Do It Yourself Conservation and Its Effect Upon Attitudes of Prospective Teachers

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The teaching of conservation and ecology in the public schools and colleges has been receiving increased emphasis. It is also true that in the public schools in particular there has been a growing tendency to include field trips and some type of work activity performed by the students. In the Northeastern United States, the work activity has frequently consisted of tree planting. However, the attitudes of students and their possible attitude changes are of utmost importance in the teaching of science, especially conservation of natural resources. An evaluation of attitude change in response to conservation work activities was the subject of the first author's investigation.

Before discussing the details of attitude testing and their results, we should describe the particular activities of the students who were the subject of this study. In the early 1950's the Faculty-Student Association of the State University of New York College of Education at Buffalo purchased an abandoned farm of 435 acres at Franklinville, New York. One of its prime purposes was to provide firsthand experiences in conservation practices. The purchase of the land was an outgrowth of an effort of many years to incorporate a greater degree of conservation education into the State University Colleges of Education. George Laug was appointed conservation manager of the property.

The first step was consultation with conservation technicians. With the assistance of Mr. Edward Whalen, District Forester, the property was registered under the New York State Forest Practice Act. With the very able assistance of Mr. Homer Stennett, Cattaraugus County Soil Conservationist, we received benefits by becoming associated with Cattaraugus County Soil Conservation District. On the advice of Mr. Richard Hyde, District Game Manager, we established the property as a game preserve. Repeated meetings were held with these conservation men and a number of interested students. An over-all farm plan was developed which could be carried out over a period of many years. In this way successive classes of students could take part in the planning and carrying on of conservation activities for any one year. The comprehensive farm plan included:

1. Provision for eventual reforestation of approximately 120 acres of the property
2. A soil map of the property with the best land usage indicated
3. A series of suggested plantings of shrubs to improve wildlife habitat
4. The suggested location of a number of farm ponds
5. Suggested methods of improving two of the streams on the property in order that they might eventually support fish.

The next task involved incorporating what had been learned through the conservation experts into a meaningful program for our students. The first step was to develop a unit in conservation which could be used in all classes in general biology. This unit had to be general by its very nature but also specific in that it was to be directed to those aspects of conservation which would be observed and carried out on the college property by the students. Actually a great many varied activities have been performed by successive groups of students since 1953. The authors will confine themselves to the total program for the students during the year in which the attitude study was made.

The attitudes of students were measured in the spring of 1958. The final unit plan as used in all biology classes was improved and refined over the original one of 1953. Four instructors participated in the experimental program, consisting of class presentation and the field trip activities. Four instructors cooperated in the control program in which conservation was presented incidentally from the text, without the experimental classroom unit or the field trips. A complete conservation bibliography for use of students and instructors

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was included in the conservation unit. The following films were made available on campus: 1. Future Forests in the Making. 2. Birth of the Soil. 3. Arteries of Life. 4. Then It Happened. 5. Wildlife in Slow Motion. 6. Trees for Tomorrow.

The field trips of the experimental groups were of two types, a one-day field trip in which students were in the environment from 10:00 a.m. to 3:30 p.m., and the other, a two-day overnight trip in which the students were in the field from 10:00 a.m. of the first day until 3:30 p.m. of the second day. The authors had charge of the two-day trip. Because the single-day trip students were the largest group, 370, the details of this type of field trip will be presented first.

The work activities of the one-day field trip students consisted of tree planting and shrub planting. The instructions for these two activities were spelled out in great detail for the benefit of the cooperating faculty. Failure to do this could result in confusion during the work experience. Confusion in the field is even more fatal than in the classroom. A single sheet explaining these two activities was passed out to all students going to camp.

By agreement of the participating faculty, the non-work activities included: 1. Pond ecology. 2. Observation and discussion of existing forest plantations. 3. Observation and discussion of previously planted hedge rows. 4. Basic field ecology. 5. Wildlife management. 6. Forest ecology.

The two-day overnight conservation experience could be chosen by students as an alternative to the day trip. So far, only the authors have conducted overnight trips to the college camp and usually, as was true in 1958, they are joint affairs involving the cooperation of the authors of this article. As would be expected, the overnight conservation activities were considerably more detailed and included a greater variety of field activities. Each student going on the overnight trip received an extensive manual which included many facets of conservation and ecology. The manual included check lists of common spring flowers, wildlife signs, amphibians and reptiles, birds and mammals. The work activities of the overnight group were: 1. Taking part in landscaping of the camp lodge. 2. Woodlot management including thinning. 3. Tree planting. 4. Shrub planting.

The non-work activities included: 1. Discussion and observation of wildlife signs. 2. An address by Mr. Homer Stennett on land management throughout the country and Cattaraugus County in particular. 3. Discussion and observation of the uses of farm ponds and pond ecology. 4. A night hike for orientation by the stars, night sounds, and night nature study. 5. Bird hike.

To construct a valid and reliable attitude scale was very important in order to accomplish the aims of the study. The scale finally decided upon was the Likert type. The Likert type of scale involves the use of statements of attitudes toward some psychological object. The student indicates his or her degree of agreement or disagreement with the statements. The usual method of constructing the scale is to employ five degrees of response, SA meaning strongly agree, A meaning agree, U meaning undecided, D meaning disagree, and SD meaning strongly disagree. The statements represent favorable and unfavorable attitudes. The student is scored on the basis of 4 points for full agreement with a favorable attitude, 3 points for one step removed from full agreement, 2 points for two steps removed, 1 point for three steps removed and 0 for complete lack of agreement with a favorable attitude. For an unfavorable attitude statement, the scoring is reversed. The student's total score is the sum of the weights of his responses.

Attitude items were collected by placing those heard among people of many walks of life on 3 x 5 cards. Over a period of years the frequency of verbal expression of these attitudes was checked as well as the frequency of expression in the conservation literature. Only the more frequently expressed attitudes

FIGURE 1. Students planting a tree.

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were used in the scale. Eventually nearly 300 attitude items were compiled.

However, the criteria for judging an attitude item by Wang, Thurstone, Clave, Likert, Bird, Edwards, and Kilpatrick were used. This type of careful scrutiny narrowed the attitude items down to eighty-four. When the attitude scale seemed to be in workable order, it was submitted to eight well-known persons in conservation education or science education. These men were asked to examine the scale items for the purpose of establishing the validity of each attitude item for inclusion in the final scale. They also proceeded to respond to the scale in the same manner as would the students. If an item was approved by six out of eight experts, it was retained. Regarding any one attitude item, if six out of eight responded in the same way, the item was retained. The refined attitude scale was established as having a reliability coefficient of .94 by using the Pearson product moment "r" and the Spearman-Brown prophecy formula.

Before the first administration of the attitude scale, all participating faculty were brought into a meeting in which the purposes of the research were outlined and the details of administering the scale were explained. Although the faculty knew the keyed responses to the scale, they were instructed to in no way teach to the individual attitude items in the scale. Change in attitude had to be in response to the student's exposure to conservation. The instructions for the administration of the attitude scale were fully standardized. Students were identified only by a number drawn at random from a cigar box. The number was known only by the student, and it was used only in identifying the student in the pre-testing and in the post-testing situations.

FIGURE 2. Laying out trees in rows.

FIGURE 3. A new pond beginning to fill with water.

The statistical treatment of the data concerned many separate factors such as relating the experimental and the non-experimental groups, rural, suburban and urban background, boy scout and girl scout activity, and many others. Naturally, all of these cannot be reported here, but selected tables are included.

The first concern was as to whether a significant difference existed between the mean of the pre-test and the mean of the post-test for the entire experimental group and the control group. This involved the use of "t" for correlated means.

The results of this statistical treatment appear in the following combined table.

For the experimental group, the observed "t" turned out to be significant. It appears that there has been a favorable change in the mean of the experimental group taken as a whole from the time of the pre-test to the time of the post-test with an advance of 11.51 points. For the control group, the observed "t" also turned out to be significant. It will be noted that the mean for the control group has moved significantly, 3.16 points in an unfavorable direction.

The same data was now handled by means of the uncorrelated "t" technique contrasting the experimental with the control group. Obviously, the groups in question were different as different individuals were involved and no matching technique was used.

Both "t" 's are significant at the 1% level of confidence. The mean of the control group was, significantly, 4.34 points higher in the pre-testing situation as compared with the experimental group. The "t" observed for the post-test situation is highly significant with

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TABLE 1
"t" for Correlated Means of the Entire Experimental Group and Control Group, Pre- and Post-Testing

Experimental Group	N	Mean	$\overline{D}$	Sum of Squares $\Sigma(D - \overline{D})^2$	$S\overline{D}$	t
Pre-Test	427	178.47	11.51	37384	.45	25.58**
Post-Test	427	189.98		**Sig. at 1% level of confidence		
Control Group	N	Mean	$\overline{D}$	Sum of Squares $\Sigma(D - \overline{D})^2$	$S\overline{D}$	t
Pre-Test	287	182.81	3.16	23990	.54	5.85**
Post-Test	287	179.65		**Sig. at 1% level of confidence		

TABLE 2
"t" for Uncorrelated Means of Experimental and Control Groups Compared on the Pre-Test and Post-Testing Situation

Testing Situation	N	Mean	Difference In Means	S^2	t
Pre-Test Exper.	427	178.47	4.34	205.62	3.94**
Pre-Test Con.	287	182.81			
Post-Test Exper.	427	189.98	10.33	228.44	8.98**
Post-Test Con.	287	179.65	**Sig. at 1% level of confidence.		

TABLE 3
"t" for Correlated Means of Three Experimental Conditions Pre- and Post-Testing

Experimental Group	N	Mean	$\overline{D}$	Sum of Squares $\Sigma(D - \overline{D})^2$	t
Overnight					
Pre-Test	39	184.97	17.46	5952	8.73**
Post-Test	39	202.43			
Day Trip					
Pre-Test	370	177.83	11.39	31337	23.73**
Post-Test	370	189.22			
Missed Trips					
Pre-Test	19	177.10	1.47	623	1.06
Post-Test	19	178.57	**Sig. at 1% level of confidence.		

an advance of 10.33 points for the experimental group over the control group. This seems all the more important in view of the fact that the control group started out with a significantly higher mean.

Within the experimental group, three possible situations existed. Thirty-nine students experienced the overnight experimental program and 370 students experienced the single-day trip experimental program. Nineteen students were instructed according to the conservation unit outline in the classroom situation but did not go on any of the field trips. It would have been preferred to have the last group larger, but an administrative factor made this impossible. As a result, the smaller control group was composed of those students who were absent on the day of the trip. The following table contrasts these three groups in the pre- and post-testing situation by the use of the correlated "t."

The "t" 's for the overnight and day-trip groups were significant, indicating that an important change in attitude had occurred for

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TABLE 4

Pre- and Post-Testing Means of the Four Experimental Groups According to Instructors

Instructor	N	Pre-Test Mean	Post-Test Mean	Diff. In Mean
I	145	179.93	186.70	+6.77
II	114	179.64	193.44	+13.80
III	65	179.95	194.78	+14.83
IV	102	174.36	187.63	+13.27

TABLE 5

"t" for Uncorrelated Means of Four Experimental Groups in the Post-Testing Situation

Instructor Pairs	N	Mean	Diff. In Mean	S^2	t
I	145	186.70	.93	222.23	.48
IV	102	187.63			
IV	102	187.63	5.81	222.23	2.86**
II	114	193.44			
II	114	193.44	1.34	222.23	.57
III	65	194.78			
I	145	186.70	6.74	222.23	3.60**
II	114	193.44			
I	145	186.70	8.08	222.23	3.64**
III	65	194.78			
IV	102	187.63	7.15	222.23	3.03**
III	65	194.78			

**Sig. at 1% level of confidence.

these two groups. The mean attitude score advanced for those students who missed the trips, but not significantly. Additional statistical treatment showed that the overnight students were already significantly higher in mean in the pre-testing situation than the day trip group. The day trip group was not significantly higher than the group which missed the trips.

The next matter of interest in the study was the question of possible effect of individual instructors upon expressed attitudes of students within the experimental program. It could well be that individual instructors, dealing with the same material, could cause a different development of student attitude in accordance with the individual instructor's background and interest. The names of these instructors will be kept anonymous and designated by number. A simple table showing the pre- and post-testing means for these instructors is helpful.

In the pre-testing situation, one instructor (number IV) had students significantly lower in mean than the other groups. No attempt has been made to explain this situation.

The following table pairs the instructors in the post-testing situation, indicating significance of difference in mean between these groups by means of the uncorrelated "t."

It can be seen that a significant difference appears in many of these pairs.

In spite of the differences between instructors, students taking part in the full experimental program showed a significant advance in their "means." It is evident from these data and is supported by others not included here that the total program was effective in favorably changing the attitudes of those students involved. On the basis of this evidence and our experience with the program, we are confidently going ahead with development of new experiments and techniques.

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For the coming year a new work activities program is being planned. One of these activities is explained here. This will involve a combination of forest ecology and forest management experiences. This project is still in a formative stage, but a diagram might help to explain the new venture.

The area involves a section in which a young climax type forest is naturally regenerating. Enough plots 46′ on a side will be laid out to accommodate all sections of General Biology. In each plot assigned, the students will count all trees in the plot. This will include the total number by species and diameter. The students will survey the distribution of herbaceous plants of the forest floor. Some plots as designated would not be thinned at all, while others would receive light and heavy thinning. Light thinning would keep the forest canopy closed. Heavy thinning will allow sunlight to reach the forest floor between the remaining trees.

The principles and practices of forest management will be explained to all students. Working in small groups, they will then select and mark the trees to be removed. However, before the tree is cut the entire group with the instructor would have to agree with the decision of the small group. The thinnings could then be left on the ground or used to establish brush shelters for small game. Accurate records of the entire procedure will be kept so that future groups of students will be able to analyze possible ecological changes.

CONTROL	THIN LIGHT	THIN HEAVY
THIN HEAVY	CONTROL	THIN LIGHT
THIN LIGHT	THIN HEAVY	CONTROL

Book Reviews

Earth Science

LABORATORY EXERCISES IN PHYSICAL GEOGRAPHY AND EARTH SCIENCE, M. H. Shearer, 139 pp., McGraw-Hill Book Company, Inc., New York, 1959.

This is a tear-out workbook to accompany the text by the same author. There is a great emphasis on maps and the book is liberally supplied with a great variety. The type face is typewriter style which the reviewer does not find easily readable. However, the exercises are well organized, and the questions pertinent. Obviously, earth science *can* be a laboratory course.

P. K.

DOWN TO EARTH, Carey Croneis and William C. Krumbein, 499 pp., Pheonix Science Series, The University of Chicago Press, Chicago, Illinois, 1961.

Another classic, first published in 1936, to reach a paperback edition. It still retains the lively reading and subject development it did when first published. The publishers are to be congratulated on the handsome format. The authors indicate that after considerable thought they decided not to rewrite the book for the treatment still remains fresh. This is true.

It is a general geology text for the college physical science course, and its approaches should be a fine addition to such a course. For the biologist, the major section of the book on the evolution of life will be most interesting, including the rise of man. If you are looking for a good geology reference, this is it, but its greatest strength is that it will appeal to the student reader wishing to explore another source. A classic.

P. K.

BIOGRAPHY OF THE EARTH, George Gamow, 194 pp., $.50, New American Library, New York, 1948.

The latest edition of a paperback classic. Written as a biography, this distinguished scientist traces the life of earth as we know it. Included is excellent material on the origin of life and the subsequent evolution of life. However the development of earth in its astronomical relationships on through what geology tells us occupies the bulk of the book. A most respectable book to use on this fascinating subject. Of course, the author, besides being a careful scientist, is a wonderful writer.

P. K.

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