Impact of conservation education program on students' environmental knowledge, attitudes, behaviour and skills. A Case Study from Azerbaijan

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Abstract

This article presents the effectiveness of conservation education program on Azerbaijani students' knowledge and skills on monitoring of rare vegetation and its threats within the "buffer zones" (areas between Industry Zone and non-industrial protected area in Gobustan National Park) and responsible environmental behaviour. There was a significant statistical difference between the overall pre and post test impacts on the level of environmental knowledge, attitudes, behaviour and skills of the students from "experimental" and "control" groups. In the post test result, the "experimental group" students scored significantly higher knowledge, attitudes, skills and behaviour than the students who were exposed to the traditional teaching methods with existing curriculum.

Introduction

Conservation education program evaluation is important for environmental and conservation education, because it allows program facilitators to know what is working and what can be improved (Bennett 1989; Jacobson 1987b; Thomas 1990). The main Objectives of this research were to assess the effectiveness of conservation education program on Azerbaijani students' knowledge about and attitudes towards rare vegetation within the "buffer zones" in Gobustan State National Park and students' behaviour change.

For evaluations of the training course we used Donald Kirkpatrick's levels model: reaction, learning and behaviour (Kirkpatrick James D., 2016) (Figure 1a)).

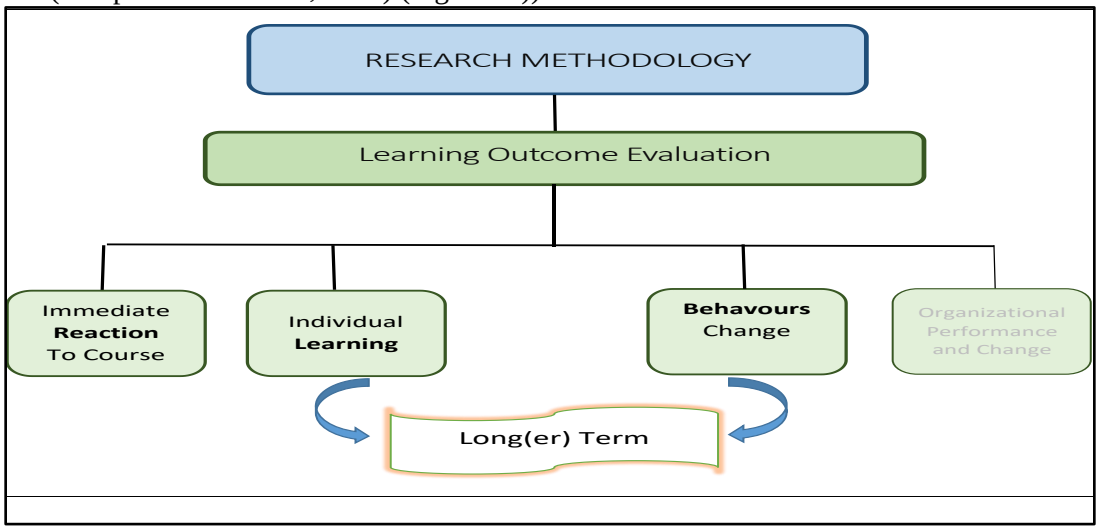

Figure 1a). Research Methodology

The first we carried out was an evaluation of the students' reaction (Level 1 Kirkpatrick Model). Evaluation on this level measured how participants reacted to the training. It was important for us to get a positive reaction immediately after the training. The results presented in Figure 1b show that the participants were pleased with the quality of the training (Gambarova, Y., Gambarov, A. 2016). The level of the Training Course was assessed as "Good".

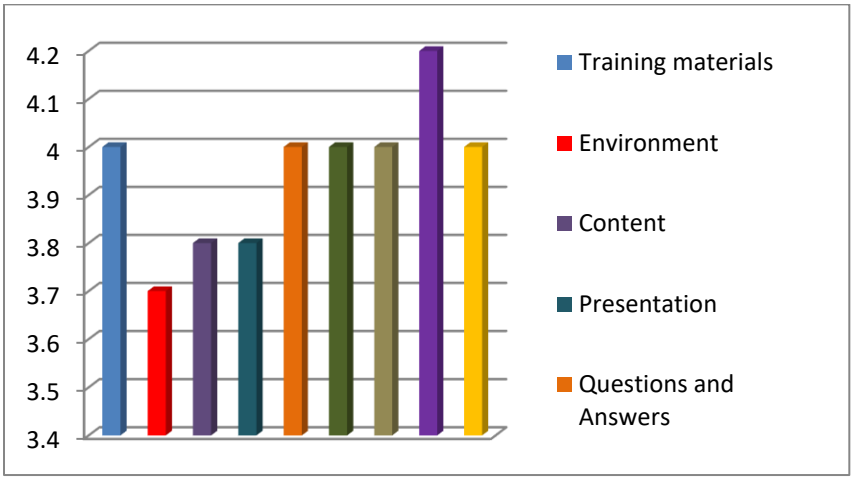

Figure 1b). Results of evaluation of the students' reaction

Evaluation of student's knowledge, experience and skills they have gained and used in practice (Level 2 Kirkpatrick Model) are presented in this paper.
Assessment of students' behaviour change (Level 3 Kirkpatrick Model) also have been presented in this paper. It takes one year for participant behaviours to change as a result of the education program. Given this, discerning whether or not behaviour change occurs requires long-term study.
Responsibility for Level 4 Kirkpatrick Model evaluations resides at the program manager/training manager level, thus specific procedures were not detailed in this research.

Methods

Data collection

To evaluate the conservation education program, we surveyed students from the University about their environmental knowledge, attitudes, skills and self-reported behaviours, using a questionnaire. The selected students were divided into two groups of which students were in experimental and remaining kept in control groups for each school. There are a few studies of the published literature on evaluating environmental education programs that recommends the use of control groups (as recommended by both Munro, Morrison-Saunders, and Hughes (2008) and Jacobson (1987b).
The "experimental group" consisted of students who participated in the conservation education program. The students were implemented with an innovative curriculum on environmental education for rare vegetation conservation. These students completed a questionnaire just before they participated in the conservation education program (the 'pre-test') and about one year after they participated (the 'post-test'). The "control group" is given the same pre- and post-training tasks as the training participants, but they do not receive any training. By comparing the results of the "experimental group" with the results of the "control group", it can be established if training contributed to the learning, which can also guide future decisions on when to conduct training.
The student questionnaire which was designed to measure the intended outcomes of the conservation education program was grouped into four categories: (modified and adopted from Hagenbuch et al 2009).
Category: 1 Environmental Attitudes.

Category: 2 Rare Vegetation Knowledge Test (Competency test used in writing to test principles, facts and other knowledge-based objectives).
Category: 3 GIS and Remote Sensing Test / Geographic Information Systems (GIS): Knowledge Base - Remote Sensing Exercises (Demonstrations of skills are particularly useful for evaluating technical skills.
Category: 4 Environmental Behaviours. Measuring Behaviour Changes (one year after the training).
Students' knowledge about and attitudes towards rare vegetation have been assessed through making use of "Rare Vegetation Knowledge Test" consisting of 12 multiple-choice items with three-four options (Multiple-choice questions ask respondents to select among several possible answers). These tests assessed rare vegetation conservation knowledge and will asked respondents to identify rare plant species. This part elicited students' opinions about the rare vegetation conservation by presenting 2-3 statements (e.g. people should be allowed to let their goats graze freely in Gobustan park) and asking students how much they agreed or disagreed with each statement.
In order to examine how students demonstrate their skills through application of GIS and Remote Sensing technologies in environment protection, "Special Topic Questionnaire" and "Remote Sensing Exercises" have been developed. Performing these exercises, students demonstrated their knowledge on rare vegetation identification within the "buffer zones".
Based on the student survey responses, we constructed summary measures of rare vegetation knowledge (percent of correct answers in the knowledge section) and self-reported behaviours (average behaviour score), excluding missing answers in all cases. For our primary measure of knowledge, we calculated the percent of correct answers out of all questions attempted.

Data analysis

In this study, standard statistical techniques such as mean (X) and standard deviation (Std. DEV) were used in the analysis of the data. Mean pre- and post- test scores were evaluated for the student's assessment attributes such as knowledge, attitude, behaviour and skills.

Category: 1. Environmental Attitudes

This part of the survey is designed to determine environmental attitudes. Students showed their interest in rare vegetation conservation between pre- and post- testing phases: the questionnaire in order to test the students understanding and the relevance of biodiversity to real world issues, explore their interest in taking additional courses related to rare vegetation conservation, getting involved in environmental issues (Figures 2a & b).

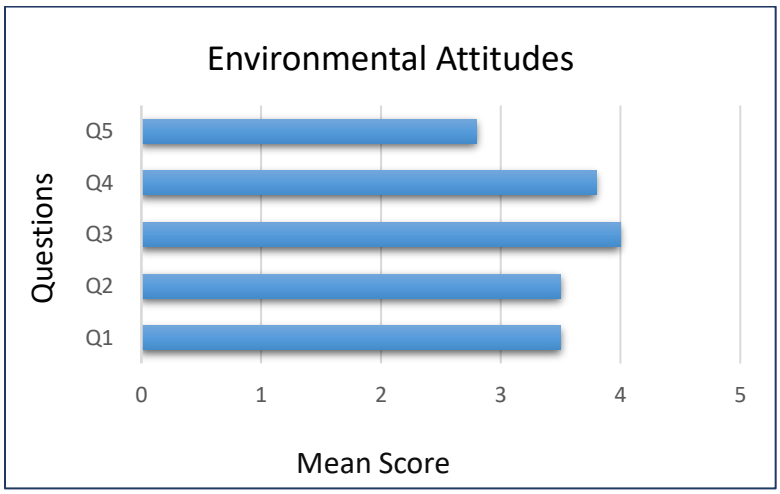

Figure 2a). Assessment of student's interest in biodiversity conservation.

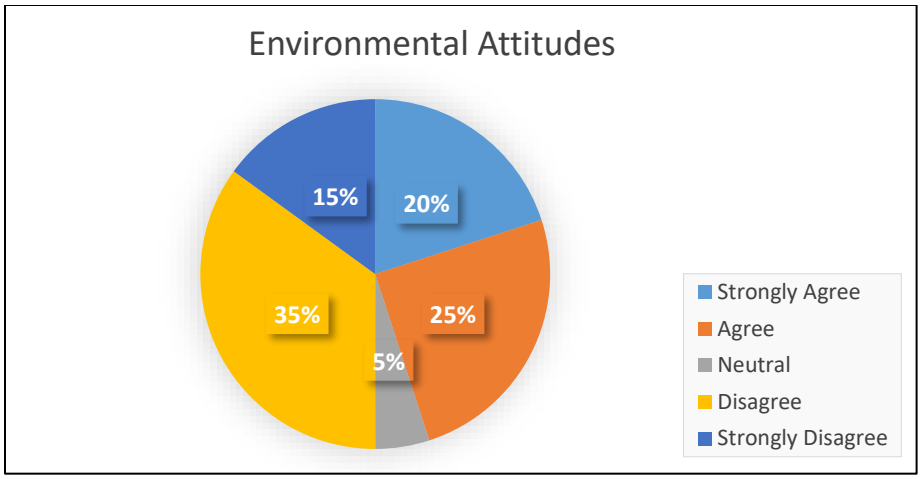

Figure 2b). Assessment of student's interest in biodiversity conservation.

Category: 2. Rare Vegetation Knowledge Test (Competency test used in writing to test principles, facts, and other knowledge-based objectives)

Methods for Evaluating Individual Learning

Competency test used a written Rare Vegetation Knowledge Test, consisting of 10 multiple-choice, to measure changes in students' knowledge of rare vegetation. Students in the post test phase significantly increased their confidence in Rare vegetation knowledge: defining type of habitat for rare species of vegetation post- testing and type of soil and the degree of salinity for rare vegetation, identifying principal threats, providing examples of which rare types of plant communities have been degraded. Assessment of rare vegetation knowledge presented in Figures 3a), 3b).

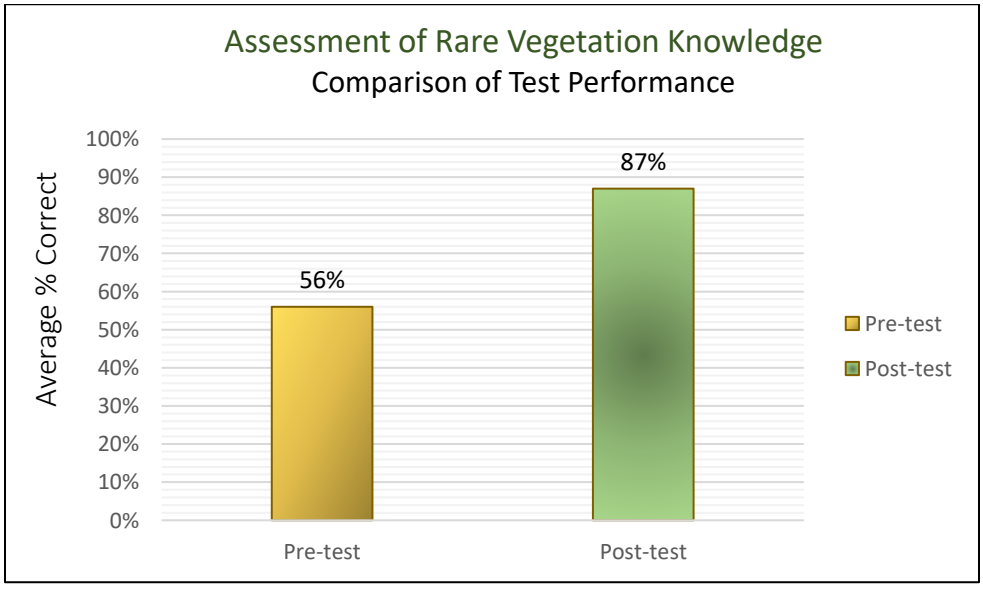

Figure 3a). Assessment of rare vegetation knowledge before and after (”experimental group”)

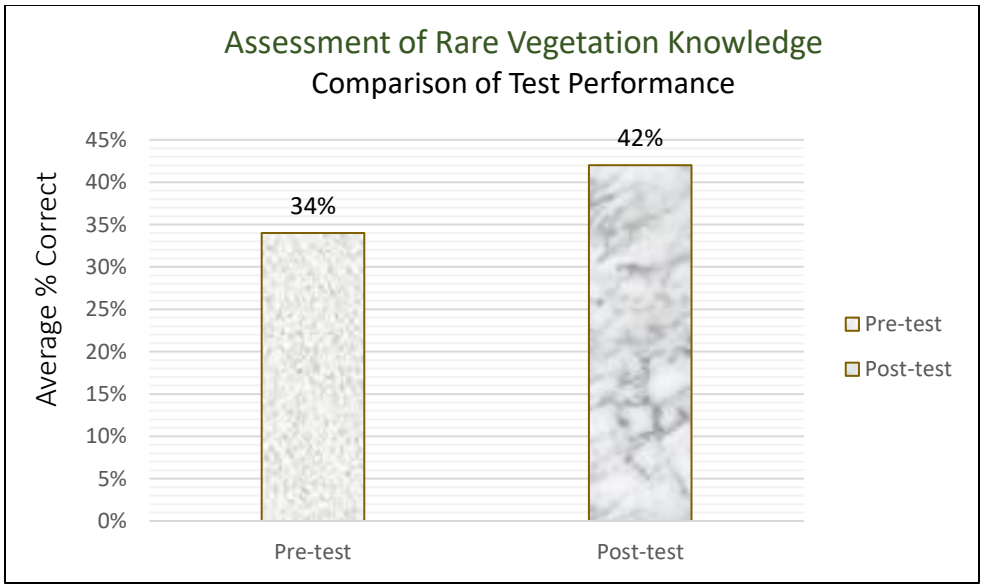

Figure 3b). Assessment of rare vegetation knowledge before and after (”control group”)

When evaluating multicultural scores (multiple-choice), the dichotomy system is obscured by negligible repetition, which can be denied the answer. As a robustness check, we also constructed in this case, it is impossible to teach only the maximum number of answers, but not the number of missed cases. Assessment calculated on the following formula:

$$r_i = \frac{Q_2}{Q_1 + Q_3}$$

where Q1 is the set of all correct answers in the task;
Q2 is the number of right options variants, selective by trainee;
Q3 is the number of invalid variants.

Rare Vegetation Knowledge Test Results presented in Figures 3c).

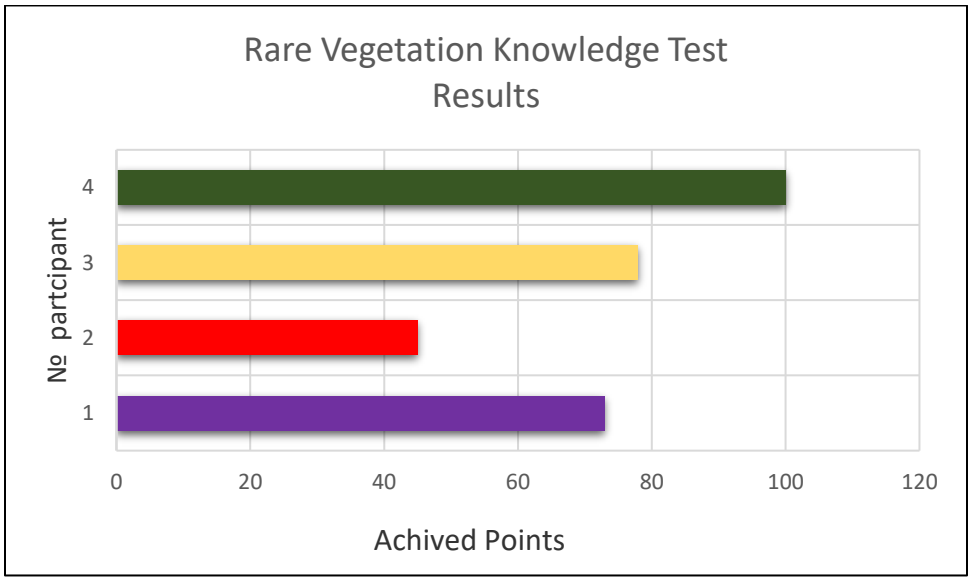

Figure 3c). Assessment of rare vegetation knowledge (”experimental group”)

Category: 3. GIS and Remote Sensing Test (Demonstrations of skills are particularly useful for evaluating physical (technical) skills

The trainees were asked to demonstrate their skills (using Geographic Information Systems (GIS): Knowledge Base and Remote Sensing (RS) technologies by producing rare vegetation map using the software (special computer program).

In terms of Demonstrations of skills on rare vegetation identification, students reported significant gains between pre- and post- testing phase in data recording, rare vegetation classification and rare vegetation change detection (Figures 4a & 4b).

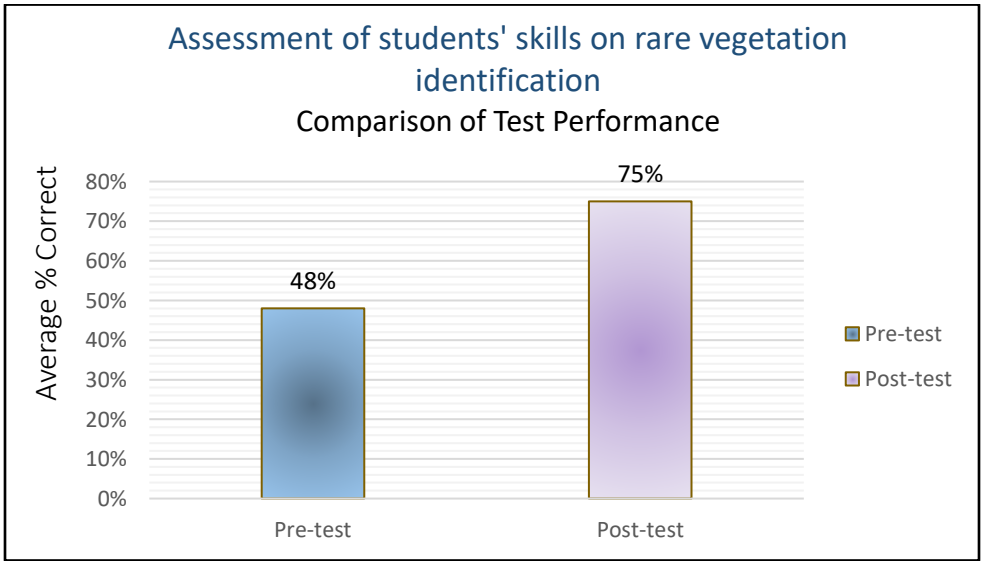

Figure 4a). Assessment of rare vegetation identification skills in confidence before and after (”experimental group”).

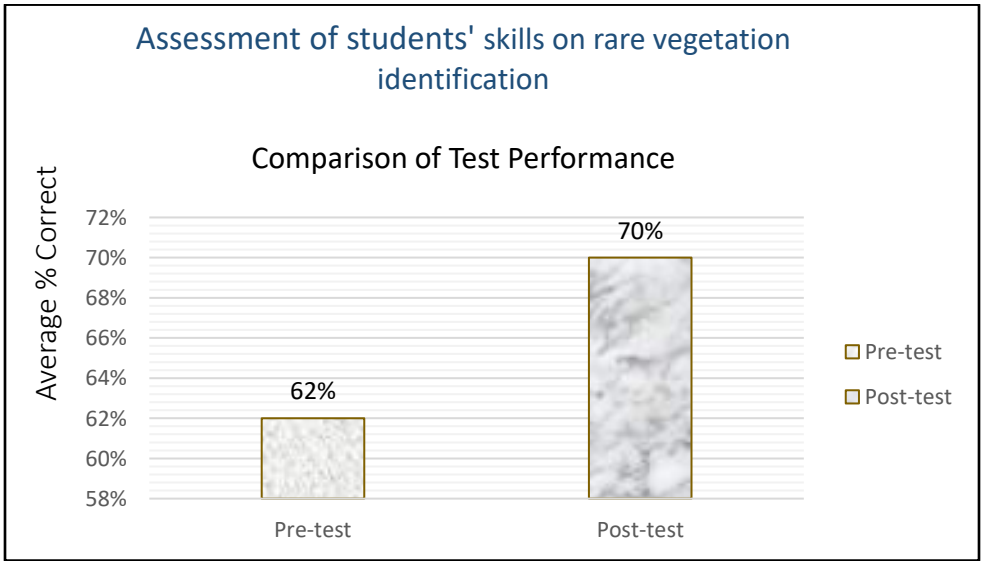

Figure 4b). Assessment of rare vegetation identification skills in confidence - before and after (”control group”).

Category: 4. Environmental Behaviours. Measuring Behaviour Changes (one year after training)

Kirkpatrick Level 3: Behaviour

Evaluation on this level measures whether the knowledge and skills that the training participants have learned in the training are applied to their work. The amount of time required for the change to manifest itself will depend on the type of training, how soon the participant has an opportunity to practice the skill, how long it takes participants to develop a new behavioural pattern, and other aspects of the job. The success of a Kirkpatrick Level 3 evaluation largely depends on the design of the evaluation. Data Collection Method and Metrics/Indicators used in this research are presents in Table 1.

Table 1: Data Collection Method and Metrics/Indicators

Measurement instrument	Pre/Post	Outcome Indicator
Questionnaires	✓	Respondents list behaviours that they began after the program.
Observations	✓	Observer tests for the presence or absence of a number of behavioural criteria (i.e. classroom recycling program.
Interviews		Open-ended questions prompt interviewees to remark on changes to their behaviour.
Job Shadow Performance Testing	✓	This tool is a test that allows the individual conducting the follow-up to determine if the trainee remembers and applies the lessons from the training into their daily life at the workplace.

Environmental Behaviours

This section of the survey is designed to find out what things students do about the environment.
The trainer asked to mark the answer that is closest to the right answer for the student:

"There are no right or wrong answers, so don't worry if you have never done any these things, and don't worry if all your tick marks end up in the 'N' column. We ask only that you be truthful as you answer these questions.

Mark the answer that is closest to the right answer for you:
N - stands for never or no
R – stands for rarely (three or four times a year
S – stands for sometimes (three or four times a month)
U – stands for usually, or yes (most of the time you have the chance)"

Assessment of student's interest in biodiversity conservation is presented in Figure 5a.

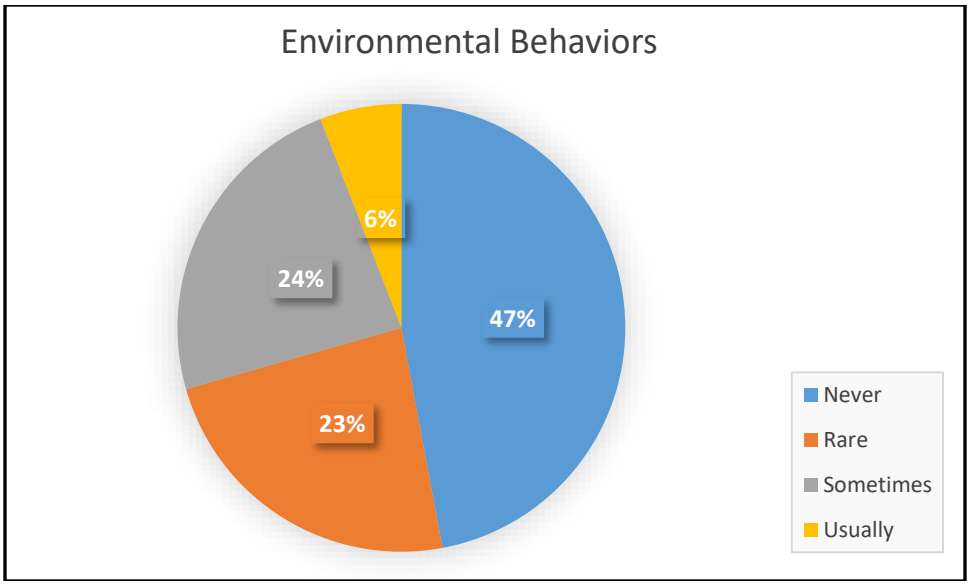

Figure 5a). Assessment of student's interest in biodiversity conservation

Measuring Behaviour Changes (one year after training)

The main purpose of the impact survey was to assess the behavioral change of participants (Level 3) and improvements or outputs on their work that can be linked to the training program (Level 4).

The trainer asked as follows:

"Please indicate whether you have completed each of the job tasks taught in the course.

If you indicate that you have not completed a task, you will be asked in the following question to identify why not".

Assessment of student's interest in biodiversity conservation presented in Figure 5b)

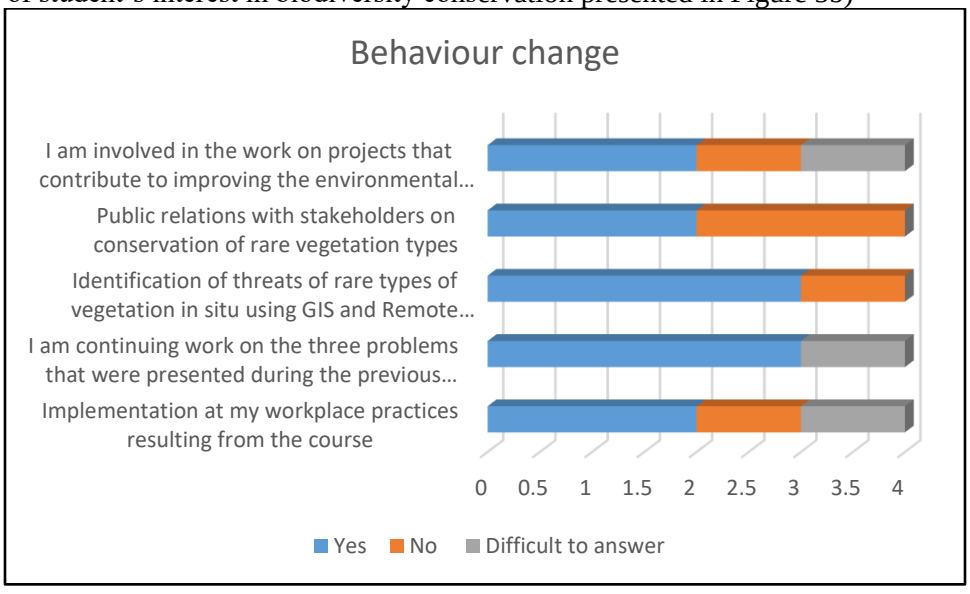

Figure 5b. Assessment of behaviour change (one year after training).

Results and Discussion

We examined the effectiveness of the conservation education program ("Rare vegetation conservation in Gobustan National Park") in changing students' knowledge and behaviour by (1) comparing responses of before and after the educational program and (2) comparing responses of the "control group" and "experimental group" after the educational program.

Participants in the educational program significantly increased their Rare vegetation knowledge and Demonstrations of skills on rare vegetation identification became significantly more pro-environmental. The average student who participated in the program answered one more question correctly on the post-test compared to the pre-test, increasing the percent correct by 31% (Rare Vegetation Knowledge Test) and by 27% (Demonstrations of skills on identification of rare vegetation) (Table 2). Attitude and behavioural changes increased in case of "experimental group".

Comparing the post-test results from the two groups, experimental and control groups, experimental had significantly greater Rare vegetation knowledge (87% vs. 42%) while their Demonstrations of skills changed slightly (75% vs.70%) (Table 3).

Table 2. Tests comparing paired pre- and post-test average scores ("experimental group").

Variable	Mean score pre-test	Mean score post-test	Change in score
Average % Correct Rare Vegetation Knowledge	56%	87%	31%
Average % Correct Demonstrations of skills	48%	75%	27%
Average Attitude	3.5	4.2	0.8
Average Behaviour	3.2	4.0	0.8

Table 3. Comparison between experimental and control post-tests.

Variable	Post-test score (experimental vs. control)
Average % Correct Rare Vegetation Knowledge	87% vs. 42%
Average % Correct Demonstrations of skills	75% vs.70%
Average Attitude	4.2 vs. 3.2
Average Behaviour	4.0 vs. 3.2

Conclusion

There was a significant statistical difference between the overall pre and post test impacts on the level of environmental knowledge, behaviour, attitudes and skills of the students from both the groups. In the post test result, the experimental group students scored significantly higher knowledge, attitudes, skills and behaviour on rare vegetation conservation than the students who were exposed to the traditional teaching methods with existing curriculum. It may be concluded that the active teaching learning approach is more effective in environmental education.

Acknowledgements

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