

An evaluation of “Forests of the World,” a Project Learning Tree secondary module

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ABSTRACT

This study sought to determine whether a secondary level curricular model based on enhancing knowledge and awareness of global forest issues would have an effect on students' self-perceived knowledge of forest issues, actual content knowledge of these issues, and pro-environmental attitudes. The study instrument is the secondary module “Global Connections: Forests of the World”, a publication of the American Forest Foundation and part of its Project Learning Tree series of curricula. The module activities provide students with opportunities to apply scientific processes and higher order thinking skills while investigating world forestry issues and conducting service-learning action projects. Overall, the use of Forests of the World as a curriculum to teach about forest issues seems to be effective in increasing student attitudes and self-assessed knowledge about forests. There is some indication that the curriculum increases content knowledge as well.

Keywords: environmental education, environmental attitudes, program evaluation, environmental issues

INTRODUCTION

Is our educational system adequately preparing our future citizens and leaders to make responsible environmental decisions? The research suggests that we are not. Many studies show that our students are not knowledgeable of global environmental issues such as habitat loss, invasive species introductions, acid rain, or air pollution, to name a few. In fact, the research suggests that most citizens do not possess enough background knowledge about many environmental issues to make informed decisions. The result is a citizenry making crucial decisions with regard to the environment without knowing what the consequences of those decisions are. For example, Gambro & Switsky (1996) found that, while high school students tend to have a basic knowledge base of environmental concepts, they were for the most part unable to apply that knowledge to comprehend consequences or to find solutions to environmental problems they were presented with. Similarly, McBeth & Volk (2010) report that, in a national survey of environmental literacy in middle school students, their ecological understandings were moderate to high, but they lacked the critical thinking and decision making skills that would allow them to address the environmental issues facing their communities and the world at large as they become adult citizens.

The National Environmental Education Foundation's *Environmental Literacy in America* report (Coyle, 2005), based on ten years of NEEF/Roper survey research and related studies, indicates:

- Only twelve percent of Americans can pass a basic quiz on energy topics.
- Less than half of the U.S. population knows that the cars and appliances they use contribute to global climate change.
- Nearly 80 percent of Americans are heavily influenced by incorrect or outdated environmental myths.
- Fifty-six percent of Americans want to take action to protect the environment, but they don't know what to do.

Similarly, Hausbeck et. al (1992) found that secondary school students in New York State scored low in environmental knowledge assessments but scored significantly higher when assessed for awareness and concern for the environment. Fifty-six percent of the students surveyed would have liked to see more environmental education included in their high school studies, demonstrating that there is motivation among students to learn about environmental issues.

The primary aim of environmental education is to change learner behavior toward the environment. To do this, we hope to produce students who will be environmentally literate and responsible citizens (Knapp, 2000). The 2006 Program for International Student Assessment study effectively demonstrates the crucial link between knowledge and the ability to make informed environmental decisions. The results showed that those students who scored highest in knowledge of environmental issues are the most realistic about global environmental problems facing us over the next 20 years. Those students who scored lowest on the knowledge assessment were the most over optimistic. The connection between knowledge and attitudes (and ultimately, behavior) is continually debated in the literature. While there is not a direct, linear relationship between environmental knowledge and pro-environmental behavior, several researchers have shown that greater environmental knowledge can lead to more positive environmental attitudes, ultimately leading to more environmentally responsible behavior

(Pe'er, Goldman, & Yavetz, 2007; Hsu, 2004; Bradley, Waliczek, & Zajicek, 1999; McMillan, Wright, & Beazley, 2004). Some research has shown that knowledge does not per se lead to environmental action or the development of pro-environmental behavior, but knowledge is one of many important preconditions to lead to better behaviors (Jensen, 2002). Thapa, Graefe, and Meyer have even gone as far to say that “environmental knowledge is a major factor in predicting pro-environmental behavior” (2005). Kuhlemeier et.al (1999) stress the importance of knowledge on pro-environmental behavior in secondary students. Other research has found that “several student participants retained long-term environmental and ecological content and evidenced a potentially perceived increase in pro-environmental attitude” (Farmer, Knapp and Benton, 2007). Schultz (2004) found that deaf students exposed to an environmental science course showed a significant increase in mean scores for the evaluation of their attitudes toward the environment. Johnson & Manoli (2011) found changes in the environmental attitudes of students who were exposed to earth education programs. No such changes were found within the control group. An integral part of any environmental curriculum should promote “respect for the environment, teaching values related to the environment, and encouraging environmentally responsible behavior” (Hewitt, 1997). Obviously knowledge acquisition and awareness of environmental issues is a crucial beginning. This study sought to determine whether a secondary level curricular model based on enhancing knowledge and awareness of global forest issues would have an effect on students’ self perceived knowledge of forest issues, actual content knowledge of these issues, and pro-environmental attitudes.

Global Connections: Forests of the World

Global Connections: Forests of the World is published by the American Forest Foundation and was added to the Project Learning Tree set of classroom resources in 2008. The purpose of this curriculum is to provide opportunities for student investigations that focus on environmental, social, and economic issues, and help students develop and strengthen their knowledge and awareness of global forest issues. Like many other curricula, all Project Learning Tree educational materials undergo independent and rigorous evaluations, and these evaluations have shown the materials to be effective (Haines & Hermann 2011). This study was modeled after those of Covitt *et. al.* (2005) which analyzed the effectiveness of the Project Learning Tree curricula *Focus on Risk*, and Haines & Hermann (2011), which analyzed the effectiveness of the Project Learning Tree curricula *Exploring Environmental Issues: Places We Live*. However, as Haines & Hermann point out, since many of these evaluations were undertaken (mostly in the 1990s), many educational practices have changed. We know more about environmental education research and place-based educational research, and how these can affect student achievement, attitudes, and bring about changes in behavior. Haines & Hermann also appropriately point out that the characteristics of the students we are teaching is changing. Research conducted by Gravett & Throckmorton (2007) suggests that today’s students are heavily influenced by technology and are not as interested as students in past generations in text-based information or doing work in a traditional linear, logical pathway (Lippincott, 2009). Since, like the other Project Learning Tree modules evaluated before, the Global Connections: Forests of the World curriculum is text-based, linear in many respects and requires a logical thought progression, the need for an evaluation of the extent to which the curriculum is effective with the current generation of students is well deserved.

Description of the Curriculum

All Project Learning Tree curricular materials are available to educators through professional development workshops. Fee structure depends on the state the workshop is held in; some states do not charge for workshops and materials while others charge a nominal fee.

The study instrument is the secondary module “Global Connections: Forests of the World”, a publication of the American Forest Foundation and part of its Project Learning Tree series of curricula. The module activities provide students with opportunities to apply scientific processes and higher order thinking skills while investigating world forestry issues and conducting service-learning action projects. *Global Connections: Forests of the World* provides educators with a series of activities to help students gain an increased understanding and appreciation of the diversity of world forest environments, with an emphasis on the human interaction with and dependence on those environments.

The *Global Connections: Forests of the World* curriculum is composed of nine lessons that emphasize ecological and socioeconomic concepts related to global forest use. Lessons need not be completed as a set; each lesson can act as a “stand alone” lesson. In fact, there is anecdotal evidence to suggest that many teachers are likely to select only a few of the lessons found in the module. To that end, one salient aspect of this study is the comparison of a control group to a group that completed four of the nine activities. To provide a sense of the flow of lessons and the content covered in each, a brief description of each lesson follows.

In lesson one, *Making the Global Connection*, students conduct a survey to help them assess what they and others know about forests and to consider ways that people are linked to forests around the world. In the second lesson, *What is a Forest?*, students learn that dozens of official definitions of the term forest are in use throughout the world. Here, students analyze various definitions of this term and then consider different cultural perspectives that affect people’s perception of forests. Lesson three, *Mapping the World’s Forests*, students see that identifying, documenting, classifying, and accurately mapping the diversity of forests found around the world is an active, ongoing process. A holistic system of global ecological zones related to simple, well-known climate characteristics and vegetation types is now used to classify the world’s forests. Students examine this system to see how temperature and moisture determine the type of forest in a given locale. The fourth lesson, *Analyzing Patterns of Forest Change*, students identify global trends in forest cover; through maps and historical accounts they analyze how particular forests have changed over time. In lesson five, *Understanding the Effects of Forest Uses*, students analyze the effects of different ways that people use the world’s forests and determine which effects may be sustainable according to one definition. In *Seeking Sustainability: A Global Response*, the sixth lesson, students consider possible indicators that a forest is sustainable, and learn about one international initiative for monitoring forest sustainability. They find out what is being done locally and in other countries to determine whether forests are managed in a sustainable way.

Lesson seven, *Exploring the World Marketplace*, has students conduct a simulation in which countries use their forest resources to “manufacture” products and to sell them to an international trader. Through the simulation, students experience what can happen when forest resources are unevenly distributed around the world and explore some of the tradeoffs of resource use. In Lesson eight, *Making Consumer Choices*, students use paper as an example to analyze the life cycle and consumption patterns of forest products, and they identify the international dimensions of product use. Using their findings, they then draw conclusions about

consuming forest products in a way that is more intelligent and takes into account the global consequences. In the final lesson, *Researching Forests Around the World*, students explore their connections to the world's forests by researching a forest in another country or region, and by creating a profile about that forest.

Purpose

The *Global Connections: Forests of the World* was designed to provide ideas and guidelines about how to integrate the important topic of the world's forests into secondary level teaching. The module provides formal and nonformal educators with a series of activities to help students explore their connections to the forests of the world, and to learn how forests affect people and how people affect forests. Students are expected to be able to do the following upon completion of the module (American Forest Foundation, 2008):

- Demonstrate an understanding of how different cultures, people, and societies view and define forests
- Describe different ways that people around the world interact with forests
- Identify geographic factors that determine the major types of forests around the world
- Explain how environmental and human factors have affected and continue to affect the world's forests
- Describe how economic, political, and social systems play a role in managing forests around the world for a variety of uses
- Define sustainability as it relates to the world's forests, including ecological, economic, and social elements of sustainability
- Explore efforts around the world to protect and conserve forests and natural resources

While these objectives were thought to have been adequately covered within the curriculum, the extent to which they were supported was not evident. Therefore, a national study of the curriculum was designed that quantified the extent to which the completion of the curriculum resulted in positive student attitudes and increased content knowledge regarding global forest issues. Principle research questions are:

- Does exposure to the *Global Connections: Forests of the World* curriculum result in a change in environmental attitudes with respect to global forest issues?
- Does exposure to the *Global Connections: Forests of the World* curriculum result in greater researcher assessed content knowledge with respect to the issues covered in the curriculum?
- Does exposure to the *Global Connections: Forests of the World* curriculum result in greater self-assessed content knowledge with respect to the issues covered in the curriculum?

METHODS

This quasi-experimental research design seeks to determine the extent to which the *Global Connections: Forests of the World* curriculum facilitates a change in students' self-assessed ability, content knowledge, and attitudes toward the global forest issues. Secondary school teachers from across the country were selected to participate in the study with two of the classes they taught during the 2010-2011 school year.

Sampling

Teachers that have had training in and experience teaching with the *Global Connections: Forests of the World* curriculum were invited to participate in the study. Teachers meeting those criteria were also recruited at national science education conferences. Invitations to participate were sent to 28 teachers. All teachers agreed to participate but only 13 (46% response rate) completed all of the study requirements, including pre- and posttest data collection. The end result was a sample size of around 700 students representing seven states (see Tables 1&2 in Appendix).

Each participant teacher taught two classes for the study. One of the classes was assigned to the control group and the other class was assigned to the experimental group. To mitigate the results of teachers selecting their higher performing classes to complete the *Global Connections: Forests of the World* curriculum, the teachers were given the following instructions: “Assign the first class you teach during the day to the experimental group and the second class to the control group.” In an authentic classroom setting, true randomization is not possible, but the researchers acknowledge this and attempted to make the study as bias free as possible in these circumstances.

There are nine activities in the published curriculum, but this study limited the number of activities taught to four, specifically lessons three through six. The purpose of this was twofold; 1) to center the content topics around forest conservation and 2) to make the study more manageable in terms of time. Students in the control group were exposed to similar material, but by the traditional textbook or classroom materials, rather than by the *Global Connections: Forests of the World* curriculum.

Instruments

The data collection for this study was collected utilizing survey methodology. Pretest and posttest questionnaires were given to all students in the control and experimental groups. The pretest questionnaires consisted of 42 questions. The posttest was identical to the pretest. Three questions measured basic demographic information: participation in the curriculum, gender, and grade level. The remaining questions measured self-assessed ability, content knowledge, and students’ attitudes toward forest conservation (See the Appendix for sample questions from each section). The following sections provide a description of each subsection of the questionnaire.

Self-assessed ability

The ten questions designed to measure self-assessed ability are stylistically similar in that each is a Likert-type question with seven answer choices. The answer choices were scored along a continuum from Strongly Agree (7) to Strongly Disagree (1), and I Don’t Know was coded as zero (0) with the highest score demonstrating the greatest self-assessed ability of the environmental issues affecting global forests.

Content knowledge

The twenty assessed content knowledge questions each have favorable answers that indicate a superior level of understanding about the environmental issues affecting global forests. Whereas the previous section measured how well students think they understand the environmental issues affecting global forests, this section actually measures how well they do understand the environmental issues affecting the global forests. This section is scored as a multiple choice content knowledge assessment with distracters being viable options, but which do not demonstrate the degree of understanding the most favorable answer choice represents. Thus, of the five possible answers, one is correct, three are incorrect, while the fifth choice was “I don’t know”. The incorrect answers were coded as zero (0) and the correct answer was coded as one (1). The response “I Don’t Know” was coded as zero.

Attitudes

Nine questions were designed to measure students’ attitude toward global forest issues. The answer choices were scored along a continuum from Strongly Agree (7) to Strongly Disagree (1), and I Don’t Know was coded as zero (0) with the highest score demonstrating the greatest self-assessed knowledge of the environmental issues affecting global forests.

Instrument Reliability and Validity

The researcher-developed instrument used in this study to measure students’ self-assessed ability, content knowledge and attitudes has not been used in prior research. To that end, the reliability and validity of the instrument were determined prior to the study. A pilot study was conducted with 44 high school students who were not involved in the current research study, but had been taught using the curriculum being studied.

Reliability

An analysis was performed to determine internal consistency of the three parts of the assessment. Since the self-assessed knowledge section and the attitude section utilize Likert-type responses that are weighted, the Cronbach’s alpha measure is ideal for these sections. For the self-assessed ability section Cronbach’s alpha was found to be 0.84 and for the attitude section Cronbach’s alpha was 0.98.

The content knowledge section of the instrument contains correct and incorrect responses. To determine the test’s internal consistency the method of rational equivalence was utilized. The Spearman-Brown prophecy formula was calculated for the content knowledge questions to determine reliability due to the short length of the knowledge section. The Spearman-Brown coefficient was found to be 0.87.

Validity

To determine the validity of the instrument, a panel of environmental educators, environmental consultants, natural resource educators, and teachers of grades 7-12 were given the instrument and the *Global Connections: Forests of the World* curriculum. Each expert

compared each of the self-assessed knowledge, content knowledge and attitude questions of the instrument to the *Global Connections: Forests of the World* curriculum. Assessors ranked each question on a scale of 1 (indicating poorly matched) to 5 (indicating well matched). With feedback from the experts, the instrument was revised and agreed to be valid based on expert analysis.

Data analysis

Data collected from the control groups and the experimental group was entered into SPSS. Both pretest and posttest data were entered into SPSS and coded based on the control or experimental group each student was assigned to by the researchers. Analysis consisted of several steps. First, descriptive statistics were computed for each question from the pretest and posttest. Second, an ANOVA was performed to determine if the control group and experimental groups were similar in terms of pretest scores. A second ANOVA was performed to determine if there were significant differences in pretest to posttest scores for the experimental group as well as the control group. The pretest scores were compared to the posttest scores for each group and for each of the 3 sections of the instrument to determine the extent to which the scores changed.

Since this study was carried out over several weeks, students were not always present for both the pretest and posttests. This led to a challenging data set where the pretest and posttest scores were not paired. As an alternative to a paired t test, other tests were performed to discover trends and patterns in the data.

One of the major goals of the *Forests of the World* curriculum is to improve the attitudes of students about global forest issues. For that reason, the researchers looked at individual questions in the attitudes section of the questionnaire and compared overall score means from the control group and the experimental group. Comparing differences in scores from pretest to posttest would have been ideal, but not possible in this study, since paired test scores were not available.

RESULTS

Scoring on sections of test

Questions 4-13 represented the self-assessed knowledge section of the test. Each was scored on a Likert scale from 0-7. Scores on this portion of the test range from 0 to a maximum of 70. Questions 14-33 represented the content knowledge section of the test. This was a multiple choice test, so each question was worth 1 point. Scores on this portion of the test range from 0 to a maximum of 20. Questions 34-42 represented the attitudes section of the test. Each was scored on a Likert scale from 0-7. Scores on this portion of the test range from 0 to a maximum of 63.

Analysis of variance

To ascertain if the two groups were similar at the outset of the study, the pretest scores of the control group were compared to the pretest scores of the treatment group (Table 3). The control groups had significantly higher pretest scores for all three subsections of the pretest

(attitude: $F=4.29$, $p=0.04$; content: $F=3.90$, $p=0.05$; self-assessed knowledge: $F=183.6$, $p<0.01$). This was not expected, but may be due to the artificial nature of the assignment of the groups.

To determine if the control group as a whole experienced changes, the pretest means for the control group were compared to the posttest means for the control group. The results of the ANOVA (Table 4) show that the control group either did not change significantly, as in the case of the attitudes ($F=0.003$, $p=0.96$), or showed a significant negative change, as in the case of both the content ($F=5.85$, $p=0.01$) and self-assessed knowledge sections ($F=93.8$, $p<0.01$). The pretest mean for the treatment group were compared to the posttest means for the treatment group to determine if the treatment groups as a whole experienced changes. The results of the ANOVA (Table 5) show that the treatment groups significantly improved in all three subsections of the test (attitudes: $F=74.5$, $p<0.01$; content: $F=70.0$, $p<0.01$, self-assessed knowledge: $F=183.6$, $p<0.01$).

An ANOVA was performed to compare the posttest means of the control group to the posttest scores of the treatment group. The results (Table 6) show that the treatment group significantly outscored the control group in all three sections of the posttest (attitude: $F=29.0$, $p<0.01$, content: $F=60.8$, $p<0.01$, self-assessed knowledge: $F=93.8$, $p<0.01$).

One major focus of the curriculum developers was to improve students' attitudes toward global forest issues. To that end, the attitude section of the test was more deeply analyzed. Mean scores were calculated for the answers to each question in the attitude section. Using those means, difference scores were calculated for the control group and treatment group (see Figure 1.). The mean difference value (mean pretest score subtracted from the mean posttest score) was positive for all questions in this section for the treatment group. For the control group, some questions showed a positive difference, some showed a negative difference, and one had no change.

DISCUSSION

When testing a curriculum for effectiveness, it is important to understand that, while true randomization is not possible, efforts can be made to make the study as rigorous as possible by randomizing classes as units, rather than students, and comparing posttest scores across all students. In this authentic setting, students were participating in learning about the forest environment, either through the use of the Forests of the World curriculum, or more traditional curriculum, and all students were tested using the same instruments. The sample size in this study is large enough and there is sufficient geographical and demographic variation among participants that generalizations generated by these data can be made.

An additional point to consider is that the control groups were not given a standardized curriculum to follow. While the treatment groups all were participating in the Forests of the World activities, the control groups were receiving the normal curriculum of their specific school, which may have greatly varied across the study participants. This is a critical issue to discuss as it closely mimics authentic educational systems and allows the researchers to better generalize across the nation.

A main goal of this curriculum is to increase students' positive attitudes towards environmental conservation topics. To that end, the design of the study was primarily focused on obtaining information from participating students about their attitudes. This was done using questionnaires to assess their self-assessed abilities for skills like map-reading and explaining forest patterns and changes. In addition to the self-assessed ability section, students responded to

opinion questions that assessed their attitudes on topics such as the impact a single person can have or how human activity impacts forests. The content section of the assessment looked at students' understanding of basic conservation content like reforestation, sustainability, and economic value of forests. The research questions of this study were

- Does exposure to the *Global Connections: Forests of the World* curriculum result in a change in environmental attitudes with respect to global forest issues?
- Does exposure to the *Global Connections: Forests of the World* curriculum result in greater researcher assessed content knowledge with respect to the issues covered in the curriculum?
- Does exposure to the *Global Connections: Forests of the World* curriculum result in greater self-assessed content knowledge with respect to the issues covered in the curriculum?

Content knowledge

This was the weakest part of the curriculum, as posttest scores ranged from a mean of 20.6% (4.12/20) for the control group to a mean of 29.3% (5.86/20) for the treatment group. Neither of these averages is close to a passing score. It is significant that the treatment group outscored the control group and is even more significant in that the control group started out with a significantly higher pretest score than did the treatment group. As the main focus was not on increasing content knowledge as much as the other domains, these results are acceptable, although somewhat discouraging, indicating more work to be done.

Self-assessed knowledge

This section of the assessment looked at how students self-assessed their ability to use maps to explain forest patterns and explain forest characteristics. These questions were aimed at finding links between content and attitudes towards forest topics, where specific skills enhance understanding. For example, an increase in scores for a specific question, like, "I know what 'certified' forest products are" may be related to increases in awareness of the importance of sustainability issues. Again, the control group was significantly higher in pretest scores than the treatment group pretest scores. This is interesting, but becomes startling when connected with the posttest scores. The control group self-assessed knowledge scores decreased after using the traditional curriculum and the treatment group self-assessed knowledge scores increased using the Forests of the World curriculum. This indicates that using the Forests of the World activities helps students gain self-efficacy about their skills to understand forest issues better than traditional curriculum.

Attitude

Pretest scores for attitude were significantly higher for the control group than the treatment group. Despite this, the treatment group outscored the control group on the attitude section of the posttest. This would indicate that the Forests of the World activities are designed to increase student awareness and positive attitudes towards forest conservation issues. Since

this was a major focus of the original curriculum writers, this section of the posttest was further analyzed.

One question of interest is question number 37, “One person’s actions can make a positive impact of forest conservation and protection”. The treatment group showed a positive difference score from pre- to posttest. The control group, after using the traditional curriculum of their school, exhibited a negative difference score from pre- to posttest. This indicates that the traditional curriculum may be lacking in action and civic engagement strategies that can illustrate the impact of individuals.

Questions 39 and 40 both deal with how global issues can impact local forests. For both questions, the control group had a negative difference score, showing that they do not think that global changes, such as climate change, and economic issues are likely to affect their local forests. This misunderstanding can be lessened with the use of curricula like Forests of the World, as evidenced by the positive difference score for the treatment group. These students, after completing activities in the Forests of the World curriculum showed an increased awareness of how global issues can greatly impact local forests.

CONCLUSION

Overall, the use of Forests of the World as a curriculum to teach about forest issues seems to be effective in increasing student attitudes and self-assessed knowledge about forests. There is some indication that the curriculum increases content knowledge, but more research needs to be done in this area.

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APPENDIX

Table 1: Demographics for Participating Teachers and Classes

Teacher	State	Subject
1	AL	Biology
2	NC	Greenhouse Biology
3	IN	Environmental Science
4	IN	General Science
5	NC	Earth Science, Oceanography
6	NM	General Science
7	OK	Zoology
8	FL	Environmental Science, Biology
9	AL	Environmental Science
10	IN	Biology, Botany, Earth Science
11	IN	Environmental Science
12	NV	AP Geography, World Geography
13	IN	Environmental Science

Table 2: Student participants (pretest n = 728; posttest n = 703)

TEACHER	Treatment group		Control group	
	pretest	posttest	pretest	posttest
1	74	30	51	48
2	30	26	X	33
3	26	28	22	25
4	9	8	12	10
5	45	44	16	15
6	19	18	21	16
7	24	26	25	28
8	48	48	9	10
9	35	35	25	23
10	57	53	8	7
11	45	26	X	18
12	47	44	30	33
13	25	26	25	25
TOTALS	484	412	244	291

Table 3: Comparison of pretest mean scores for control group and treatment group

	Control group	Treatment group	
Self-assessed knowledge	42.3	28.9	p<0.01
Attitude	26.0	23.5	p=0.04
Content knowledge	4.73	4.29	p=0.05

Table 4: Control group pretest scores compared to control group posttest scores

	Pretest mean score	Posttest mean score	
Self-assessed knowledge	42.3	30.5	p<0.01
Attitude	26.0	26.1	p=0.96
Content knowledge	4.73	4.12	p=0.02

Table 5: Treatment group pretest scores compared to treatment group posttest scores

	Pretest mean score	Posttest mean score	
Self-assessed knowledge	28.9	42.3	p<0.01
Attitude	23.5	32.3	p<0.01
Content knowledge	4.29	5.86	p<0.01

Table 6: Control group posttest scores compared to treatment posttest scores

	Control posttest score	Treatment posttest score	
Self-assessed knowledge	30.5	42.3	p<0.01
Attitude	26.1	32.3	p<0.01
Content knowledge	4.12	5.86	p<0.01

Figure 1: Difference scores (posttest mean – pretest mean) for each question in attitude section

