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Developing sustainable environmental behavior in secondary education students (12-16) Analysis of a didactic strategy

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Abstract

Even though the concern about the environment has never been so deep in the developing countries, this fact does not translate into behaviours that are environmentally responsible. One of the possible reasons of the gap between attitudes and behaviours is that the generalized interest for the environment lives with a feeling of hopelessness and incapability to turn the interest in actions. Environmental Education (EE) may play a core role in the solution of this problem, if makes them capable to have a “sustainable” behaviour and make decisions in favour of the environment.

In this paper we present a investigative didactic methodology, of a constructivist type, that intends to achieve this goal. The results obtained with students of E.S.O. show that it is a good alternative compared to a more traditional methodology.

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Keywords: Environmental education; action competence; didactic strategy.

1. Introduction

There is no doubt that the concern by the environment is a new identity sign of the XXI century society. Nevertheless, the increasing concern for environmental problems is not always linked to knowledge, attitudes, and the necessary competence for its protection.

Environmental education takes its higher sense in this context. It tries to involve completely to the people when dealing with the real and concrete problems, rejecting the conformity to the simple discussion of possible solutions. Individuals have not only to evaluate but they have to be qualified for acting for the environment. They have to deal with the insufficiency of developing only good citizen habits, that are sometimes closer of the urbanity (i.e.: do not leave waste in the natural environment...) than of a genuine concern for the environment.

From this perspective, we have carried out an “experimental” didactic model, with a research character and a constructivist basis. We pretend that Secondary Education students (12-16) acquire the necessary concepts, attitudes

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and behaviours for promoting closer actions to that which has been named “*sustainable development*”. The aim is providing them competence for participating, individual and collectively, in the solution of environmental problems within their close environment –consequence of our lifestyles–.

In front of the “traditional” didactic methodology, which is generally used in this education level, a more experimental didactic model is presented, and, as the main objective of this research, its effectivity is analysed.

2. Methodology

2.1. Method

According with the constructivist perspective assumed for the didactic model we aim to evaluate, we must first know the students initial situation regarding the environment, not only as a way of setting an starting point of the learning process, but also to establish a reference to evaluate the conceptual and attitudinal changes this experimental methodology will produce compared to the “expositive” didactic methodology.

2.2. Participants

All 99 participants in the research are of the same procedence: 73 students from “Ángel Ganivet” School, and 26 students from “Padre Suárez” School. Both of them located in Granada (Spain). They were separated in two groups:

Experimental Group. 39 students from the speciality of Sciences, coming from “Ángel Ganivet”, 28 of which were female (71,80%) and 11 male (28,20%). All of them of an average age of 14,923 (typical deviation = 0,422).

Control Group: 60 students (28 female, 46,67; and 32 male, 53,33%). 34 of them from the speciality of Humanities (from “Ángel Ganivet”) and 26 from the speciality of Sciences (from “Padre Suárez” School). Their average age was 15,083 (typical deviation = 0,497).

2.3. Research design

The design of the research to test the intervention model was “quasi-experimental” (Campbell & Stanley, 1982) given that, although two natural groups were formed (experimental and control groups), the distribution of students between both was not at random but determined by pedagogical criteria (age, gender, nationality...).

2.4. Materials and procedure

The testing process of this intervention model was comprised in two phases:

2.4.1. Pre-test

At the beginning of the school year, a portfolio with the following contents was given to all of the participants:

a) One scale of environmental attitudes, previously constructed and validated (Álvarez, De la Fuente, García & Fernández, 2002).

b) One questionnaire to test their previous training in natural environment and environmental problems, sources of “standard” education and information received, as well as two questionnaires on general concepts related to the environment.

b.1) showing ten open questions to test their previous knowledge, previously validated (Álvarez, De la Fuente, Perales & García, 2002).

b.2) including several environmental problems which students must order according to the importance (seriousness) of each one.

c) One scale of intention on pro-environmental conduct, created specifically for this research.

2.4.2. Experimental treatment

Subjects from the control group followed an “*expositive*” methodology based on “ordinary” lectures. Simultaneously, the contents were taught to the subjects on the experimental group following the experimental didactic model.

2.4.3. Post-test

At the end of the course, the portfolio (except the questionnaire b) was distributed again among the students with the intention of detecting the differences regarding environmental attitudes, knowledge on environmental problems and conduct intention that may occur between the subjects on both groups and, may it be the case, observe whether these differences were statistically significant.

2.5. Experimental didactic model

The main axis of the experimental didactic model is to pose and work with environmental problems observed in the student’s near context Vega, P. y Álvarez, P., 2006). The model is organized in the phases shown in the figure below.

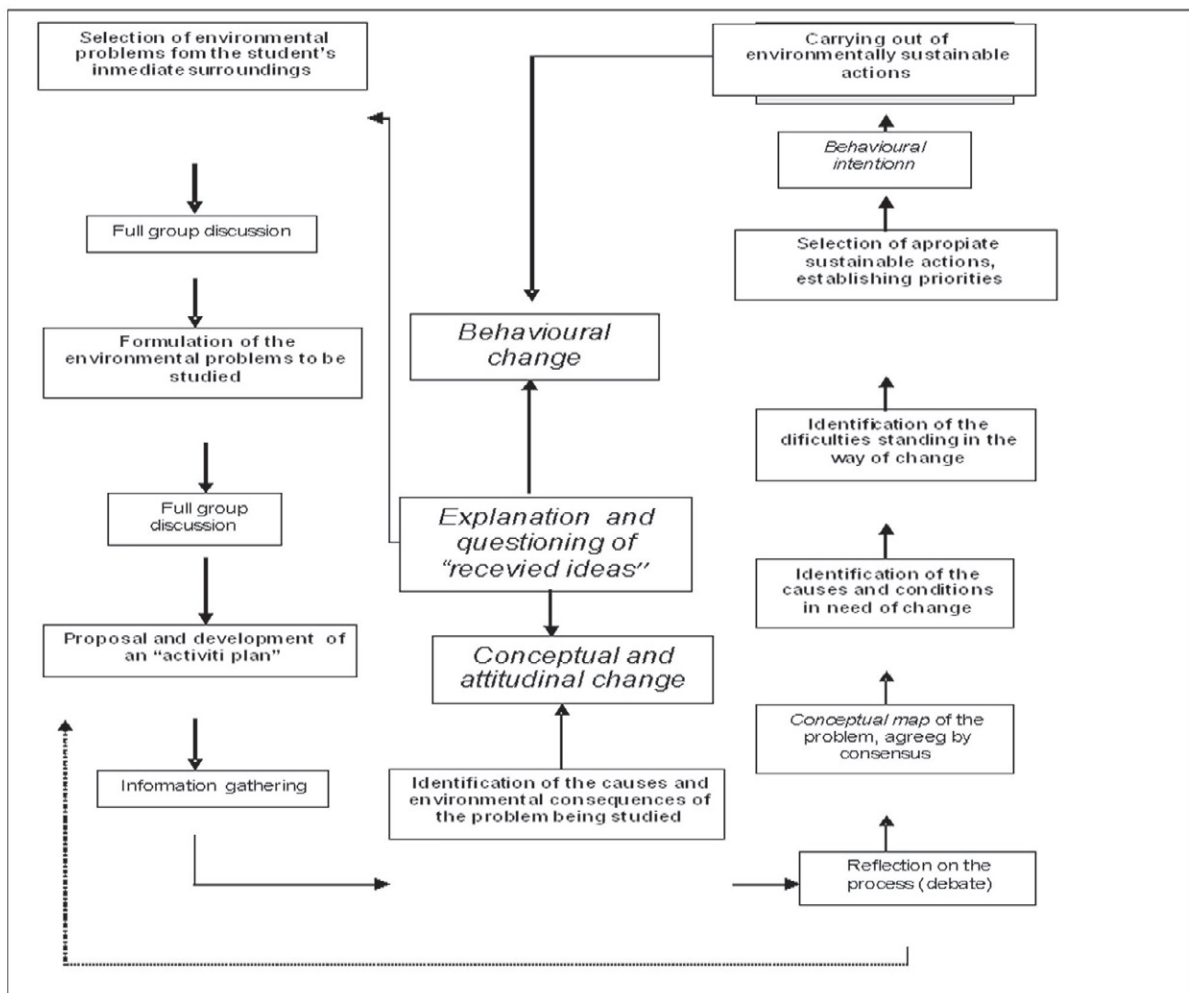


Figure 1. Model of methodological strategy

2.6. Statistical analysis and results

The obtained data was analysed using the statistics package SPSS (*Statistical Package for the Social Sciences*), version 15.0.1 and *Excel 2007*.

The first step was to analyse the existence of statistically significant differences regarding personal and dependant variables between both groups before the beginning of the experiment. The results are shown in table 1.

Table 1. Group homogeneity at the beginning of the experiment

Variable	Proof	"t"	Chi-cuadrado	Sig.
Age	"t" de Student	-0,087		0,931
Gender	prueba de contingencia		0,201	0,654
Previous studies	"t" de Student	-0,127		0,899
Conceptual knowledge	"t" de Student	1,009		0,315
Environmental attitudes	"t" de Student	-1,617		0,109
Intention of conduct	"t" de Student	-0,558		0,512

The descriptive statistics regarding the conceptual knowledge on environment and environmental problems showed that, in most cases, the students were not aware of concepts and conceptual structures related with the environment, despite of the incidence most of them have in the media. Regarding the importance (seriousness) given to certain environmental problems, the assessments are very similar in both groups, although it is remarkable the tendency towards giving more importance to near context problems (attention to local) than others of planetary dimension (attention to global).

Respect the attitudes towards the environment, the data obtained in the pre-test also show similar results for both groups 43,6001 typical deviation = 10,45604 (control group) and 42,931, typical deviation = 9,82849 (experimental group). Moreover, after contrasting between the control and the experimental group through a "varianza" analysis (ANOVA), it became clear there was no significant differences between the averages of both groups ($F = 8,419$; $p = 0,000$).

Regarding the intention of developing sustainable environmental activities, the average score for both groups is quite similar: 35,3500 over 100 (typical deviation = 3,93517) for control group and 35,8462 (typical deviation=3,97054) for experimental group. Therefore, we can conclude that the two groups taken for study in this research don't show statistically significant differences during the pre-test in any of the variables considered, being those personal or dependant.

Under experiment's conclusion (by the end of the school year), a statistical analysis was performed with the data gathered during the pre-test with the goal of determining whether the participants following the experimental method improved significantly, in statistical term, their environmental attitudes, their knowledge on the environment and their intention towards assuming sustainable routines, in comparison to those on the control group. As far as conceptual knowledge on the environment is concerned, students from both groups obtained remarkably higher scores to those obtained on the pre-test. Moreover, after performing a *Mann-Whitney test* over the percentages of right answers from members of both groups ($U = 6,000$; $p = 0,001$), as well as contrasting the average scores obtained ($t = 12,383$; $p = 0,001$), we could observe these differences were statistically significant. On the other side, the contrast of averages for both groups between the pre-test and the post-test, also show statistically significant differences ($t = 10,874$; $p = 0,000$); in other words, even though both groups had increased their conceptual knowledge on the environment, members on the experimental group had experienced a more notable improvement than those on the control group, as it's shown on figure 2.

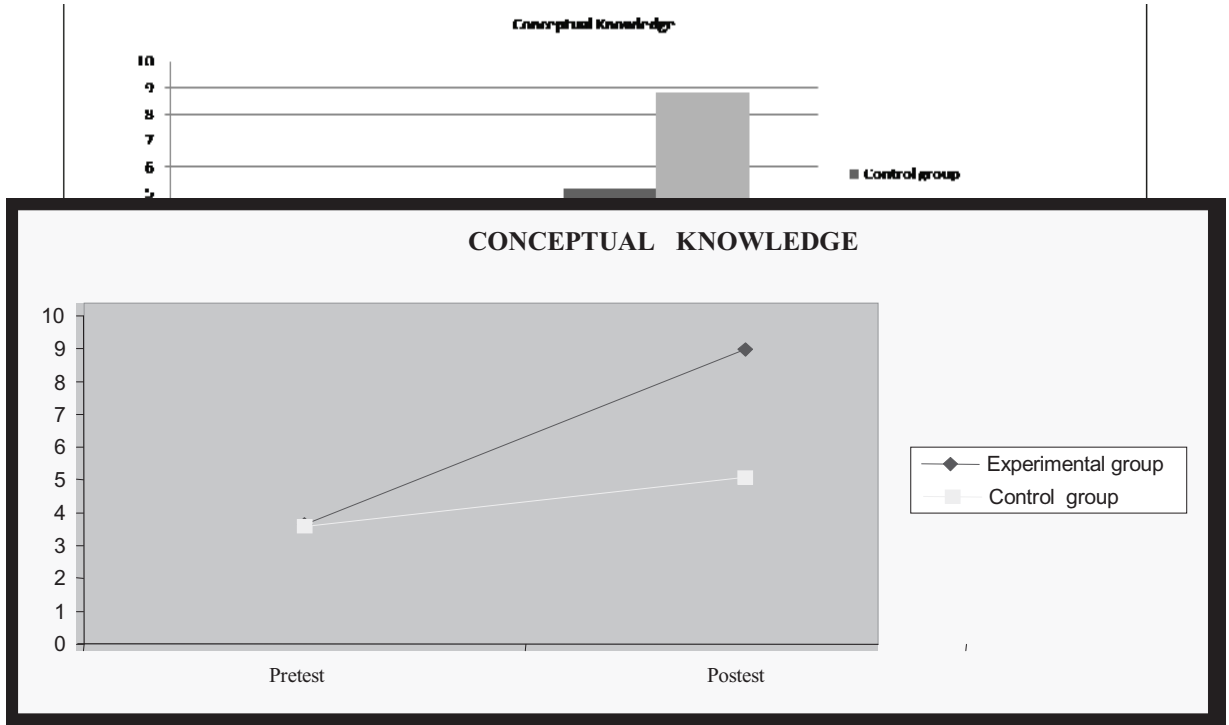


Figure 2. Evolution of conceptual knowledge on environment and environmental problems

Respect the attitudes towards the environment, the contrast between the control and the experimental group based on the data gathered during the post-test, shows that the differences between both are statistically significant (figure 3).

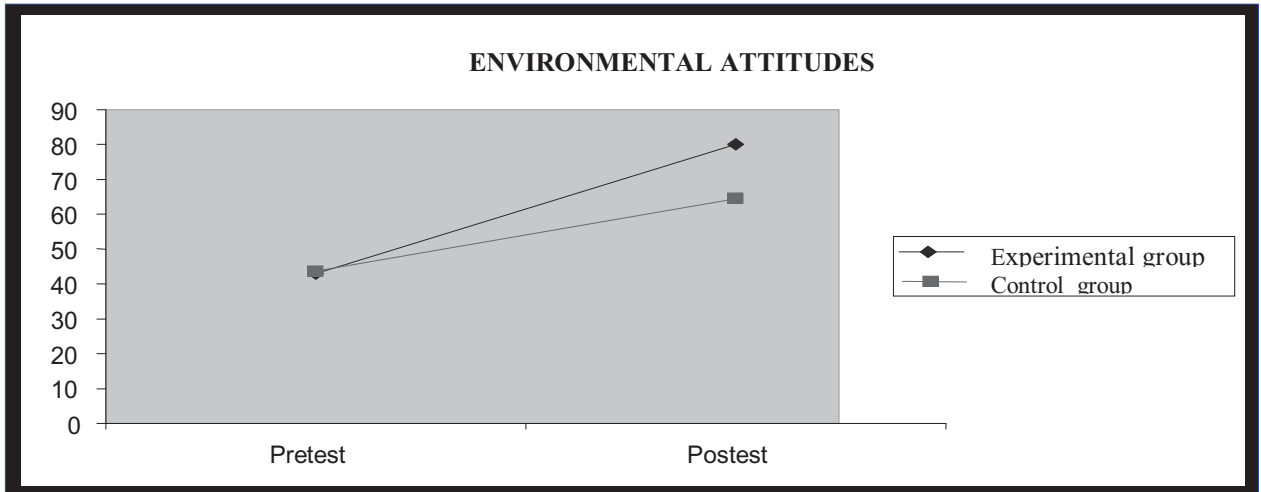


Figure 3. Evolution of attitudes towards the environment (pretest/posttest)

The final data about intention of conduct regarding the environment, compiled during both the pre-test and the post-test, was used to performed a descriptive statistics and a “t” Student test, which lead us to detect the existence of statistically significant differences in the experimental group not shown in the control group (figure 4).

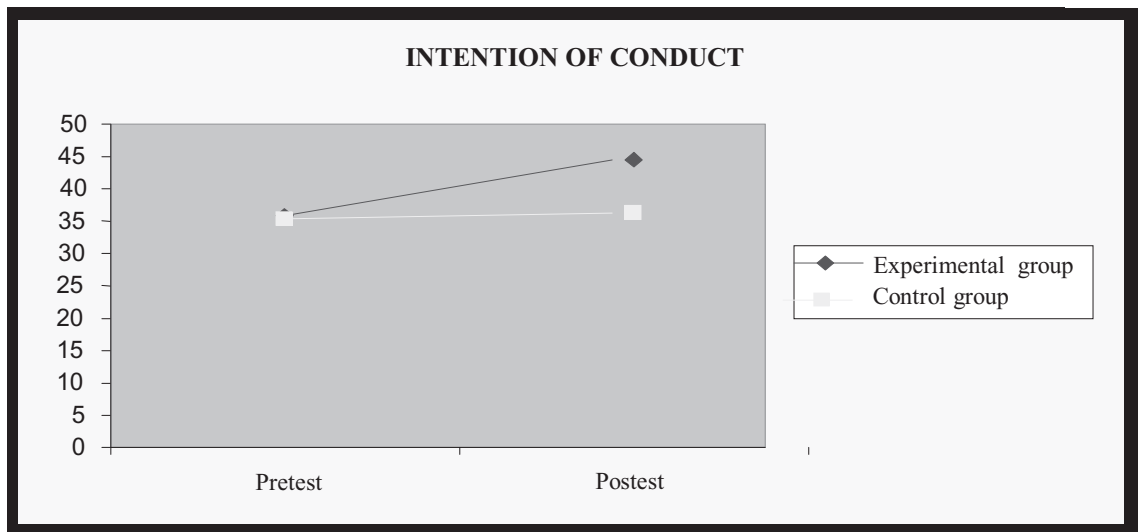


Figure 4. Evolution of intention of conduct towards the environment (pretest/posttest)

3. Conclusions

The experimental didactic strategy reveals as a very efficient resource for the EE -at least in the age range of 12-16, as it favours the development of pro-environmental attitudes between the students. We have also observed a differential learning by the subjects, which might be due to the fact that the use of the experimental didactic model in the EE proves to be more efficient than the “expositive” methodology as far as the learning of conceptual contents is concerned.

We must also point out the tendency of the experimental group towards giving more importance to “global” problems, while the subjects in the control group have barely changed their scope respect the pre-test.

Regarding the “intention of conduct”, the differences respect the pre-test show up specially in individual behaviours, in energy saving procedures and protection of biodiversity.

Moreover, even though it was not the goal of our study and therefore it hasn't been quantified, we have observed the great efficiency of press and other media as platform for the information transmission.

It is, therefore, very recommendable the study of the environment in the subject of Environmental Education through environmental problems extracted directly from the students context and posed by their functional activities in spite of being “taught” in the shape of “lectures” in which succession and continuity are rigorously programmed in advance and imposed by the teachers, as stated in the Tbilisi Conference (UNESCO, 1983).

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