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ABSTRACT

Examines the effects of a one-day Department of Energy sponsored workshop on the energy conservation attitudes of four groups (N=60) of science teachers (K-8). Content included information in the area of energy resources and energy education. Information was presented in the form of mini-lectures, slide presentations, discussions, demonstrations, and hands-on activities. A pre/post 24 item Likert-type instrument was utilized with items categorized into the following groups: (1) Business/Industry; (2) Government; and (3) Personal/Individual. Significant changes in overall pre/post scores occurred across the board. It was concluded that workshops of this type can cause "positive" shifts in participants attitudes toward energy related attitudes. (DS)

THE EFFECTS OF A ONE-DAY ENERGY WORKSHOP ON SCIENCE TEACHERS' ATTITUDES TOWARD ENERGY-RELATED TOPICS

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Objectives:

The primary purpose of this investigation was to examine the effect of a one-day Department of Energy-sponsored institute on the changes in science teachers' attitudes toward energy conservation. A second purpose of this study was to identify and examine attitude changes associated with three major components (business/industry, government, and personal) of c - society which may be preceived by an individual as having an impact on energy conservation programs.

Four groups of teachers participated in the study, and for each group the problem was examined in terms of the following null hypotheses:

1. There is no significant difference in the mean value of the teacher's overall pre and post test scores.
2. There is no significant difference in the mean value of the teacher's pre and post test sub-scores for "business/industry."
3. There is no significant difference in the mean value of the teacher's pre and post test sub-scores for "government."
4. There is no significant difference in the mean value of the teacher's pre and post test sub-scores for "personal/individual."
5. There is no significant difference in the mean value of the teacher's pre and post test scores for the statement, "The energy crisis is over."
6. There is no significant difference in the mean value of the teacher's pre and post test scores for the statement, "We should launch national programs to find new types of energy sources."

Procedures:

In November of 1979, we conducted four, one-day workshops which provided specific instruction in the area of energy education for elementary and junior high science teachers. Teachers in these workshops were sub-grouped according to the grade level at which they taught: Workshop I, K-2nd grade; Workshop II, 3rd and 4th grades; Workshop III, 5th and 6th grades; and Workshop IV, 7th and 8th grades.

The stated purposes of the workshops were: (1) to provide elementary and junior high science teachers with a comprehensive base of information in the area of energy resources and energy education; (2) to provide the participants with methods, materials, and activities that would be actively applied in their science classrooms.

The format of each workshop was similar and included lectures, slide presentations, discussions, demonstrations, and hands-on activities. Several games such as Energy Quest were introduced and projects such as solar cookers were initiated. The content included an historical perspective of energy development (with an emphasis on petroleum), U.S. energy policy, energy resources and demands, home heating, and personal energy usage.

Each school district in our region was invited to send one participant to each workshop. The selection of teachers was made by principals and other school administrators.

A 24 item, Likert-type instrument (ES) was administered as the initial and terminal activity of each workshop. The statements on the instrument were categorized into three areas (sub-groups) as follows: (1) Business/Industry, (2) Government, and (3) Personal/Individual. Changes in attitude as measured by these sub-groups were analyzed using a correlated t-test, and it was then possible to determine the relative impact of each sub-group on resulting changes in attitude.

Because of the comprehensive nature of statements eleven and twenty, it was determined that they would be analyzed separately as indicated by hypotheses five and six.

Results:

Correlated t-tests were used in the analysis of the pre and post test scores, and as one can see from Table 1, the changes in overall attitude were

Table 1. Summary of correlated t-test values derived from a 24-item Likert-type instrument designed to measure general attitude shifts as well as shifts for each of three sub-sets of statements.

	Overall		Business/Industry		Government		Personal/Individual	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
				Workshop I (N=12)				
$\bar{X}$	87.50	91.42	25.42	25.92	31.58	34.92	27.50	30.58
s	7.23	4.92	2.78	2.06	3.23	2.31	2.81	2.94
r	0.476		0.371		0.299		0.578	
t	-3.67		-0.62		-3.43		-4.04	
p	0.0039		0.5520		0.0057		0.0022	
				Workshop II (N=14)				
$\bar{X}$	85.43	93.79	24.71	26.21	32.50	35.47	28.21	32.00
s	3.96	3.47	2.23	2.01	2.53	2.34	2.55	2.45
r	0.383		0.495		0.596		0.604	
t	-7.77		-2.62		-5.22		-6.37	
p	0.0000		0.0201		0.0003		0.0001	
				Workshop III (N=20)				
$\bar{X}$	84.70	95.65	24.35	29.95	32.70	36.25	27.65	32.45
s	9.33	6.67	3.05	3.38	4.29	3.45	3.53	1.99
r	-0.185		0.436		-0.393		-0.014	
t	-3.94		-3.40		-2.45		-5.27	
p	0.0012		0.0033		0.0228		0.0001	
				Workshop IV (N=12)				
$\bar{X}$	85.00	91.58	25.08	27.25	32.33	34.42	27.58	29.92
s	4.71	7.04	2.97	3.93	2.67	3.45	2.86	4.14
r	0.804		0.675		0.644		0.653	
t	-5.31		-2.57		-2.69		-2.57	
p	0.0004		0.0248		0.0200		0.0248	

Table 2. Summary of correlated t-test values derived from responses to statements number 11 and 20 of a Likert-type instrument designed to measure attitudes with respect to energy-related topics.

Teacher's Grade Level	N*	Pre-test $\bar{x}$	Pre-test s	Post-test $\bar{x}$	Post-test s	r	t-value	Level of significance
				Statement 11				
K-2	11	4.25	0.45	4.50	0.52	.19	1.34	.1
3-4	14	4.50	0.52	4.86	0.36	.36	2.62	.02
5-6	20	4.55	0.60	4.95	0.22	.21	3.00	.005
7-8	12	4.25	0.87	4.58	0.51	.46	1.46	.1
				Statement 20				
K-2	11	4.55	0.52	4.82	0.40	.52	1.94	.06
3-4	14	4.57	0.51	4.71	0.47	.41	0.98	.1
5-6	20	4.56	0.94	4.96	0.22	.14	1.92	.05
7-8	12	4.67	0.49	4.42	0.67	.18	-1.15	.1

*Some of the participants did not properly complete the attitude survey, and hence, the sample size does not equal the number of participants.

very significant for each of the four groups of teachers. Also from table 1, it can be seen that a significant change in attitude for each of the three sub-sets (Business/Industry, Government, and Personal/Individual) occurred in all of the groups with the exception of the business/industry sub-score in workshop I.

Correlated t-test analysis of statement number eleven (The energy crisis is over.) and statement number twenty (We should launch national programs to find new energy sources.) is summarized in table 2. It may be seen that all but one of the groups shifted their attitude concerning these two issues in a "positive" direction; however, only 50% of the shifts were statistically significant (.05 level or greater).

Discussions and Conclusions:

One conclusion is that significant changes in attitude occur as a result of participation in a workshop such as the one described in this paper. This finding is supported by Fazio and Dunlop (1) and Dunlop (2) who reported cognitive and attitudinal gains for several groups of individuals who were "exposed" to presentations which used the Department of Energy's Citizen's Workshop as the basis for the instruction.

Since attitudinal changes relating to the sub-sets of business/industry, government, and personal/individual were all similar and significant (one exception was the sub-set of business/industry for workshop I), it appears that the overall change in attitude was not the result of just one subset. In other words, the participants changed their attitudes in a similar manner toward all three subsets examined. This suggests that a workshop such as the one conducted will be equally valuable in changing teachers' attitudes toward business/industry,

government, and personal/individual responsibilities for energy conservation.

As mentioned in the results and as can be seen from table 2, all but one of the groups demonstrated a positive shift in their attitude with respect to statements 11 and 20; however, only [illegible] of the shifts were statistically significant (.05 level or greater). It should be noted that all of the groups indicated a very positive attitude on the pre-test, and we feel that this precluded further significant shifts in the direction.

Although this paper is emphasizing the attitudinal changes which occur as a result of participation in an energy workshop, the cognitive domain cannot be ignored. This is because attitudes are, in part, shaped by knowledge. Rokeach (3) defines attitude as a relatively enduring organization of beliefs around an object or situation pre-disposing one to respond in some preferential manner. Further, attitude has three components: cognitive (knowledge about the object or situation), affective (a tendency to take a position or negative position toward the object or situation), and behavioral (an observable action with respect to the attitude, object or situation).

Since it is impossible to totally separate attitudes from knowledge, it is reasonable to assume that at least part of the attitudinal changes which were described in this study can be attributed to increases in content knowledge and/or a better understanding of the situation.

Nelson (4) indicates that education is the most effective means available to us of changing values and attitudes to create a new environmental citizenship. Whiting (5) also discusses the importance of education and knowledge as part of the energy situation.

Studies such as this lend strong support to the leadership position which science educators can effectively assume in helping to solve the world's energy crisis.

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