdoor activities in Madison County, Alabama. In summer 2014 and 2015 we surveyed students from 8 schools which were associated with the North Alabama Centre for Educational Excellence. A total of 86 completed questionnaires were received. A multidimensional construct, consisting of a 16-item mixed-format set of questions was used for data collection. Descriptive statistics and graphical representation were used to interpret the results. Cranach's alpha coefficient was computed to measure internal consistency, reliability and validity of the questionnaire. Pearson's chi-square test was used to assess differences on attitude, experience, and participation among students based on gender and grade. There was no significant difference in students' attitudes towards environmental protection based on gender and grade. Overall, the study found strong positive attitude towards environmental protection and environmental education but low experience and participation in pro-environmental activities among students.*

**Keywords:** high school; environmental education; environmental protection; students' behaviour; students' perceptions; Alabama

### **1. Introduction**

Current youth education and learning should seek to integrate values and principles of sustainable development which include natural resource conservation and utilization, by establishing a balance between economic, social, and environmental dimensions (Alabama's Environmental Literacy Plan 2013; Hassan, Noordin, and Sulaiman 2010; Uitto and Saloranta 2010; Wals 2009). Environmental education (EE) programmes build awareness and understanding among people, helping them to understand that their actions and decisions could have significant effects on the natural resource and environmental management efforts of the state ("Alabama's Environmental Literacy Plan" 2013). School-based EE programmes are essential in the present context of environmental problems across the world because such programmes can reach and build awareness among a wider audience due to the process of intergenerational influence (Ballantyne, Fien, and Packer 2001). Students learn pro-environmental information, and develop skills, attitudes, behaviours and approaches that could contribute to protecting the environment through informed decisions and actions in future. These students understand that the conservation of natural resources and environmental protection are our collective responsibilities for the well-being of society, country and the world. Involving students in environmental activities, such as planting trees, cleaning creeks or neighbourhoods, and action research in local communities can augment their understanding and interest in EE (Hassan, Noordin, and Sulaiman 2010; Ballantyne, Fien, and Packer 2001). The attitudes and behaviours of students towards the environment depend on their knowledge, skills, experiences, and interactions between ecological and social systems, and protection measures undertaken regarding the environment.

Many researchers have investigated students' attitude towards environmental awareness and education (Asan, Mile, and Ibraim 2014; Ballantyne, Fien, and Packer 2001; Cetin and Nisanci 2010; Erdogan, Bahar, and Usak 2012; Hassan, Noordin, and Sulaiman 2010; Koruoglu, Ugulu, and Yorek 2015; Köse et al. 2011; Ozkan 2013; Tuncer 2008; Ugulu, Sahin, and Baslar 2013; Uitto and Saloranta 2010). Attitude is defined in social psychology as "favourable or unfavourable evaluative reaction toward something or someone expressed in one's beliefs, feelings, and behaviour" (Ugulu, Sahin, and Baslar 2013; Runcan and Rata 2014). Attitude includes cognitive, affective, and behavioural components and it may develop with or without awareness and can be implicit or explicit (Runcan and Rata 2014). However, life experiences, education and exposure to new information influence one's attitude and perception which ultimately changes one's behaviour (Ugulu, Sahin, and Baslar 2013). There are many instruments developed to investigate the effect of educational programmes on enhancement of pro-environmental attitudes. Many are designed to measure a person's environmental attitude, concern and values. There are one-dimensional to multi-dimensional constructs to measure environmental attitudes. One-dimensional construct relates to bipolar construct that varies between two opposite extremes such as 'concerned' or 'unconcerned', 'agreeable' or 'hostile' about the environment, while multi-dimensional constructs are related to value-based orientations and consists of multiple dimensions and concerns. For example, Liefländer and Bogner (2014) used a multi-dimensional construct to measure environmental attitudes of students in terms of preservation and utilization, which consisted of a bio centric dimension (selfless environmental attitude on conservation and protection), and a anthropocentric dimension (self-interested environmental attitude on utilization of natural resources).

Ugulu, Sahin, and Baslar (2013) used several scales such as "Environmental Attitudes and Knowledge Scale", "Environment Attitude Questionnaire for Elementary School Students", and "Environmental Attitude Scale" for attitude test among high school students on a 4-point Likert type scale in Turkey. They found that the "environmental attitude scale" grouped under four subscales: environmental awareness, attitudes towards recovery, attitudes towards recycling, and environmental consciousness and behaviour as a valid and reliable method for assessing attitudes of high school students towards environmental science education. The environmental attitudes among girls and boys also differ significantly (Tuncer 2008; Köse et al. 2011). Hassan, Noordin, and Sulaiman (2010) used a Likert scale questionnaire to investigate relationship between environmental awareness and sustainable development in three categories namely emotional, attitude and behavioural, and sustainability practice among high school students in Malaysia. The researchers found higher levels of environmental awareness among female students than among males and among urban students than among suburban students. Hassan, Noordin, and Sulaiman (2010) also found a weak positive correlation between the level of environmental awareness for sustainable development and the sustainability practices. The Alabama school system 'see programmes are intended not only for enhancing knowledge based on valuable natural resources, ecology and environment but also for encouraging students' participation in decision making processes for managing and protecting the environment ("Alabama's Environmental Literacy Plan" 2013). The current EE programmes in Alabama are designed to provide knowledge and to stimulate awareness among students about environmental challenges that are currently being experienced at local, regional, and global scales and for assisting students to understand their roles as responsible citizens and leaders for environmental protection in the future (Alabama's Environmental Literacy Plan 2013).

The Alabama Math, Science, and Technology Initiative (AMSTI) are responsible for delivering environmental education for Grades K-12 teachers and administrators (Alabama's Environmental Literacy Plan 2013). There were 681 active AMSTI schools in Alabama during the 2012-2013 school year (Alabama's Environmental Literacy Plan 2013). AMSTI provides nationally recognized EE curriculum material and training, in which contents include topics on weather and phonology, soils, hydrology, land cover, erosion, and habitats (Alabama's Environmental Literacy Plan 2013). There are many nature centres, residential programmes, non-profit groups, and science museums across the state, which offer environmental education to schools according to the state's courses of study. The Alabama high school courses with environmental education content consist of biology, environmental science, earth and space science, marine science, health science, agriculture, food, and natural resources (Alabama's Environmental Literacy Plan 2013). The mere design and implementation of an EE program is not enough for achieving desired results and outcomes. Students' attitude to environmental protection and progress on development of planned behaviours should be evaluated on temporal basis to determine the program's impacts and need for further planning (Ugulu, Sahin, and Baslar 2013).

The perspectives of the students on the levels of environmental awareness, attitude, skills and practices need to be evaluated (Ozkan 2013; Köse et al. 2011). There is an apparent lack of information on results or outcomes of Alabama's high school EE programme, particularly in Northern Alabama.

The overall goal of the study was to examine high school students' knowledge, attitude, experience, and participation in environmental protection, natural resources conservation, and outdoor activities. The specific objectives of the study were to: 1) investigate the attitudes and knowledge of high school students towards environmental protection and natural resource conservation; 2) explore the experience and participation level of high school students in environmental protection, natural resource conservation, and outdoor activities; and 3) examine the attitude, experience, and participation of high school students towards environmental protection, based on gender and school grade.

## 2. Materials and Methods

### 2.1. Study Area and Data Collection

The study was conducted in north Alabama, more specifically in Madison County (Figure 1).

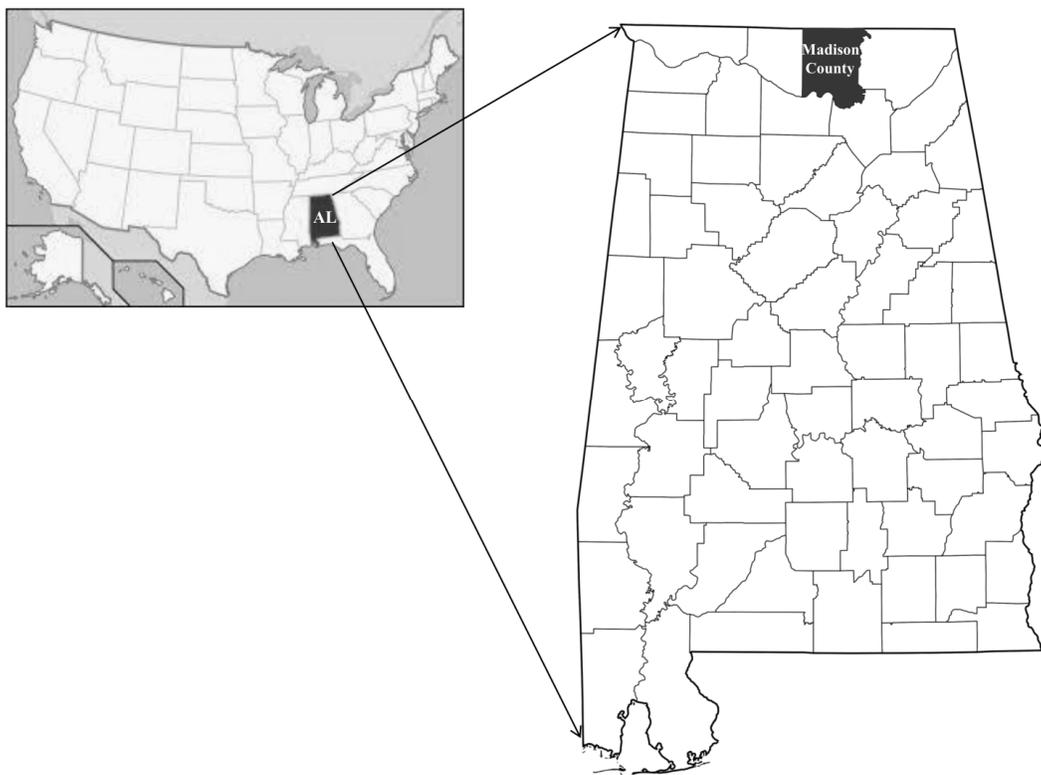


Figure 1. The study area was the Madison County in Alabama. The study represented the High Schools located in the Madison County (The United States in inset map). Map source: (Benbennick 2006; Huebi 1998)

The North Alabama Centre for Educational Excellence (NACEE), a non-profit educational centre, provides academic advising and tutoring, college study skills training, GED/High School equivalency preparation, ACT preparation, and many other services to high school students in Madison County, the majority of whom come from minority low income families (NACEE 2016). With the approval of NACEE's Programme Administrators' data was collected from high school students participating in NACEE's Summer Upward Bound and Upward Bound – Science/Math programmes. The Upward Bound programme is a 12-month comprehensive programme that includes academic activities, summer courses and activities, and bridge counselling for selecting their college. The Upward Bound – Science/Math programme provides the same services but additionally supports, motivates, encourages, and trains students in mathematics and science for leading careers in technical fields. There is a 6-weeks summer module imbedded in the overall Upward Bound and Upward Bound – Science/Math programmes.

The lead author mentored an average of 3 upward Bound/Upward Bound – Science/Math participants in summer 2014 and summer 2015. These mentees had expressed special interest in the disciplines of forestry and natural resources hence the reason for their attachment to Alabama A&M University's Forestry, Ecology and Wildlife Programme for their 6-weeks summer module. These mentees, with the support of the NACEE Programme Administrators, were responsible for getting other participants to complete and return the survey instruments. Participants had one day to complete and return the survey instrument. All students in the programmes were encouraged to participate in the study. However, they all did not. A multidimensional construct (a 16-item survey instrument) was developed for data collection. The initial instrument was revised based on the results of a pre-test administered to a sample of Alabama A&M University freshmen forestry students. The survey instrument was divided into three sections: (1) Demographic and general information, (2) Environmental knowledge, beliefs, and actions, and (3) Outlook and assessment of the role and influence of conservation. Each section consisted of a mixed-format set of questions such as, multiple choice questions, "yes/no" questions, 5-point Likert scale questions, and open ended questions.

NACEE accepts 64 students, representing most of the public high schools in Madison County, Alabama, into the 6-weeks summer programme each year. The students enrolled for Upward Bound and Upward Bound – Science/Math Programmes in summer 2014 and 2015 were the target groups for this study. One of the summer 2014 Programme participants was not a high school student but rather a post-high school-aged candidate seeking to complete the GED requirements. A total of 42 completed questionnaires were collected in 2014 and slightly higher number of 44 in summer 2015, reflecting a total of 86 completed questionnaires received for data analysis. The small sample size of the study was primarily due to our focus only on NACEE high school students.

## **2.2. Data Analysis**

Students' knowledge, attitude, experience, and participation in environmental protection and natural resource conservation were interpreted using descriptive statistics and graphical representation (Köse et al. 2011; Uitto and Saloranta 2010). We computed Cronbach's alpha reliability coefficient to measure internal consistency for a set of Likert scale questions (Hair et al. 1998). Reliability analysis determines whether the scale used is reliable and valid.

We selected eight Likert scale questions to measure student's level of agreement or attitude for conservation and commitment. The objective of running Cronbach's alpha was to understand whether all the questions reliably measured the same latent variable (conservation and commitment attitude). Each question was a 5-point Likert item with 1-Strongly Agree, 2 - Agree, 3 - Strongly Disagree, 4 - Disagree, and 5 - No opinion/Don't Know. A Pearson's chi-square test was applied to determine whether there was any significant difference among high school students' attitude, experience, and participation on the basis of gender and school grade. Pearson's chi-square test examined how likely it was that the observed distribution of males and females and their attitudes (responses i.e., 'Yes' and 'No') were completely independent (Hair et al. 1998). It was also used to evaluate how likely it was to identify differences between students' school grade and attitudes (responses i.e., 'Yes' and 'No') due to chance. Phi and Cramer's V measure strength of association between sets of variables (Kotrlík and Williams 2003). The software package Statistical Package for Social Scientists (SPSS) 21 was used in all data analysis procedures.

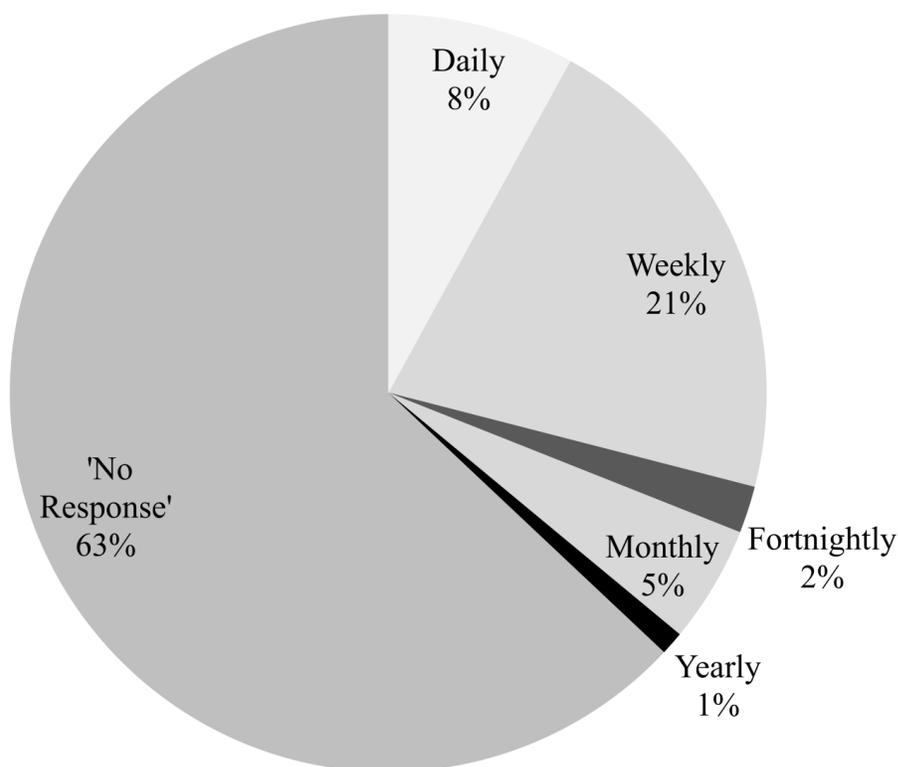
## **3. Results**

The number of students participated in our investigation was equal to 43 from each NACEE's Upward Bound and Upward Bound- Science/Math programme of summer 2014 and 2015. A total of 86 students from 8 high schools participated in this study, of which 19 were males and 67 were females. The highest and the lowest number of respondents were from Johnson High School (26) and from Grissom High School (1), respectively. Participating students' ages ranged from 12 to 17 years. The highest number of respondents were Blacks/African Americans (73), followed by Hispanic (6), other (3), 'No response' (2), Native American (1), and Pacific Islander (1). Based on the students' current class status (school grade), the highest number of respondents were sophomores (30), followed by freshmen (29), juniors (14), and seniors (12). One student, most likely the post high school GED candidate, did not respond to that particular questionnaire item. Family background of the students was evaluated based on number of siblings in the family. The number of siblings of the students ranged from 1 to more than 8. Fourteen students had 1 sibling, 5 had more than 8 siblings, 18 students had 2 siblings and a similar number of students had 3 siblings. This showed that many of the participating students belonged to relatively large Black/African American families.

### 3.1. Attitudes and knowledge towards environmental protection and natural resource conservation

We found a positive attitude in the majority of students towards environmental protection. Ninety-seven percent of respondents believed in the need to protect the environment, while 2 percent of the respondents did not. One percent had no response for the question. However, only 35 percent of respondents stated that their families recycled household waste and believed that recycling is good for environmental protection as well as for saving some money. When asked about the items and materials recycled by their household, about 60 percent of respondents did not respond to the question, whereas 20 percent said plastics, 6 percent said paper, 2 percent said glass, and 12 percent said other items.

In response to the question ‘Do you look at any television programmes focused on nature and/or the environment on a regular basis?’, 27 percentage of students answered ‘yes’ and 72 percent answered ‘no’, while 1 percent did not respond the question. The students’ favourite television programmes were Animal Planet, Discovery Channel, Animals Gone Wild, National Geography, Nature, Net Geo, World’s Deadliest, and Tapped (Documentary). The percentages of students who followed nature and/or environmental-based television shows daily, weekly, fortnightly, monthly, and yearly were 8, 21, 2, 5, and 1, respectively (Figure 2). The motivation and interest of students for watching television programmes focused on nature and/or environment was found to be quite low considering that about 63 percent students had no response for this question (Figure 2).



**Fig 2: The percentage of students on how often they watch nature and/or environmental based television programmes**

To determine students’ general knowledge of flora and fauna of their home state, we asked them to name Alabama’s officially sanctioned state tree and bird. Only 26 percent student correctly named the state bird i.e., Yellowhammer (*Colaptes auratus*), and 15 percent correctly identified the state tree i.e., Southern Longleaf Pine (*Pinus palustris* Miller). These percentages were lower than anticipated.

The computed Cronbach's alpha was 0.865, which indicated a high level of internal consistency of the scales of our questionnaire that measured students’ conservation and commitment attitude. Cronbach’s alpha value normally ranges between 0 and 1; the closer the value to 1, the greater the consistency of the statement items in the scale (Hair et al. 1998). The minimum limit value for reliability can be normally taken as 0.7 but it varies in relation to the nature of the research. For example in pilot testing it can be taken as 0.60, for basic research 0.80, and for applied research up to 0.95 (Ugulu, Sahin, and Baslar 2013). The reliability analysis was run on a sample of 78 students, excluding the students who provided incomplete response on questions.

While assessing the mean values of the statement items, the statement ‘More persons should car-pool’ had the highest mean among the statements, indicating low agreement among the students for this particular item (Table 1). The standard deviation and the ‘corrected item-total correlation’ of the statements ranged between 1.14-1.48 and 0.49-0.76, respectively, whereas the differences among them were not as high and therefore we found all the questions (statement items) to be important and retained them (Table 1). The ‘corrected item-total correlation’ is the Pearson correlation coefficient between an individual item score and the remaining items total score (Tavakol, Dennick, and Tavakol 2011). The Cronbach’s alpha values of the questions were very close to each other, which supports our decision for retaining all the items in reliability analysis (Table 1).

**Table 1. Measure of Cronbach’s Alpha or Internal Consistency Values for the Statements that Assess Students’ Conservation and Commitment Attitudes in the Agreement Scale**

Statement Items	Mean (scale)	Std. Deviation	Corrected Item-Total Correlation	Cronbach's Alpha
Forests and natural resources are important to me, my community, and my state	1.97	1.14	0.55	0.86
More persons should car-pool	2.90	1.48	0.49	0.86
Individuals should always try to conserve water	1.90	1.18	0.76	0.83
Individuals should always try to conserve energy	1.94	1.24	0.75	0.83
Alabama, and USA as a whole, should make greater use of renewable energy sources	1.83	1.21	0.59	0.85
Either conservation or environmental education should be a required course at high school	2.53	1.41	0.56	0.86
I am prepared to occasionally volunteer to work at community and/or state parks as my contribution towards conservation programmes	2.36	1.41	0.62	0.85
I support enactment of stronger land use and planning regulations to protect the environment	2.32	1.43	0.66	0.84

### 3.2. Experience and participation in environmental protection, natural resource conservation, and outdoor activities

The experience and participation of students in environmental protection and natural resource conservation were evaluated based on membership in a community-based conservation group, such as hiking clubs and/or heritage society, membership of school-based conservation groups, Future Farmers of America (FFA), Minorities in Agriculture, Natural Resources and Related Sciences (MANRRS), horticulture club, and/or other similar groups, and visits to a park and/or forest area within the last 5 years. Only 11 percent of the total students had involvement in community-based conservation groups, 16 percent had experience of participating in school-based conservation groups, and 36 percent had experience of visiting a state park, state forest, and/or national forest within the last 5 years (Figure 3).

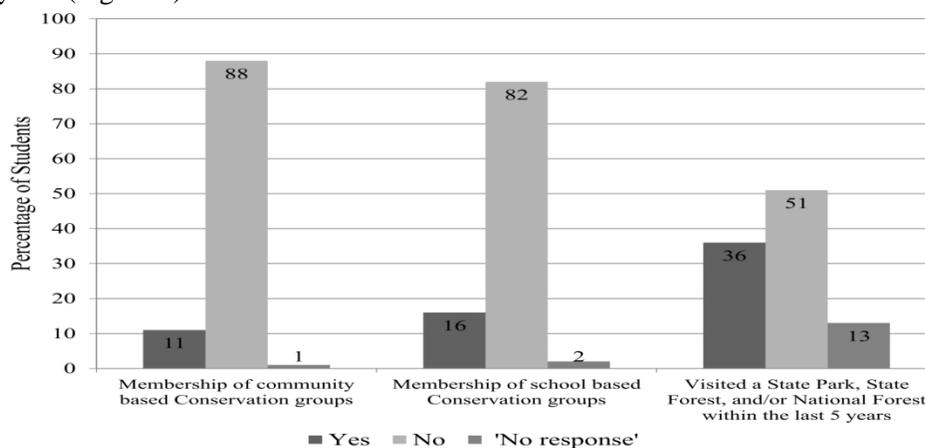
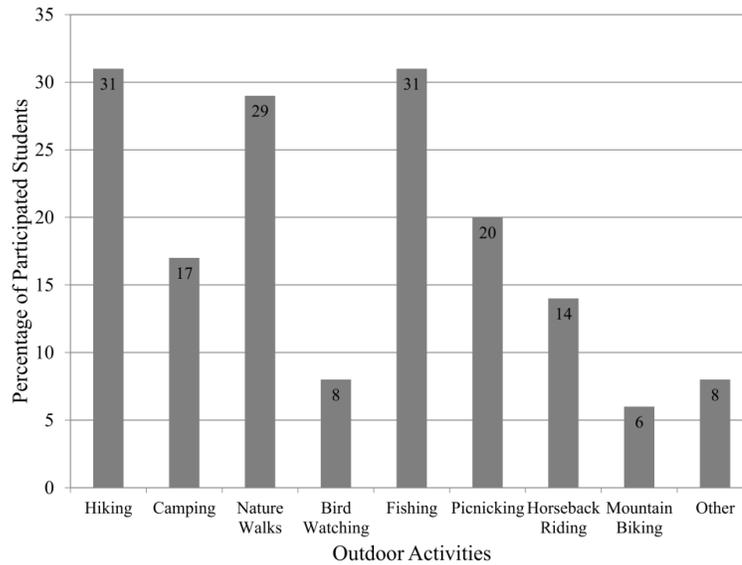


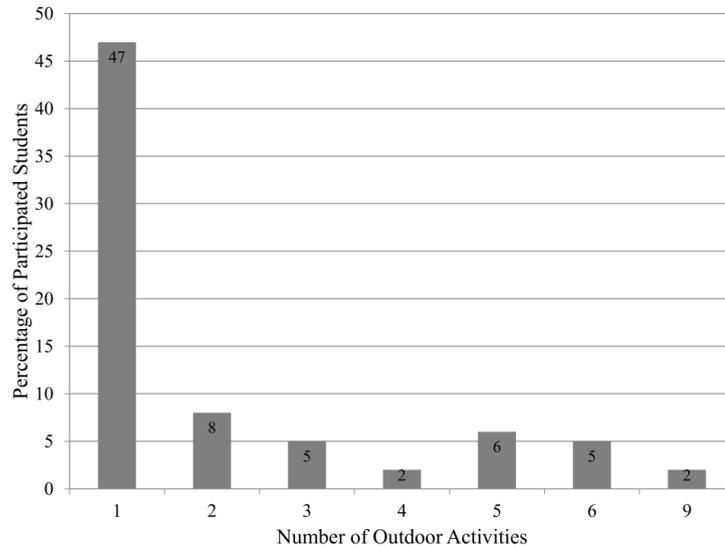
Fig 3. The percentage of students who had and hadn't 1) membership of a community-based conservation groups, such as hiking club, and/or heritage society, 2) membership of school based conservation group, such as FFA, MANRRS, horticulture club, and/or other similar groups, and 3) visited a State Park, State Forest, and/or National Forest within the last 5 years. Data values are shown inside the bar.

Although the experience and participation of students were low in pro-environmental activities, we found a relatively higher number of students had visited State Park, State Forest, and/or National Forest than those who had been involved in community- or school-based conservation groups within the last 5 years. Many of the students reported having participated in outdoor activities. Thirty-one percent of students participated in hiking and a similar percentage participated in fishing (Figure 4A) during last 5 years. Nature walks and picnicking were also popular as reflected by 29 and 20 percent of student participation, respectively. Mountain biking was the least popular outdoor activity among the students (Figure 4A).

Interestingly, 47 percent of respondents had participated in only one outdoor activity (Figure 4B) during the last 5 years. The percentage of students who experienced more than 2 outdoor activities was relatively low. Eight percent had engaged in 2 outdoor activities, 5 percent in 3 outdoor activities, and 2 percent in 4 outdoor activities. However, although the percentages were low, a few students reported having experienced 5, 6, even 9 outdoor activities during last 5 years (Figure 4B).



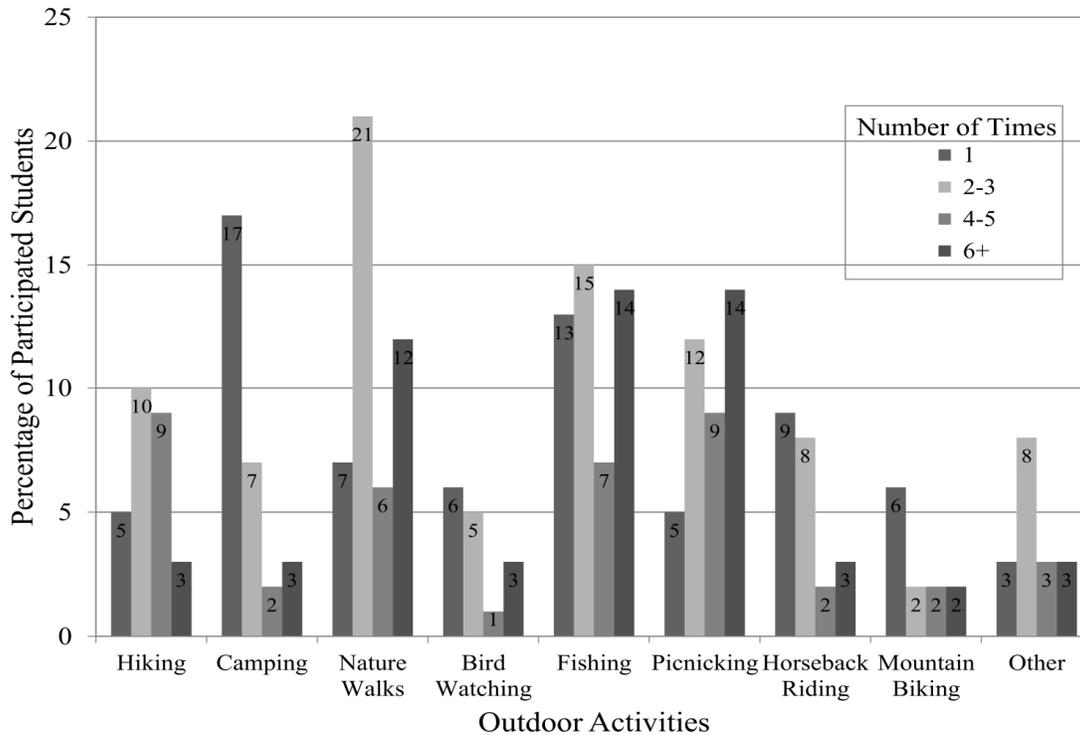
A



B

**Fig 4. The percentage of students participated in, A) outdoor activities, and B) number of outdoor activities during the last 5 years. Data values are shown inside the bar.**

We evaluated students on how many times they were able to participate in a short-list of outdoor activities during last 5 years. Twenty-one percent of respondents had participated in nature walks 2 to 3 times, 17 percent had participated in camping once, 9 percent participated in both hiking and picnicking 4-5 times, and 14 percent participated in fishing and picnicking 6 and more times (Figure 5). Hiking, camping, nature walks, fishing, and picnicking were the most preferred outdoor activities by students who participated in multiple visits or activities.



**Fig 5. The percentages of students who participated in outdoor activities number of times during the last 5 years. Data values are shown inside the bar.**

**3.3. Attitude, experience and participation towards environmental protection based on gender and school grade**

The Pearson Chi-square test showed that there was no statistically significant difference between gender and attitude of the students for environmental issues at confidence level 95% (Table 2). We concluded that there was no significant association between gender and attitude/opinion of students on environmental protection, recycle, membership of conservation groups, and visit to forest/park areas. Males and females equally supported environmental protection, recycling, membership of conservation groups, and visits to forest/park areas. Phi and Cramer's V, which measured strength of association, and the strength of association between the variables (gender and attitude) for selected questions, was very weak (Table 2).

**Table 2. Students' Attitude and Experience, by Gender, on Environmental Protection, Recycling, Membership of Conservation Groups, and Visit State/National Forests/Parks**

Questions	Gender	Number of responses (n)		Pearson Chi-square test	Symmetric measures
		Yes	No		
Do you believe in need to protect the environment?	Male	18	0	$\chi(1)=0.55, p=0.46$	Phi=0.08 Cramer's V=0.08
	Female	65	2		
Do you and/or and your household recycle?	Male	8	11	$\chi(1)=0.50, p=0.48$	Phi=0.07 Cramer's V=0.0.07
	Female	22	44		
Are you currently an active member of a community-based conservation group, hiking club, and/or heritage society?	Male	0	18	$\chi(1)=2.7, p=0.1$	Phi=-0.18 Cramer's V=0.18
	Female	9	58		
Are you an active member of FFA, MANRRS, Horticulture Club, and/or other similar groups at your school?	Male	1	17	$\chi(1)=2.04, p=0.15$	Phi=-0.16 Cramer's V=0.16
	Female	13	53		
Have you been to a State Park, State Forest, and/or National Forest within the last 5 years	Male	10	8	$\chi(1)=1.98, p=0.16$	Phi=-0.16 Cramer's V=0.16
	Female	21	36		

Similarly, the Pearson Chi-square test showed a statistically non-significant difference between school grade and attitude of the students towards environmental issues at confidence level 95% (Table 3). The results indicated that there was no significant association between school grade and attitude/opinion of students about environmental protection, recycling, membership of conservation groups, and visits to state forests/park. Freshman, sophomore, junior, and senior students equally agreed upon the merits of environmental protection, recycle, membership of conservation groups, and visit to forest/park areas. Again, Phi and Cramer's V values indicated a weak association between the variables (school grade and attitude) for each question (Table 3).

**Table 3: Students' Attitude and Experience, by School Grade, towards Environmental Protection and Conservation Matters**

Questions	School grade	Number of responses (n)		Pearson Chi-square test	Symmetric measures
		Yes	No		
Do you believe in need to protect the environment?	Freshman	29	0	$\chi(3)=2.97, p=0.39$	Phi=0.19 Cramer's V=0.19
	Sophomore	29	1		
	Junior	13	0		
	Senior	11	1		
Do you and/or and your household recycle?	Freshman	10	19	$\chi(3)=4.56, p=0.21$	Phi=0.23 Cramer's V=0.23
	Sophomore	7	22		
	Junior	8	6		
	Senior	4	8		
Are you currently an active member of a community-based conservation group, hiking club, and/or heritage society?	Freshman	2	27	$\chi(3)=0.96, p=0.81$	Phi=-0.11 Cramer's V=0.11
	Sophomore	4	25		
	Junior	1	13		
	Senior	1	11		
Are you an active member of FFA, MANRRS, Horticulture Club, and/or other similar groups at your school?	Freshman	4	24	$\chi(3)=4.08, p=0.25$	Phi=-0.22 Cramer's V=0.22
	Sophomore	8	21		
	Junior	1	13		
	Senior	1	11		
Have you been to a State Park, State Forest, and/or National Forest within the last 5 years	Freshman	5	19	$\chi(3)=7.79, p=0.05$	Phi=-0.32 Cramer's V=0.32
	Sophomore	11	15		
	Junior	8	5		
	Senior	7	5		

However, the visiting experience of students to a state park, state forest and/or national forest showed a borderline *p* value (0.05), and a comparatively better strength of association (Phi=0.32) between school grade and response ('Yes' and 'No'), which indicated that the students possibly did not have an equal preference for visiting a state park, state forest and/or national forest based on their school grade.

### 3.4. Motivation and satisfaction on environmental education

The percentage of students who had interest in attending college and pursuing careers in biology/environmental discipline was only 13 percent, whereas 84 percent had no interest in these disciplines. Three percent did not respond to the question (Figure 6A). Among the 13 percent of students who responded ‘Yes’, the preference was highest for natural resource management and agriculture specialist fields with 4 percent in each. Students had no preference at all for the geographic information system (GIS) specialist, park ranger, and environment specialist fields (Figure 6A). The reason for selecting natural resource management and agriculture specialist fields could be due in part to the students’ familiarity with farms and forest landscapes. Other fields might not have been selected due to unfamiliarity or lack of much knowledge and personal experience about them.

The EE programme in the school systems in Madison County was evaluated by students’ satisfaction level. The percentages of students who were ‘Extremely Satisfied’, ‘Very Satisfied’, and ‘Satisfied’ were 1, 9, and 59, respectively, whereas the percentages who were ‘Very Dissatisfied’ and ‘Dissatisfied’ were 3, and 21, respectively (Figure 6B). Seven percent of the students had no response for this question.

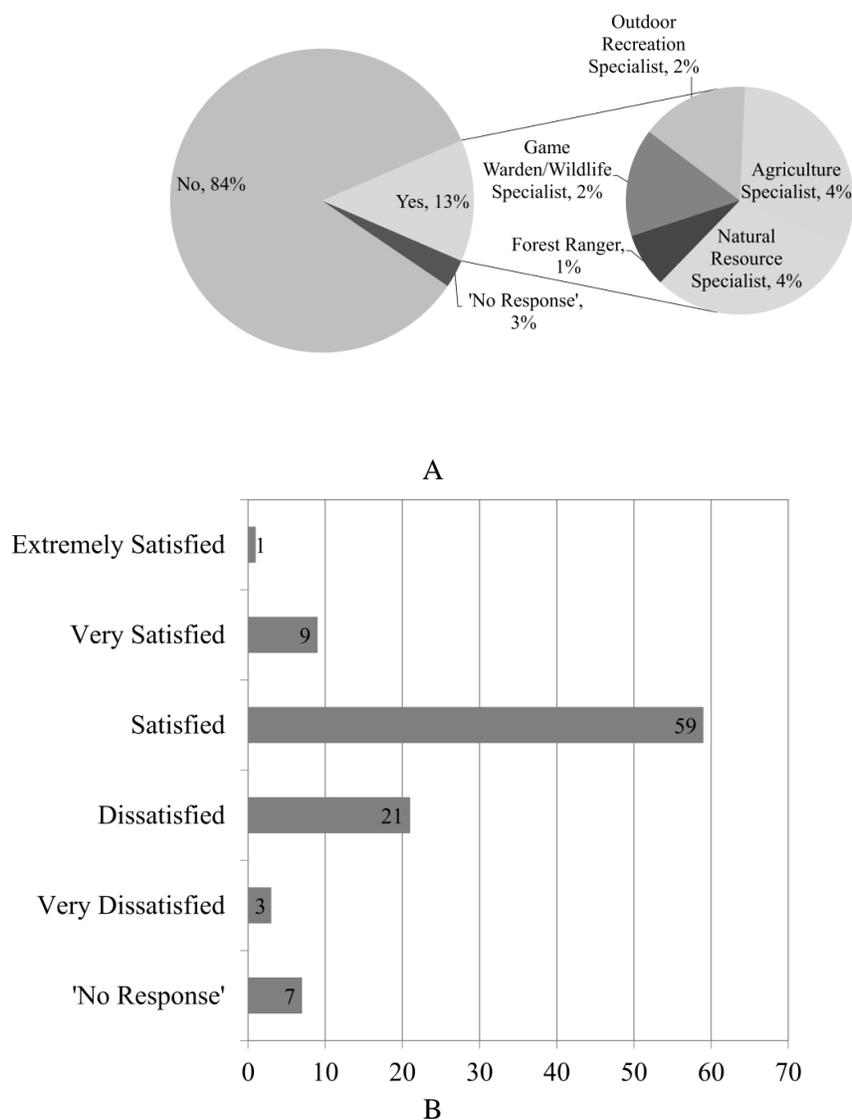


Fig 6. The percentages of students’ who A) indicated for possible college preparation for careers in the agriculture, environmental, and/or natural resource fields, B) Level of satisfaction of respondents about conservation and education programmes in the school system.

#### **4. Discussion**

The findings of this study are being discussed in the following context: 1) the sample size was small because we focused only on high school students who were associated with NACEE, 2) about 85 percent respondents represented Black/African American low income families and most of them had relatively large families, 3) female respondents were almost three times more than males, and 4) about two-thirds of the total respondents were sophomores and freshmen.

##### **4.1. Attitudes and knowledge towards environmental protection and natural resource conservation**

A pro-environmental attitude was reported by 97 percent of the students. They believed in the need to protect the environment. However, a low level of household recycling practice was found among students. The likely reasons for not recycling could be the lack of knowledge and/or parents' educational status and level of environmental awareness. We did not collect information about students' parents' education and social status; however most of the students represented minority families and possibly had poorly educated parents. One of our survey questions was a multi-dimensional construct which included conservation and commitment dimensions with self-rating Likert scale to investigate the students' environmental attitudes. The result showed that the Likert scale question can be regarded as reliable and valid to measure students' conservation and commitment attitude. The conservation and commitment attitudes of the students were overall positive because many questions (statement items) had low mean agreement-scale values. The average agreement level of students for environmental issues was between 'Strongly Agree' and 'Agree' that ranged from 80 to 100 percent of the maximum points. Asan, Mile, and Ibraim (2014) examined attitudes of Macedonian high school students towards environmental pollution, environmental protection, technology, ecology and ecosystem, human life and resources utilization, and resource conservation in a 13-item and five-point Likert scale. The researchers found that students' average concern for environmental issues was about 70 percent of the maximum points.

Television programmes related to environment and conservation are considered an important medium to boost knowledge and attitude of the students' towards environmental issues (Eilam and Trop 2012). But, we found that a low number of students followed such programmes. Also, the general knowledge of the students about Alabama's natural resources was poor. For example, only a few students were able to name the state's tree and state's bird. Improved teaching methods (e.g. audio-video aided lectures) and learning materials at schools could raise students' interest in and knowledge about the environment and conservation.

##### **4.2. Experience and participation in environmental protection, natural resource conservation, and outdoor activities**

In addition to environmental knowledge and awareness, conservation-minded students are expected to actively participate in environmental protection and improvement activities, outdoor recreational activities, household recycling, and conservation group related activities. In comparison to the high level pro-environmental attitudes, there was a very low level of participation in environmental conservation activities among students. The experience of visiting park and/or forest areas was higher among students than participating in community or school-based conservation groups within the last 5 years.

In India Abbas and Singh (2016) found that students' knowledge and attitude levels towards environment were high but low participation level in environmental protection activities was apparent. Similarly, Boiyo, Koech, and Manguriu (2015) also found no statistically significant relationship between attitude and level of participation in environmental activities of high school students in Kenya; however, they reported a positive relationship between attitude and ecological behaviour. Bradley, Waliczek, and Zajicek (1999) found a statistically significant correlation between knowledge and attitude after both pre-test and post-test of students in Texas, where high school students were provided a 10-day environmental science course and the exposure of environmental education increased students' knowledge as well as their favourable environmental attitudes.

Hiking, fishing, and nature walks were the single most participated outdoor activities among the students during last 5 years. It was possible that some of the students had opportunity for getting collective experience of these three activities during a single field trip in summer. Schools in North Alabama frequently arrange field trips to various places of interest at a nominal charge to students. It is possible that some of the field trips were related to environment and nature conservation. A number of students had participated in outdoor activities within the last 5 years. Although a few students had the experience of participating in multiple outdoor activities, hiking, nature walks, fishing, and picnicking were the most preferred outdoor activities for multiple visits among the students.

Parents' interests, discretionary time, and income levels are likely to be some of the crucial factors that have influenced the students' experience and participation in outdoor activities.

#### **4.3. Attitude, experience and participation towards environmental protection, based on gender and school grade**

We found that males and females were equally concerned about environmental protection, recycling, membership in conservation groups, and visits to forest/park areas. In other words, there was no significant difference in attitudes/experiences between male and female students on environmental issues. Likewise, freshman, sophomore, junior, and senior students were equally concerned about environmental protection, recycling, membership in conservation groups, and visiting forest/park areas. This was most probably due to the dominance of students from one race/ethnicity in our sample, who may share common interests and values. Similarly, Liefländer and Bogner (2014) reported no differences in attitudes towards preservation and utilization of nature because of gender differences among students. Heyl, Moyano Díaz, and Cifuentes (2013) found that attitude and behaviour of the students towards the environment do not differ based on grade levels.

In another study Varisli (2009) found a significant effect of gender, parents' education level, and mothers' work status on students' environmental literacy (knowledge, attitude, sensitivity and concern). They found that girls were more concerned about environmental protection than boys, and also positive effects of parents' education and mothers' work status on students' environmental literacy. In a study of university students in Turkey, Tuncer (2008) found significant difference between boys' and girls' perception on sustainable development. Köse et al. (2011) reported that female undergraduate students in Turkey were more aware than male students about environmental matters. Tikka, Kuitunen, and Tynys (2000) evaluated students of different educational establishments (school, college, vocational school and others) in Finland and found that female students had more concern for environment than male students.

#### **4.4. Motivation and satisfaction with environmental education programmes**

Motivating and encouraging students towards pro-environmental attitude and behaviour are important to enhance their role in environmental protection and to help secure a sustainable future. The interest and motivation levels for possibility of selecting college training in preparation for careers in agriculture, environmental, and/or natural resources fields was very low among students. Fizer (2013) reported some of the important factors that influence students when choosing a major in college and to prepare for future career path include family background (parents', friends' and others' education and profession), personally rewarding career, and attitude towards field of experience. Liefländer and Bogner (2014) recommended that environmental education programmes should be designed appropriately on the basis of students' age differences. Liefländer and Bogner (2014) also concluded that younger students of ages 9-10 were more responsive with positive attitude towards preservation and utilization of nature than older students of ages 11-13 in a pre- and post-retention test in Germany. This indicates that environmental education beginning from the elementary school is likely to be more effective for enhancing children's interest in and curiosity towards environmental/natural resource conservation disciplines.

The majority of the respondents were satisfied with Madison County's current conservation and EE programme. Students' perception and satisfaction with the EE programme was possibly associated, to some extent, with teachers' role and teaching methods at school. The environmental education programme could be improved to promote students' knowledge, skills, attitudes, motivations, and commitment for selecting careers in the fields of environment, agriculture, and natural resource conservation.

An important consideration is how we can communicate effectively to students in order to motivate them towards pro-environmental behaviour and careers. A cognitive research by Ham (1992) identified the EROT interpretative communication model which suggested four qualities that are essential for successful communication: enjoyable (E), relevant (R), organized (O), and thematic (T). The style of interpretation of educational content to students needs to be enjoyable enough so that it can motivate and engage them in the subject area. Moreover, the interpretation needs to be relevant to students, using appropriate teaching methods and learning materials, such as audio/visual shows, debates, and field trips that could connect them to environmental issues. Finally, the interpretation needs to be thematic in order to provide relevant message on a particular subject area to students so that they can understand and remember messages afterwards. High quality interpretation can enhance students' satisfaction towards environmental education and motivate them in choosing future career paths in environment-related fields.

## 5. Conclusion

Environmental education is an important learning process that increases students' knowledge, awareness and skills towards environmental protection. EE also develops positive attitude, motivation, and commitment among students to address the environmental challenges through informed decisions and responsible actions. The study found high positive attitudes towards environmental protection but low participation and experience in pro-environmental activities among students. This indicates that factors other than pro-environmental attitude may be important to determine students' active participation in environment protection activities. Male and female students were equally concerned about environmental protection/nature conservation, and so were students from different school grades. Most of the students were satisfied with present environmental education programmes being offered in Madison County, Alabama. But, only a few students had interest in pursuing post-high school education in preparation for and career paths in agricultural, environmental, and natural resources fields.

The highest number of respondents was from a single race/ethnicity, thus the need to identify the reasons why Black/African-American students were reluctant in participating in pro-environmental activities as well as in choosing careers in environmental fields. School curricula could integrate appropriate teaching methods and learning materials using interpretative communication style to motivate students to participate in pro-environmental activities and in choosing careers in the agricultural, environmental, and/or natural resource disciplines. Additionally, there is the need to design broad environmental literacy and outreach programmes to motivate and enhance knowledge, awareness and involvement of students from minority communities in various fields of environment.

Obviously this study has implications for further environmental literacy planning and decision making in Northern Alabama. To increase awareness and secure wider participation of students, particularly those from minority groups, in environmental protection and conservation, it is important to design and implement inclusive environmental education programmes that could motivate students and ultimately impacting their families. Some other factors such as parents' education and work status, socio-economic status, social norms and values, and the role of mentors or teachers may be considered for further investigations. Students' ingenuity and cognizance are other factors that might influence their environmental attitudes and could form part of future research efforts. The evaluation of low and high achieving students as well as science oriented and non-science oriented students to determine whether they differ in attitudes, behaviours and perspectives towards the environment also merit further investigation.

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