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ABSTRACT

The purpose of this study, a doctoral thesis project, was to determine the attitudes of selected principals and teachers relative to their open and closed belief systems, science commitment levels, and opinions as to the extent of agreement or disagreement regarding the adoption and implementation of the "Regents Experimental Earth Science Curriculum" in New York State. The Attitudes, Perceptions and Process (APP) Theory was utilized as a conceptual research framework. The median, t test for uncorrelated means, non-pooled variance, double classification of analyses of variance, and the Pearson product-moment coefficient of correlation were used to analyze the data. Significant differences were found between principals and teachers on only one of the seven items studied--nature of the experimental program. Significant relationships (.05) were found for principals between belief system and three of the seven items studied. (Author/PR)

ATTITUDES AND OPINIONS OF PRINCIPALS AND TEACHERS INVOLVED IN AN EXPERIMENTAL EARTH SCIENCE PROGRAM IN NEW YORK STATE

PRESENTED BY

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TO THE

20th ANNUAL MEETING OF THE NATIONAL SCIENCE TEACHERS ASSOCIATION, NEW YORK CITY, NEW YORK, APRIL 10, 1972

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Attitudes and Opinions of Principals and Teachers Involved in an Experimental Earth Science Program in New York State

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ABSTRACT

The purpose of this study was to determine the attitudes of selected principals and teachers relative to their (1) open and closed belief systems, (2) science commitment levels, and opinions as to the extent of agreement or disagreement regarding the adoption and implementation of the Regents Experimental Earth Science Curriculum in New York State. The APP Theory (Attitudes, Perceptions and Process) was utilized as a conceptual research framework. The median, t test for uncorrelated means, non-pooled variance, double classification of analyses of variance and, the Pearson product-moment coefficient of correlation were used to analyze the data. Significant differences were found between principals and teachers on only one of the seven items studied - nature of the experimental program. Significant relationships (.05) were found for principals between belief system and three of the seven items studied.

Pressures for science curriculum change will increase as technological advances continue in our society. Educators must inquire as to the potential impact of the attitudinal factors in relation to the adoption and implementation of new science curriculum programs. Pre-service and in-service education programs must prepare science educators to meet the future needs of education. Perhaps, Eiss and Harbeck (5) assessed this need, when they recommended that Schwirian's (10) Science Support Scale be implemented to assist in the evaluation of teacher attitudes.

In 1967, New York State, endeavoring to keep pace with societal change, developed and instituted a new earth science curriculum program (4). It was predicated upon the philosophy that student behaviors could be measured in terms of learning skills, which would reflect the specific attitudes of open-mindedness and commitment to the value of science. The participants involved in the experimental program-- principals and teachers-- were assumed to possess the same kind of attitudes to be inculcated.

The implication of this lack of understanding of the curriculum process change and the attitudes of the personnel involved, demands an investigation of newly established science education programs. To provide a conceptual research model, the APP Theory was postulated, which involved attitudes, perceptions and process. It proposed that

belief system and science commitment attitudes tended to evidence a positive relationship in the degree of perceptions of principals and teachers about the adoption and implementation of the experimental earth science program.

This hypothesis was based, in part, on related research derived from Coleman (2), Neal (7), and Dutta(3). A composite picture of their research revealed that : (1) social change could be equated with curriculum change, (2) attitudes effected social change within the Catholic Church, and (3) the inner system of an individual was composed of attitudes based on his values while his outer system involved his opinions about change principles.

The belief system was defined by Rokeach (9 : 57) as the " extent toward which a person can receive, evaluate and act on relevant information received from the outside on its own intrinsic merits unencumbered by irrelevant factors arising from within the person or from the outside." The term, science commitment, as defined by Schwirian (10 : 1-45), encompassed : rationality--use of reason to understand nature, utilitarianism--application of reason to understand the natural world, universalism--acceptance of scientific ideas, individualism--decisive individual action, progress and meliorism--acceptance of change in the name of progress and better living.

Two other variables--cost per pupil in the school dis-

trict and a program success rating-- were included in the research design. Cost per pupil in the school district was a statistic obtained from the Annual Education Summary (1 : 152-75). The program success rating was formulated for this study, by dividing the number of students passing the Regents experimental earth science examination on the raw score only, by the total number of students taking the experimental earth science examination. This score was interpreted as a raw score percentage and further as the program success rating criterion within a school. The raw score results were obtained from the Principal's Report (8 : 1).

Statement of the Problem

This study sought to determine the attitudes of selected principals and teachers relative to their (1) open and closed belief systems, (2) science commitment levels, and (3) opinions as to the extent of agreement or disagreement regarding the adoption and implementation of the Regents Experimental Earth Science Curriculum in New York State. The study also sought to determine what relationships, if any, existed between these attitudes, opinions and the control variables : (1) cost per pupil in the school district and (2) program success rating.

Specifically, this study proposed to obtain data regarding the following questions :

1. What was the distribution of the extent of the belief system, science commitment and opinions about the experimental program ?

2. Did significant differences exist between the responses of principals and teachers about belief systems, science commitment and opinions about the experimental earth science program ?

3. Did significant differences exist between the responses of open and closed belief system educators concerning their opinions about the experimental earth science program ?

4. Did a significant interaction exist between belief system and educational role ?

5. Did significant differences exist between the responses of educators with high and low science commitment concerning their opinions about the experimental earth science program ?

6. Did a significant interaction exist between science commitment and educational role ?

7. Did significant relationships exist between belief systems, science commitment and opinions about the experimental earth science program for teachers and principals ?

8. Did significant relationships exist between the responses of principals concerning their belief systems, science commitment, opinions about the experimental earth science program and the variables of cost per pupil in the school district and program success rating ?

5. Did significant relationships exist between the responses of teachers concerning their belief systems, science commitment, opinions about the experimental earth science program and the variables of cost per pupil in the school district and program success rating ?

The Subjects, The Materials and The Procedure

The Subjects

This study investigated 89 principals and 105 teachers, who were participants in the 18 state-wide Experimental Earth Science Try-out Centers in New York State, during the 1968-1969 school year. Usable responses from 44 principals and 63 teachers, representing 55 per cent of the original sample, served as the data for the study.

The Materials

Data were obtained in the study through the Opinionnaire. This three-part instrument measured the respondent's belief system, level of science commitment and appraisal of the experimental earth science program in New York State. The Rokeach Dogmatism Scale, Form E, was used to measure the belief system, while the Schwirian Science Support Scale was used to measure science commitment. The reliabilities of the Rokeach (9) Dogmatism Scale, Form E, ranged from .68 to .93, while the reliability of the Schwirian (10)

Science Support Scale was .873. The third part of the instrument was developed specifically for this study and it pertained to the appraisal of seven major factors involved in the adoption and implementation of the experimental program : (1) adoption ease, (2) adoption influences, (3) nature of the program, (4) student learning, (5) parent reaction, (6) principal support, and (7) teacher qualifications.

The Procedure

A jury was included in the study to assist in the development of the instrument. Five administrators and 20 teachers were involved in a pilot study to review the instrument for the purpose of further refinement.

Data were analyzed according to the questions posed in the study's sub-problems. These included the number of respondents, the extent of the responses, and the means, standard deviations and range of values as determined in the three parts of the Opinionnaire. The median was employed to dichotomize subjects on the belief system continuum and the science commitment continuum. The t test for uncorrelated means, non-pooled variance, was used to determine whether the responses of principals differed from teachers on belief systems, science commitment and opinions about the experimental program.

Double classification analyses of variance were used to analyze the Part III scores on the Opinionnaire. The

main effects of educational role and belief system as well as the main effects of educational role and science commitment, were employed in the 2 x 2 design. The Pearson product-moment coefficient of correlation was utilized to determine relationships between the attitudes (1) belief system, (2) science commitment and opinions about the experimental program, as well as the relationships between these attitudes, opinions and the variables : (1) cost per pupil in the school district and the (2) program success rating, for principals and teachers. Significant differences were accepted when the level of confidence was at .05 or less. All computations were performed on Honeywell Data Processing equipment.

The Findings

The findings, described in five sections, were related as follows : (1) Distribution of Educators' Responses Concerning their Attitudes and Opinions, (2) Comparison of Opinions of Educators with Different Belief Systems, (3) Comparison of Opinions of Educators with Different Science Commitments, (4) Relationships between Educators' Attitudes and Opinions, and (5) Relationships between Educators' Attitudes, Opinions and Two Variables.

I. Distribution of Educators' Responses Concerning their Attitudes and Opinions

1. Principals as a group, tended to have more open belief systems, as measured by the Dogmatism Scale, and another

science commitment attitudes, as measured by the Science Support Scale, than teachers; but these differences were not statistically significant (t = 1.39).

2. Principals tended to be in greater agreement than teachers about adoption ease, principal support and teacher qualifications in the experimental program, as categorized on Part III of the Opinionnaire (Table I, mean values - items 81,86,87).

3. Teachers appeared to be in stronger agreement and more perceptive than principals about adoption influences, nature of the program, student learning and parent reaction to the program, as categorized on Part III of the Opinionnaire (Table I, mean values - items 82,83,84,85).

4. Although principals and teachers appeared to differ in their appraisal of the experimental program, significant differences were indicated on only one of the seven items on Part III of the Opinionnaire - nature of the program (Table II, item 83, F ratio = 6.25).

II. Comparison of Opinions of Educators with Different Belief Systems

1. A closed belief system attitude, as measured by the Dogmatism Scale, appeared to increase an educator's agreement and perception about almost all of the seven opinion categories (Table II, mean values - items 81 to 87).

2. Analysis of variance revealed that only one item 83 - nature of the program - indicated that significant differences existed between the opinions of principals and teachers ,as

well as open and closed educators (Table II, item 83, F ratio = 3.93).

3. Neither an educator's belief system attitude nor his educational role appeared to affect his appraisal of the other items on Part III of the Opinionnaire, when compared as single or interacting factors (Table III).

III. Comparison of Opinions of Educators with Different Science Commitment

1. High science commitment attitudes, as measured by the Science Support Scale, appeared to increase an educator's agreement and perception about almost all of the seven opinion categories on Part III of the Opinionnaire (Table IV).

2. Analysis of variance revealed significant differences on item 84- student learning- between the opinions of low and high science commitment educators (Table V, item 84, F ratio = 8.91).

3. Neither an educator's science commitment nor his educational role appeared to affect his appraisal of the other items on Part III of the Opinionnaire, when compared as single or interacting factors (Table V).

IV. Relationships between Educators' Attitudes and Opinions

1. A principal's belief system attitude was related to his appraisal of only three of the seven items on Part III of the Opinionnaire - nature of the program, student learning, and teacher qualifications (Table VI, item 83-r = .340, item 84 r = .308, item 87 -r = .315). However, a teacher's belief

system attitude was not related to his appraisal of any of the seven items on Part III of the Opinionnaire (Table VII).

2. A principal's science commitment attitude was related to his appraisal of student learning (Table VI, item 84-r=.397), while a teacher's science commitment attitude was related to his evaluation of the nature of the program (Table VII, item 83-r = .304).

3. Belief system and science commitment attitudes were not related for principals or for teachers.

V. Relationships between Educators' Attitudes, Opinions and Two Variables

1. A principal's belief system, but not a teacher's was related positively to the program's success rating (Table VIII).

2. Neither principals' nor teachers' science commitment attitudes were related to the cost per pupil in the school district.

3. A principal's appraisal of only one of the seven items on Part III of the Opinionnaire, parent reaction, was related negatively to the program's success rating (Table VIII, item 85, r = -.403). However, teachers' appraisals of the seven items on Part III of the Opinionnaire were not related to program success rating at all (Table IX).

4. A principal's evaluation of the seven items on Part III of the Opinionnaire was not related to cost per pupil in the school district (Table VIII). However, a teacher's evaluation of one of the seven items on Part III of the Opinionnaire -

principal support, was negatively related to cost per pupil in the school district (Table IX, item 86, r = -.346).

Conclusions

The following conclusions were drawn from the data :

1. Closed belief system educators, who are encumbered by internal personal factors as well as external factors, positively appraised (1) adoption ease, (2) adoption influences,(3) nature of the program, (4) student learning, (5)parent reaction, (6) principal support, and (7) teacher qualifications higher than open belief system educators. This fact appeared to indicate that creating stress within a system in transition, may be a desirable educational goal to advance a new program, such as the experimental earth science program.
2. High science commitment principals and teachers, who support science, its products and practitioners, positively appraised student learning and the nature of the program higher than low science commitment educators. This fact appeared to indicate that this strong science support attitude may be important in the promotion of better science education.
3. The closed belief system attitudes of principals were related to their opinions about the nature of the program,

student learning and teacher qualifications. This fact appeared to indicate that principals with closed belief systems contrary to the converse phenomenon, appear to be the kind of educational leaders, who tend to experiment and take more risks with new curricula.

4. The principals' belief systems were related to the experimental earth science program's success rating, but the teachers' belief systems were not so related. These data pointed to the generalization that principals, as a group, are more concerned with long range goals than teachers.

5. The principals and teachers involved in the experimental program were not in agreement about the nature of the program, i.e. (1) classroom direction, (2) laboratory activity time, (3) science materials, (4) independent study, and (5) science behavior. Either stronger lines of communication were needed among educators, or the investigation was limited naturally by the diverse perceptions of the participants in the study.

Recommendations

This study was intended to serve as an introduction to needed investigations into the relationships of attitudes and perceptions regarding processes in transition. The following recommendations were formulated :

1. Empirical studies to determine the relationships between

belief system attitudes and the nature of curriculum change, student learning and teacher qualifications should be encouraged. These findings would enhance administrative theory, as a basis for in-service education for both administrators and science educators.

2. The Science Support Scale provided discriminating data as a research instrument. It could be used to plan in-service education programs for both administrators and science educators.

3. Another instrument, other than the Dogmatism Scale, might be constructed for use in conjunction with the Science Support Scale to measure openness and science commitment. The implications of the research emanating from the same proposition for administrative leadership and secondary school science curriculum are numerous.

4. Additional studies should be patterned replicating the Attitudes, Perceptions and Process Theory, by incorporating other relevant variables such as : (1) team teaching, (2) parent support, (3) special curricula, (4) principal's preparation, etc.

5. A study should be made to ascertain why principals' belief system attitudes were related to the success of the experimental program; while teachers' belief system attitudes were not related.

6. To continue to test the APP Theory, various propositions

may be investigated :

(1) Closed attitudes of educators are positively related to their perceptions and receptivity of new programs in science, as well as other curricular areas.

(2) The more positive the attitude, the greater the appraisal ability of educators regarding programs and processes in transition.

(3) The greater the appraisal ability of the educator, the higher the value that he will place on curriculum change.

(4) As the conditions in (2) and (3) increase, greater experimentation and risk taking will tend to occur with new curriculum offerings.

(5) As the conditions in (2) and (3) decrease, the greater the probability that the opposing conditions will tend to occur.

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TABLE I

DISTRIBUTION OF THE RESPONSES OF PRINCIPALS AND TEACHERS CONCERNING THEIR BELIEF SYSTEMS, SCIENCE COMMITMENTS AND OPINIONS ABOUT THE EXPERIMENTAL EARTH SCIENCE PROGRAM

	PRINCIPALS				TEACHERS			
DIMENSIONS	N	R	M	SD	N	R	M	SD
Belief system	44	40-183	125.93	27.52	63	56-246	133.39	25.80
Science commitment	44	129-181	159.20	10.64	63	134-178	157.60	9.70
Opinions about program								
O1	44	4-19	14.34	2.82	63	5-19	13.69	3.09
O2	44	4-17	12.97	2.66	63	8-20	13.12	2.36
O3	44	10-23	18.04	2.55	63	13-25	19.28	2.50
O4	44	7-20	15.68	2.33	63	9-20	15.92	2.47
O5	44	8-15	10.02	1.54	63	6-14	10.41	1.77
O6	44	6-20	14.00	2.2[illegible]	63	8-18	13.14	2.24
O7	44	8-20	14.47	2.13	63	10-18	14.12	1.94

Note: Opinions about program
O1 = adoption ease
O2 = adoption influences
O3 = nature of program
O4 = student learning
O5 = parent reaction
O6 = principal support
O7 = teacher qualifications

TABLE II

MEAN RESPONSES OF EDUCATORS WITH DIFFERENT BELIEF SYSTEMS REGARDING THEIR OPINIONS ABOUT THE EXPERIMENTAL EARTH SCIENCE PROGRAM

	PRINCIPALS			TEACHERS			ALL EDUCATORS	
	MEANS							
	Open	Closed	Total	Open	Closed	Total	Open	Closed
Opinions about program								
81	14.04	14.63	14.34	13.50	14.00	13.75	13.72	14.25
82	12.72	13.22	12.97	12.93	13.37	13.15	12.85	13.31
83	17.18	18.90	18.04	19.06	19.50	19.28	18.29	19.25
84	15.40	15.95	15.68	15.65	16.31	15.98	15.55	16.16
85	9.86	10.18	10.02	10.40	10.37	10.39	10.18	10.29
86	13.45	14.54	14.00	13.31	13.00	13.15	13.37	13.62
87	14.04	14.90	14.47	14.34	14.03	14.18	14.22	14.38

Note: open belief system = low mean score
closed belief system = high mean score
81 = adoption ease
82 = adoption influences
83 = nature of program
84 = student learning
85 = parent reaction
86 = principal support
87 = teacher qualifications

TABLE III

ANALYSIS OF VARIANCE OF MEAN RESPONSES OF EDUCATORS WITH DIFFERENT BELIEF SYSTEMS REGARDING THEIR OPINIONS ABOUT THE EXPERIMENTAL EARTH SCIENCE PROGRAM

	MEAN SQUARES				F RATIOS		
	PRINCIPALS AND TEACHERS	OPEN AND CLOSED EDUCATORS	INTER-ACTION	WITHIN	PRINCIPALS AND TEACHERS	OPEN AND CLOSED EDUCATORS	INTER-ACTION
Opinions about program							
81	9.11	7.78	.06	9.21	.98	.84	.00
82	.83	5.78	.03	6.38	.13	.90	.00
83	39.82	25.03	10.08	6.35	6.25*	3.93*	1.70
84	2.38	10.08	.08	6.06	.39	1.66	.01
85	3.53	.34	.79	2.91	1.21	.11	.27
86	18.56	1.80	12.85	5.13	3.61	.35	2.50
87	2.19	.74	9.02	4.25	.54	.17	2.11

Note: F ratio = analysis of variance, double classification

	df
between	3
principals and teachers	1
open and closed educators	1
interaction	1
within	104
total	107

* significant at .05 level

TABLE IV

MEAN RESPONSES OF EDUCATORS WITH DIFFERENT SCIENCE COMMITMENTS REGARDING THEIR OPINIONS ABOUT THE EXPERIMENTAL EARTH SCIENCE PROGRAM

	PRINCIPALS			TEACHERS			ALL EDUCATORS	
	MEANS							
	Low	High	Total	Low	High	Total	Low	High
Opinions about program								
01	13.81	14.06	14.34	14.21	13.26	13.75	14.05	13.92
02	12.77	13.18	12.97	13.03	13.28	13.15	12.92	13.24
03	17.68	18.40	18.04	18.81	19.75	19.28	18.35	19.20
04	14.54	16.81	15.68	15.62	16.34	15.98	15.18	16.53
05	10.00	10.04	10.02	10.15	10.02	10.39	10.09	10.38
06	13.81	14.18	14.00	13.00	13.31	13.15	13.33	13.66
07	14.09	14.86	14.47	14.00	14.37	14.18	14.03	14.57

Note: weak science commitment = low mean score
strong science commitment = high mean score

Opinions about program
- 01 = adoption ease
- 02 = adoption influences
- 03 = nature of program
- 04 = student learning
- 05 = parent reaction
- 06 = principal support
- 07 = teacher qualifications

TABLE V

ANALYSIS OF VARIANCE OF MEAN RESPONSES OF EDUCATORS WITH DIFFERENT SCIENCE COMMITMENTS REGARDING THEIR OPINIONS ABOUT THE EXPERIMENTAL EARTH SCIENCE PROGRAM

	MEAN SQUARES				F RATIOS		
	PRINCIPALS AND TEACHERS	LOW AND HIGH EDUCATORS	INTER-ACTION	WITHIN	PRINCIPALS AND TEACHERS	LOW AND HIGH EDUCATORS	INTER-ACTION
Opinions about program							
81	9.11	.45	25.63	9.03	1.00	.05	2.83
82	.83	2.67	.17	6.40	.12	.41	.02
83	39.82	19.59	.28	6.50	6.11*	3.00	.04
84	2.38	49.34	15.76	5.33	.43	8.91**	2.84
85	3.53	2.37	1.17	2.89	1.22	.82	.40
86	18.56	3.00	.01	5.24	3.53	.57	.00
87	2.19	7.78	1.04	4.26	.53	1.82	.24

Note: F ratio = analysis of variance, double classification

	df
between	3
principals and teachers	1
low and high science commitment educators	1
interaction	1
within	104
total	107

* significant at .05 level
** significant at .01 level

TABLE VI

RELATIONSHIPS BETWEEN BELIEF SYSTEMS, SCIENCE COMMITMENTS AND OPINIONS ABOUT THE EXPERIMENTAL PROGRAM FOR PRINCIPALS

DIMENSION	BELIEF SYSTEM	SCIENCE COMMITMENT
	r Values	
Belief system	1.000	
Science commitment	.029	1.000
Opinions about program		
O1 (adoption ease)	.279	-.016
O2 (adoption influences)	.184	-.005
O3 (nature of program)	.340*	.100
O4 (student learning)	.308*	.397**
O5 (parent reaction)	-.130	.054
O6 (principal support)	.189	-.059
O7 (teacher qualifications)	.315*	.248

Note: r = Pearson product-moment coefficient of correlation

* significant at .05 level

** significant at .01 level

N-2 is 42

TABLE VII

RELATIONSHIPS BETWEEN BELIEF SYSTEMS, SCIENCE COMMITMENTS AND OPINIONS ABOUT THE EXPERIMENTAL PROGRAM FOR TEACHERS

DIMENSION	BELIEF SYSTEM	SCIENCE COMMITMENT
	r Values	
Belief system	1.000	
Science commitment	-.242	1.000
Opinions about program		
81 (adoption case)	.066	-.165
82 (adoption influences)	.061	-.048
83 (nature of program)	.208	.304 *
84 (student learning)	.159	.226
85 (parent reaction)	.076	.044
86 (principal support)	.043	.101
87 (teacher qualifications)	-.026	-.005

Note: r = Pearson product-moment coefficient of correlation

* significant at .05 level

N-2 is 61

TABLE VIII

RELATIONSHIPS BETWEEN BELIEF SYSTEM, SCIENCE COMMITMENT, OPINIONS ABOUT THE EXPERIMENTAL PROGRAM AND THE VARIABLES COST PER PUPIL IN THE SCHOOL DISTRICT AND PROGRAM SUCCESS RATING FOR PRINCIPALS

DIMENSION	COST PER PUPIL	PROGRAM SUCCESS RATING
	r Values	
Belief system	.066	.300*
Science commitment	-.001	-.241
Opinions about program		
B1 (adoption ease)	-.002	.261
B2 (adoption influences)	.016	.148
B3 (nature of program)	-.067	.097
B4 (student learning)	.170	.108
B5 (parent reaction)	.034	-.403**
B6 (principal support)	.033	-.007
B7 (teacher qualifications)	.121	.164

Note: r = Pearson product-moment coefficient of correlation

* significant at .05 level

** significant at .01 level

N-2 is 42

TABLE IX

RELATIONSHIPS BETWEEN BELIEF SYSTEM, SCIENCE COMMITMENT, OPINIONS ABOUT THE EXPERIMENTAL PROGRAM AND THE VARIABLES COST PER PUPIL IN THE SCHOOL DISTRICT AND PROGRAM SUCCESS RATING FOR TEACHERS

DIMENSION	COST PER PUPIL	PROGRAM SUCCESS RATING
	r Values	
Belief system	-.068	-.031
Science commitment	.036	.206
Opinions about program		
B1 (adoption ease)	.087	-.122
B2 (adoption influences)	.044	-.050
B3 (nature of program)	.005	.040
B4 (student learning)	.037	-.002
B5 (parent reaction)	-.111	-.026
B6 (principal support)	-.346**	.159
B7 (teacher qualifications)	-.070	-.085

Note: r = Pearson product-moment coefficient of correlation

* significant at .01 level

N-2 is 61