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ABSTRACT

This study was conducted to determine what attitude changes take place in a group of secondary school teachers as a result of participation in a short course on the environmental problems of air pollution, water pollution, noise pollution, population problems and the use of natural resources. A secondary purpose was to determine if the teachers perceived the course structure as an effective method for presenting environmental topics. Participants, 43 in the experimental group and 45 in the control group, were given two questionnaires relating to environmental attitudes and environmental management. Examination of resulting data by analysis of variance indicated a statistically significant change in responses occurring for 18 of the 30 items on the questionnaire dealing with environmental attitudes, and for 25 of the 30 items on the questionnaire dealing with environmental management. In the third aspect, the structure of the course was perceived as highly acceptable by the participants. The three evaluation instruments and tables of group responses are appended. (BL)

ATTITUDE CHANGE AS A RESULT OF A SHORT COURSE ON ENVIRONMENTAL QUALITY

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A paper presented at the 46th annual meeting
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National Association for Research in Science Teaching

March 28, 1973
Detroit, Michigan

ATTITUDE CHANGE AS A RESULT OF A SHORT COURSE ON ENVIRONMENTAL QUALITY

Objectives of the inquiry

The primary purpose of this study was to determine what attitude changes take place in a group of secondary school teachers as a result of participation in a short course on the environmental problems of air pollution, water pollution, noise pollution, population problems and the use of natural resources. A secondary purpose of the study was to determine if the teachers perceived the course structure an effective method for presenting environmental topics.

Methods and/or techniques

During the summer of 1972, a group of 43 secondary school teachers met with 40 specialists in the areas of air pollution, water pollution, noise pollution, population problems and uses of natural resources. Each of these topics was introduced in a panel discussion, the panel consisting of 3 to 5 specialists from governmental agencies, industry and representatives from concerned environmental groups. Each panelist was given 30 minutes to present the viewpoint of his organization. Following these presentations, a discussion session provided an opportunity for the participants and panelists to probe the topic in greater depth. Several times during the course, the specialists and participants planned and became involved in field study tours in order to examine an area problem on a first hand basis.

Data sources

The evaluation design can be designated as a nonequivalent control group pattern. From a pool of potential participants, 43 were assigned to the experimental group and 45 to the control group. Two questionnaires relating to environmental attitudes and environmental management were administered to both the experimental and control groups. Responses to the items on these instruments were collected as pre and post-test for individuals in the experimental and control group. The pretest was given to both groups before any activities began. After a period of 15 instructional days, during which the experimental group was involved in the short course activities six hours per day, both groups were administered the post-test. A third instrument relating to the

participants' evaluation of the structure of the workshop was administered as a post-test only.

Results and conclusions

Examination of the resulting data by analysis of variance indicates a statistically significant change in responses occurring for 18 of the 30 items on the questionnaire dealing with environmental attitudes, and for 25 of the 30 items on the questionnaire dealing with environmental management. Responses to the third questionnaire indicate that 90 percent of the participants rated the specialists, format, sequence, length, level of content and physical facilities of the short course at the above average to excellent level.

These results suggest that the short course did change the participants' attitudes toward certain aspects of the selected environmental problems. It further suggests that structure of the course was perceived as highly acceptable by the participants.

Significance

Recognizing the limits imposed by the experimental procedure, this study may have implications for science educators who are involved in the design of in-service instruction. If the intensive short course does, in fact, alter attitudes on emotion charged issues such as environmental problems, then it is possible that attitudes in other areas may be changed in like matter. The teachers' strong response to the structure of the course may suggest the involvement of in-service trainees with consultants from governmental agencies, industry and representatives of citizens groups on an intensive basis.

TABLE I

SUMMARY OF STATEMENTS
INCLUDED ON INSTRUMENT ONE

ITEM	STATEMENT
1	Natural resources will support a much larger human population than the present human population of the world.
2	It is necessary for man to alter the natural environment in order to survive at present population levels.
3	The growth of our country will be retarded if we conserve our resources.
4	Governmental financial aid to landowners for conservation work makes them too dependent on the government.
5	There is too much fuss over water pollution in Texas since we have plenty of water.
6	Only in rare instances do industries pollute the environment.
7	We need not be overly concerned about pollution since science and technology will find solutions to the problems.
8	There is a population problem in the United States.
9	The United States as a whole does not have a great pollution problem.
10	Many people are over-reacting to the environmental problems around us.
11	People interested in conservation tend to stand in the way of industrial progress.
12	Recent scientific developments have made it unnecessary to conserve our resources.
13	The mining of all minerals should be controlled by the government.
14	Our home town and county do not have serious problems of environmental quality.
15	The use of some natural resources should be restricted to assure an adequate supply for future generations.
16	For a fair price the state should have the right to purchase any lands for conservation purposes.
17	Soil erosion is a minor problem in Texas.
18	There are too many people living on the earth today.
19	People in our country will implement and support efforts to improve the quality of the natural environment.
20	To help conserve natural resources much farm land will have to be returned to a natural "wild" condition.
21	Man has generally treated the natural environment in a proper manner.
22	There is an urgent need to conserve the natural resources of the United States.
23	Whether or not the government aids in the control of soil erosion is little concern of mine.
24	Limiting family size is important if a reasonable standard of living is to be maintained for immediately future generations.
25	A man should be able to use his land as he sees fit.
26	Man is faced with the possibility of extinction.
27	The number of trees cut on privately owned land should be controlled by the government.
28	An alert conservation group is a necessity in every community.
29	Most hunters and fishermen are well-founded in the principles of wildlife conservation.
30	Soil erosion control should be left entirely to the land owner.

TABLE II

SUMMARY OF STATEMENTS
INCLUDED ON INSTRUMENT TWO

ITEM	STATEMENT
1	Living things are interdependent with each other and their environment.
2	Natural resources are interdependent and the use or misuse of one will affect the others.
3	Man has been a factor affecting plant and animal succession and environmental processes.
4	The earth and life on it are greatly affected by the atmosphere.
5	Pollutants and contaminants are produced by natural and man-made processes.
6	Safe waste disposal is important if the well-being of man and the environment is to be preserved.
7	An organism is the product of its heredity and environment.
8	Man is influenced by many of the same hereditary and environmental factors that affect other organisms and their populations.
9	Organisms and environments are in constant change.
10	In any environment, one component like space, water, air or food may become a limiting factor.
11	Maintaining, improving, and in some cases restoring soil productivity is important to the welfare of people.
12	Water supplies, both in quantity and quality are important to all levels of living.
13	Increasing human populations, rising levels of living, and the resultant demands for greater industrial and agricultural productivity promote increasing environmental contamination.
14	Modern man affects the structure of his environment.
15	Increased population mobility is changing the nature of the demands upon some resources.
16	Conflicts emerge between private land use rights and the maintenance of environmental quality for the general public.
17	The management of natural resources to meet the needs of successive generations demands long-range planning.
18	Economic efficiency does not always result in conservation of a natural resource.
19	Man has ability to manipulate and change the environment.
20	Options available to future generations must not be foreclosed.
21	Environmental management has effects on individuals and social institutions.
22	Man has moral responsibility for his environmental decisions.
23	Man has the capability of improving society through sociology, psychology and science.
24	There are certain risks taken, and limitations experienced, when manipulating the natural environment.
25	Public opinion constitutes a control over the use of conservation practices.
26	Individual citizens should be stimulated to become well informed about resource issues, problems, management procedures, and ecological principles.
27	Individual citizens should be stimulated to become active in the political process.
28	Conservation responsibilities should be shared by individuals, business and industries, special interest groups, and all levels of government and education.
29	Man has responsibility to develop an appreciation of and respect for the rights of others.
30	Outdoor recreation is an increasingly important part of our culture and our economy.

TABLE III

STRUCTURE OF INSTRUMENT THREE

Speaker Topic
(Please evaluate only the activities which you attended).

A. Mr. Sam Smith - Water Pollution

. . . . . .

In your judgment, at this point in time which Workshop topic do you think was the most effective?

_____

Please identify other activities, formal and informal, which could be employed with success in future workshops.

a._____

b._____

c._____

Organization of the Workshop. (Please "x" the appropriate response.)

_____ excellent organization in meaningful sequence
_____ well organized
_____ adequate, but could be better
_____ inadequate organization
_____ confused and unsystematic

Workshop length. (Please "x" the appropriate response.)

_____ program length was about right
_____ program was long, but accentable
_____ program was short, but acceptable
_____ program was much too long
_____ program was too short to cover the content

Degree to which Workshop outcomes met my expectations. (Please "x" the appropriate response.)

_____ program exceeded by expectations
_____ my expectations were well met
_____ program was adequate in terms of expectations but could have been better
_____ program was barely adequate in this respect
_____ program completely failed to meet my expectations

Applicability of content to needs. (Please "x" appropriate response.)

_____ content was exceptionally well related to my needs
_____ content was moderately well related to my needs
_____ content was adequate - could be better
_____ content was only slightly related to my needs
_____ content was completely unrelated to my needs

Level of intellectual sophistication of content. (Please "x" appropriate response.)

_____ content level was about right
_____ high, but acceptable
_____ low, but acceptable
_____ content was far above level needed for my work
_____ level was entirely too low

Opportunity for questions and discussion. (Please "x" appropriate response.)

_____ ample opportunity
_____ moderate opportunity
_____ occasional opportunity
_____ rare opportunity
_____ never

10. What subject areas were neglected which should have been dealt with by the Workshop program?

a._____

b._____

c._____

d._____

11. As you review the Workshop program, please rank in order of significance the three program presentations which have been of greatest value to you as a practicing Educator.

a._____

b._____

c._____

12. Meeting rooms and Field trip arrangements. (Please "x" appropriate response.)

Meeting Rooms:	Field Trip Arrangements:
_____ excellent	_____ excellent
_____ good	_____ good
_____ barely adequate	_____ barely adequate
_____ poor	_____ poor
_____ completely inadequate	_____ completely inadequate

13.

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
The material presented was valuable to me.					
I did not have an opportunity to express my ideas					
My time was well spent					
Acquaintances were made which will be helpful in the future					
The Workshop had too little variety					
The Workshop had too much variety					
The program had well-chosen presentation leaders					

14. Give your general comments regarding the Workshop.

TABLE IV

ANALYSIS OF VARIANCE OF PRETEST AND POSTTEST EXPERIMENTAL GROUP RESPONSES ON QUESTIONNAIRE ONE

Item	Means Pretest	Means Posttest	Difference	MS_t df=80	MS_{bg} df=1	MS_{wg} df=79	F-ratio	P
1	3.4524	4.1026	.6502	1.0068	8.5487	.9913	9.381	.0033
2	3.4286	2.3333	-1.0953	1.1401	24.2575	.8475	28.622	.0000
3	3.6429	3.7179	.0750	1.2457	.1140	1.2600	.090	.7620
4	3.1905	3.6154	.4249	.9420	3.6511	.9077	4.022	.0456
5	2.6667	4.6923	2.0256	1.3327	82.9763	.2993	277.277	.0000
6	3.3571	4.6410	1.2839	.6494	33.3334	.2357	141.446	.0000
7	3.5714	4.4615	.8901	.5750	16.0220	.3795	42.222	.0000
8	3.3333	1.6667	-1.6666	1.5022	56.1728	.8101	69.338	.0000
9	3.3810	4.5128	1.1318	.9944	25.9072	.6791	38.150	.0000
10	3.4048	3.7692	.3644	.8966	2.6863	.8740	3.074	.0797
11	3.4286	3.5128	.0842	.9772	.1435	.9877	.145	.7058
12	3.3333	4.5641	1.2308	.7944	30.6325	.4167	73.504	.0000
13	2.9524	2.7436	-.2088	.9278	.8816	.9284	.950	.6658
14	2.4524	4.3846	1.9322	2.2392	75.5003	1.3118	57.553	.0000
15	2.5476	1.6667	-.8809	.4846	15.6940	.2920	53.739	.0000
16	2.6905	2.3333	-.3572	.9028	2.5794	.8816	2.926	.0873
17	2.9762	4.1795	1.2033	1.0250	29.2302	.6673	43.876	.0000
18	2.6667	1.9744	-.6923	.8250	9.6923	.7128	13.598	.0007
19	2.6905	3.0000	.3095	.5864	1.9374	.5693	3.403	.0654
20	2.8095	3.2564	.4469	.8244	4.0385	.7837	5.153	.0244
21	3.3810	4.4615	1.0805	.6401	23.6128	.3493	67.595	.0000
22	2.6190	1.4615	-1.1575	.6086	27.0943	.2734	99.108	.0000
23	3.4048	4.5385	1.1337	.5975	25.9911	.2761	94.139	.0000
24	3.4048	1.4359	-1.9689	1.3762	78.3990	.4014	195.303	.0000
25	3.5952	3.8205	.2253	.7111	1.0263	.7071	1.451	.2299
26	3.2143	2.1795	-1.0348	1.0559	21.6541	.7951	27.234	.0000
27	2.9048	2.4103	-.4945	.8500	4.9451	.7982	6.196	.0142
28	2.8095	1.6154	-1.1941	.6318	28.8363	.2748	104.946	.0000
29	3.2619	3.8974	.6355	.9485	8.1678	.8571	9.530	.0031
30	3.1190	4.2308	1.1118	.6790	24.9931	.3712	67.324	.0000

MS_t = total mean square

MS_{bg} = between groups mean square

MS_{wg} = within groups mean square

TABLE V

ANALYSIS OF VARIANCE OF PRETEST AND POSTTEST CONTROL GROUP RESPONSES ON QUESTIONNAIRE ONE

Item	Means Pretest	Means Posttest	Difference	MS_t df=79	MS_{bg} df=1	MS_{wg} df=78	F-ratio	P
1	2.9751	3.0751	.1000	.6070	.2000	.6122	.327	.5762
2	3.4749	3.2253	- .2496	.7367	1.2500	.7301	1.714	.1914
3	3.2736	3.4999	.2263	.4429	1.0125	.4356	2.325	.1275
4	3.0250	3.0258	.0008	.7082	.0000	.7173	.000	1.0000
5	3.4501	3.1758	- .2743	.4454	1.5125	.4317	3.503	.0617
6	3.5003	3.2001	- .3002	.382	1.8000	.3651	4.944	.0273
7	3.6508	3.4250	- .2258	.78	1.0125	.7804	1.297	.2570
8	3.2505	3.2493	.0012	.49	.0000	.5000	.000	1.0000
9	3.2501	3.3250	.0749	.6125	.1125	.6189	.182	.6747
10	3.2500	3.0252	- .2248	.7783	1.0125	.7753	1.306	.2554
11	3.0262	3.0506	.0244	.6948	.0125	.7035	.018	.8595
12	3.2011	3.1754	- .0257	.5847	.0125	.5920	.021	.8796
13	2.9251	3.0002	.0751	.5682	.1125	.5740	.196	.6635
14	3.3533	3.3258	- .0275	.3530	.0125	.3574	.035	.8463
15	2.7751	2.8503	.0752	.3568	.1125	.3599	.313	.5845
16	2.4751	2.4748	.0003	.7082	.0000	.7173	.000	1.0000
17	2.9003	2.9747	.0744	.7429	.1125	.7510	.150	.7017
18	2.7750	2.8509	.0759	.7366	.1125	.7446	.151	.7006
19	2.5502	2.5255	- .0247	.3024	.0125	.3061	.041	.8397
20	2.7750	2.7743	- .0007	.9361	.0000	.9481	.000	1.0000
21	3.2507	3.1250	- .1257	.4074	.3125	.4087	.765	.6115
22	2.7999	2.7750	- .0249	.5492	.0125	.5561	.022	.8759
23	3.1995	3.1501	- .0494	.2783	.0500	.2755	.181	.6750
24	3.1248	3.0503	- .0745	.3593	.1125	.3625	.310	.5859
25	2.9750	2.8254	- .1496	.9266	.4500	.9327	.482	.5036
26	3.2761	3.2750	.0011	.8095	.0000	.8199	.000	1.0000
27	2.6500	2.7239	.0739	.6986	.1125	.7061	.159	.6931
28	2.7253	2.9751	.2498	.6861	1.2500	.6708	1.841	.1754
29	2.7008	2.6499	- .0509	.8297	.0500	.8397	.060	.8032
30	3.0499	2.8751	- .1748	.2897	.6125	.2856	2.145	.1433

MS_t = total mean square

MS_{bg} = between groups mean square

MS_{wg} = within groups mean square

TABLE VI

ANALYSIS OF VARIANCE OF PRETEST RESPONSES FOR THE EXPERIMENTAL AND CONTROL GROUPS ON QUESTIONNAIRE ONE

Item	Pretest Means Experimental	Control	Difference	MS_t df=81	MS_{bg} df=1	MS_{wg} df=80	F-ratio	P
1	3.4524	2.9751	.4773	.9389	4.0690	.6922	5.233	.0233
2	3.4286	3.4749	.0463	.9914	.0442	1.0033	.044	.8283
3	3.6429	3.2736	.3693	1.1159	2.7724	1.0952	2.531	.1116
4	3.1905	3.0250	.1655	.8643	.5610	.8681	.646	.5705
5	2.6667	3.4501	.7834	.6149	12.5715	.4654	27.011	.0000
6	3.3571	3.5003	.1432	.2477	.4181	.2455	1.703	.1927
7	3.5714	3.6508	.0794	.5372	.1265	.5423	.233	.6360
8	3.3333	3.2505	.0828	.6293	.1423	.6354	.224	.6426
9	3.3810	3.2501	.1309	.6143	.3513	.6176	.569	.5406
10	3.4048	3.2500	.1548	.7174	.4907	.7202	.681	.5033
11	3.4286	3.0262	.4024	.8716	3.3368	.8408	3.969	.0469
12	3.3333	3.2011	.1322	.4456	.3642	.4467	.815	.6275
13	2.9524	2.9511	.0033	.6999	.0154	.7095	.022	.8781
14	2.4524	3.3533	.9009	1.4569	16.5074	1.2688	13.010	.0008
15	2.5476	2.7751	.2275	.3511	1.0593	.3422	3.095	.0786
16	2.6905	2.4751	.2154	.7395	.9512	.7369	1.291	.2581
17	2.9762	2.9003	.0759	.8234	.1189	.8322	.143	.7079
18	2.6667	2.7750	.1083	.6981	.2404	.7039	.342	.5676
19	2.6905	2.5502	.1403	.3121	.4043	.3110	1.300	.2564
20	2.8095	2.7750	.0345	.8083	.0244	.8131	.030	.8575
21	3.3810	3.2507	.1303	.2686	.3513	.2676	1.313	.2540
22	2.6190	2.7999	.1809	.4318	.6708	.4288	1.564	.2122
23	3.4048	3.1995	.2053	.2839	.8599	.2565	3.349	.0675
24	3.4048	3.1248	.2800	.3963	1.6035	.3812	4.207	.0410
25	3.5952	2.9750	.6202	.9997	7.8316	.9137	8.626	.0046
26	3.2143	3.2761	.0618	.7793	.0755	.7881	.096	.7558
27	2.9048	2.6500	.2548	.7413	1.3297	.7340	1.812	.1789
28	2.8095	2.7253	.0842	.5753	.1464	.5806	.252	.6230
29	3.2619	2.7008	.5611	.9752	6.4688	.9065	7.136	.0090
30	3.1190	3.0499	.0691	.3260	.0977	.3238	.297	.5939

MS_t = total mean square

MS_{bg} = between groups mean square

MS_{wg} = within groups mean square

TABLE VII

ANALYSIS OF VARIANCE OF POSTTEST RESPONSES FOR THE EXPERIMENTAL AND CONTROL GROUPS ON QUESTIONNAIRE ONE

Item	Pretest Means Experimental	Control	Difference	MS_t df=78	MS_{bg} df=1	MS_{wg} df=77	F-ratio	P
1	4.1026	3.0751	1.0275	.8874	20.8504	.6281	33.195	.0000
2	2.3333	3.2253	.8920	.7608	15.7001	.5668	27.701	.0000
3	3.7179	3.4999	.2180	.6005	.9380	.5961	1.574	.2109
4	3.6154	3.0258	.5896	.8345	6.8828	.7559	9.105	.0038
5	4.6923	3.1758	1.5165	.8403	45.4616	.2608	174.307	.0000
6	4.6410	3.2001	1.4409	.8767	41.6054	.3555	155.342	.0000
7	4.4615	3.4250	1.0365	.8806	21.2162	.6165	34.416	.0000
8	1.6667	3.2493	1.5826	1.0305	49.5042	.6775	73.070	.0000
9	4.5128	3.3250	1.1878	1.0335	27.8612	.6821	40.849	.0000
10	3.7692	3.0252	.7440	1.0620	10.9374	.9337	11.713	.0014
11	3.5128	3.0506	.4622	.8958	4.2298	.8525	4.962	.0271
12	4.5641	3.1754	1.3887	1.0445	38.1036	.5632	67.658	.0000
13	2.7436	3.0002	.2566	.8043	1.2983	.7979	1.627	.2032
14	4.3846	3.3258	1.0588	.6609	22.1714	.3897	56.896	.0000
15	1.0667	2.8503	1.1836	.6592	27.0511	.3087	89.585	.0000
16	2.3333	2.4748	.1415	.8535	.3963	.8655	.458	.5077
17	4.1795	2.9747	1.2048	.9486	23.0405	.5038	49.329	.0000
18	1.9744	2.8509	.8765	.9387	15.1408	.7542	20.075	.0001
19	3.0000	2.5255	.4745	.6299	4.4554	.5711	7.801	.0066
20	3.2564	2.7743	.4821	.9614	4.5764	.9144	5.005	.0265
21	4.4615	3.1250	1.3365	.9403	35.2745	.4944	71.351	.0000
22	1.4615	2.7750	1.3135	.8299	34.0669	.3983	85.536	.0000
23	4.5385	3.1501	1.3884	.7303	38.0685	.2960	128.608	.0000
24	1.4359	3.0503	1.6144	1.0377	51.4470	.3330	134.332	.0000
25	3.8205	2.8254	.9951	.9627	19.5700	.7210	27.142	.0000
26	2.1795	3.2750	1.0955	1.1207	23.6991	.8275	28.639	.0000
27	2.4103	2.7239	.3136	.7068	1.9562	.7716	2.535	.1115
28	1.6154	2.9751	1.3597	.8296	36.5031	.3663	99.651	.0000
29	3.8974	2.6499	1.2475	1.1720	30.7280	.7882	38.986	.0000
30	4.2308	2.8751	1.3557	.7097	36.2969	.3285	110.477	.0000

MS_t = total mean square

MS_{bg} = between groups mean square

MS_{wg} = within groups mean square

TABLE VIII

ANALYSIS OF VARIANCE OF PRETEST AND POSTTEST
EXPERIMENTAL GROUP RESPONSES
ON QUESTIONNAIRE TWO

Item	Means Pretest	Means Posttest	Difference	MS_t df=80	MS_{bg} df=1	MS_{wg} df=79	F-ratio	P
1	3.0000	4.8718	1.8718	1.0901	70.3589	.2071	342.150	.0000
2	3.4524	4.7949	1.3425	.9901	36.4461	.5413	67.329	.0000
3	3.4286	4.4615	1.0329	.7744	21.5775	.5314	40.608	.0000
4	3.4048	4.5641	1.1593	.8111	27.1801	.4773	56.942	.0000
5	3.4524	4.4103	.9579	1.2549	18.5564	1.0360	17.910	.0002
6	3.6190	4.6154	.9964	.7651	20.0743	.5207	38.552	.0000
7	3.5238	4.4103	.8865	.9475	15.8904	.7584	20.953	.0001
8	3.6190	4.3590	.7400	.8904	11.0715	.7706	14.360	.0005
9	3.7143	4.4359	.7216	.7836	10.5302	.6603	15.948	.0003
10	3.2381	4.6667	1.4286	1.1694	41.2698	.6618	63.356	.0000
11	3.5952	4.3590	.7638	.7361	11.7955	.5961	19.787	.0001
12	3.2619	4.6667	1.4048	1.3556	39.9056	.6682	59.723	.0000
13	3.0476	4.4615	1.4139	1.6753	40.4276	1.1848	34.123	.0000
14	3.4048	4.6923	1.2875	.7934	33.5239	.3851	87.041	.0000
15	3.7857	4.1026	.3169	.9336	2.0302	.9198	2.207	.1375
16	3.2143	4.0513	.8370	1.5642	14.3669	1.4047	10.096	.0025
17	3.4048	4.6410	1.2362	1.1000	30.9066	.7227	42.765	.0000
18	3.8810	4.2821	.4011	.8194	3.2534	.7856	4.125	.0430
19	3.3571	4.5128	1.1557	1.1299	27.0036	.8324	33.661	.0000
20	3.5476	4.3846	.8370	.8975	14.1069	.7296	19.418	.0001
21	3.8571	4.3077	.4506	.9194	4.1050	.8791	4.669	.0317
22	3.4048	4.5897	1.1849	.7994	28.3951	.4051	63.093	.0000
23	3.7143	4.3077	.5934	.8750	7.1209	.7959	8.947	.0040
24	3.7619	4.3846	.6227	1.0836	7.8415	.9981	7.856	.0064
25	3.5714	3.0513	-.5201	2.9207	5.4712	2.8884	1.894	.1692
26	3.5000	4.6667	1.1667	.7586	27.5247	.4196	65.561	.0000
27	3.0905	4.4615	.7710	.7836	12.0229	.6414	18.745	.0002
28	3.6667	4.5897	.9230	.8000	17.2308	.5920	29.105	.0000
29	3.3333	4.7949	1.4616	.7861	43.1966	.2493	173.293	.0000
30	3.7143	4.0513	.3370	1.0596	2.2966	1.0439	2.200	.1382

MS_t = total mean square

MS_{bg} = between groups mean square

MS_{wg} = within groups mean square

TABLE IX

ANALYSIS OF VARIANCE OF PRETEST AND POSTTEST
CONTROL GROUP RESPONSES
ON QUESTIONNAIRE TWO

Item	Means Pretest	Means Posttest	Difference	MS_t df=76	MS_{bg} df=1	MS_{wg} df=75	F-ratio	P
1	3.0001	3.0270	- .0269	.1972	.0140	.1996	.070	.7877
2	3.1999	3.3243	.1244	.4316	.2971	.4334	.685	.5846
3	3.1751	2.8108	- .3643	.4737	2.5493	.4460	5.716	.0183
4	3.2006	2.6757	- .5249	.3920	5.2841	.3268	16.170	.0003
5	3.6748	2.7568	- .9180	.9103	16.2064	.7145	22.683	.0001
6	3.6252	3.6541	- .0289	.7044	6.2656	.6302	9.942	.0027
7	3.3004	3.1622	- .1382	.7078	.3652	.7124	.513	.5168
8	3.5757	3.0541	- .5216	.5643	5.2163	.5022	10.386	.0023
9	3.6506	3.2973	- .3533	.8319	2.3910	.8111	2.948	.0863
10	3.3501	3.1622	- .1879	.6948	.6792	.6950	.976	.6726
11	3.2498	2.9459	- .3039	.3038	1.7769	.3652	4.865	.0296
12	3.5507	3.0811	- .4696	.7485	4.2264	.7021	6.020	.0157
13	3.2001	3.2973	.0972	1.0041	.1820	1.0151	.179	.6767
14	3.4253	2.9730	- .4523	.4209	3.9274	.3833	10.246	.0024
15	3.1758	3.2703	.0945	.5427	.1745	.5476	.319	.5810
16	3.2006	3.3514	.1508	.7273	.4403	.7311	.602	.5537
17	3.2505	3.0541	- .1964	.4754	.7380	.4719	1.564	.2125
18	3.7009	3.0000	- .7009	.9713	9.4182	.8587	10.968	.0018
19	3.4251	3. 65	.0614	.9091	.0727	.9202	.079	.7762
20	3.3505	3.2162	- .1343	.5752	.3440	.5783	.595	.5508
21	3.5001	3.3784	- .1217	1.3288	.2843	1.3427	.212	.6516
22	3.3750	3.1622	- .2128	1.0694	.8707	1.0720	.812	.6263
23	3.1753	3.1081	- .0672	.8033	.0860	.8179	.105	.7455
24	3.2506	3.2703	.0197	.8254	.0079	.8373	.009	.9198
25	3.5249	3.1622	- .3627	.9412	2.5304	.9200	2.750	.0975
26	3.2253	2.9459	- .2794	1.2416	1.4967	1.2382	1.209	.2475
27	3.4999	3.3784	- .1215	.7235	.2843	.7294	.390	.5414
28	3.3750	3.4865	.1115	.9060	.2389	.9149	.261	.6170
29	3.3506	3.1081	- .2425	.3920	1.1246	.3822	2.942	.0866
30	3.6252	2.9459	- .6793	.9754	8.8630	.8702	10.185	.0024

MS_t = total mean square

MS_{bg} = between groups mean square

MS_{wg} = within groups mean square

TABLE X

ANALYSIS OF VARIANCE OF PRETEST RESPONSES FOR THE EXPERIMENTAL AND CONTROL GROUPS ON QUESTIONNAIRE TWO

Item	Pretest Means Experimental	Control	Difference	MS_t df=81	MS_{bg} df=1	MS_{wg} df=80	F-ratio	P
1	3.0000	3.0001	.0001	.0494	0	.0500	0	1.0000
2	3.4524	3.1999	.2525	.6680	1.3050	.6601	1.977	.1600
3	3.4286	3.1751	.2535	.5355	1.3173	.5258	2.506	.1134
4	3.4048	3.2006	.2042	.3627	.8590	.3565	2.410	.1206
5	3.4524	3.6748	.2224	1.0641	1.0154	1.0647	.954	.6669
6	3.6190	3.6252	.0062	.6331	.0007	.6410	.001	.9719
7	3.5238	3.3004	.2234	.5420	1.0262	.5360	1.915	.1668
8	3.6190	3.5757	.0433	.7126	.0398	.7210	.055	.8100
9	3.7143	3.6506	.0637	.7624	.0847	.7709	.110	.7404
10	3.2381	3.3501	.1120	.6787	.2566	.6840	.375	.5491
11	3.5952	3.2498	.3454	.4699	2.4419	.4452	5.485	.0204
12	3.3519	3.5507	.2888	.5397	1.7005	.5252	3.238	.0721
13	3.0476	3.2001	.1525	1.0714	.4757	1.0788	.441	.5156
14	3.4048	3.4253	.0205	.4185	.0094	.4237	.020	.8834
15	3.7857	3.1758	.6099	.9196	7.6414	.8356	9.145	.0037
16	3.2143	3.2006	.0137	1.3269	.0042	1.3434	.003	.9545
17	3.4048	3.2505	.1543	.8162	.4907	.8202	.598	.5523
18	3.5810	3.7009	.1801	.9565	.6708	.9601	.699	.5894
19	3.3571	3.4251	.0680	1.0557	.0943	1.0677	.088	.7646
20	3.5476	3.3505	.1971	.6951	.8001	.6938	1.153	.2860
21	3.8571	3.5001	.3570	1.3056	2.6132	1.2893	2.027	.1548
22	3.6048	3.3750	.0298	.9076	.0181	.9187	.020	.8835
23	3.7143	3.1753	.5390	1.0161	5.9584	.9543	6.244	.0139
24	3.7619	3.2506	.5113	1.0189	5.3638	.9640	5.569	.0196
25	3.5714	3.5249	.0465	1.1643	.0442	1.1783	.036	.8412
26	3.5000	3.2253	.2747	.7287	1.5494	.7181	2.157	.1421
27	3.6905	3.4999	.1906	.7373	.7433	.7372	1.008	.3195
28	3.6667	3.3750	.2917	.7957	1.7429	.7839	2.223	.1360
29	3.3333	3.3506	.0073	.3511	.0057	.3554	.016	.8951
30	3.7143	3.6252	.0891	.8656	.1633	.8743	.187	.6706

MS_t = total mean square

MS_{bg} = between groups mean square

MS_{wg} = within groups mean square

TABLE XI

ANALYSIS OF VARIANCE OF POSTTEST RESPONSES FOR THE EXPERIMENTAL AND CONTROL GROUPS ON QUESTIONNAIRE TWO

Item	Pretest Means Experimental	Control	Difference	MS_t df=75	MS_{bg} df=1	MS_{wg} df=74	F-ratio	P
1	4.8718	3.0270	1.8448	1.2260	64.6154	.3694	174.943	.0000
2	4.7949	3.3243	1.4706	.8470	41.0592	.3036	135.237	.0000
3	4.4615	2.8108	1.6507	1.1347	51.7373	.4509	114.737	.0000
4	4.5641	2.6757	1.8884	1.3521	67.7100	.4554	148.690	.0000
5	4.4103	2.7568	1.6535	1.3621	51.9112	.6790	76.451	.0000
6	4.6154	3.0541	1.5613	1.1121	46.2852	.5017	92.265	.0000
7	4.4103	3.1622	1.2481	1.3339	29.5765	.9522	31.061	.0000
8	4.3590	3.0541	1.3049	.9760	32.3311	.5522	58.545	.0000
9	4.4359	3.2973	1.1386	1.0125	24.6147	.6935	35.493	.0000
10	4.6667	3.1622	1.5045	1.2356	42.9774	.6715	63.999	.0000
11	4.3590	2.9459	1.4131	1.0237	37.9101	.5252	72.179	.0000
12	4.6667	3.0811	1.5856	1.4821	47.7345	.8571	55.695	.0000
13	4.4615	3.2973	1.1642	1.4554	25.7359	1.1273	22.829	.0001
14	4.6923	2.9730	1.7193	1.0854	56.1272	.3416	164.292	.0000
15	4.1026	3.2703	.8323	.8005	13.1524	.6336	20.758	.0001
16	4.0513	3.3514	.6999	.9018	9.3017	.7882	11.801	.0013
17	4.6410	3.0541	1.5869	.9958	47.8180	.3631	131.709	.0000
18	4.2821	3.0000	1.2821	1.0814	31.2078	.6743	46.283	.0000
19	4.5128	3.4865	1.0263	.8932	20.0000	.6350	31.498	.0000
20	4.3846	3.2162	1.1684	.9523	25.9200	.6149	42.155	.0000
21	4.3077	3.3784	.9293	1.1121	16.3975	.9055	18.108	.0002
22	4.5897	3.1622	1.4275	1.0821	38.6950	.5738	67.434	.0000
23	4.3077	3.1081	1.1996	1.0026	27.3221	.6470	42.231	.0000
24	4.3846	3.2703	1.1143	1.1747	23.5772	.8720	27.038	.0000
25	3.0513	3.1622	.1109	2.7038	.2334	2.7422	.085	.7685
26	4.6667	2.9459	1.7208	1.6637	56.2178	.9265	60.680	.0000
27	4.4615	3.3784	1.0831	.9156	22.2760	.6270	35.530	.0000
28	4.5897	3.4865	1.1032	1.0105	23.1103	.7119	32.464	.0000
29	4.7949	3.1081	1.6868	.9860	54.0208	.2693	200.614	.0000
30	4.0513	2.9459	1.1054	1.3456	23.1975	1.0512	22.068	.0001

MS_t = total mean square

MS_{bg} = between groups mean square

MS_{wg} = within groups mean square