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A Measurement of the Educational Relevance of a Short-Term Training Program for Adult Literacy Teachers. Final Report.

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The study was undertaken to provide objective data for evaluating the educational relevance of short courses for teachers in literacy programs. Two short courses were orgarized for nonprofessional ABE teachers. Teachers in each course were divided in half to form an experimental group and a control group. Experimental groups completed an attitude and opinion survey about ABE students after having actually taught ABE students; control groups did not. A multiple-time series design was used to measure change over time since this design permitted the measurement of transition rates which showed shifts among responses when the same adults responded to the same questionnaire item on two different occasions. Results indicated significant shift in responses of the experimental group of ABE teachers after actual teaching experience. The study demonstrated that: (1) training programs can be evaluated by studying changes over time of the attitudes of nonprofessional ABE teachers, and (2) the particular training courses being investigated were only qualified successes since they did not induce permanent change. (Appendix 2 contains reference to a second study which substantiates the fact that short-term courses do not induce long-term changes. (nl)

FINAL REPORT
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June 1968

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

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Robert S. Laubach and others

Laubach Literacy, Inc.

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U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

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1. Summary

Adult Basic Education (ABE) has become an important field of education in the United States. Non-professionals have been recruited to serve as teachers in ABE programs. The present study was undertaken to provide objective data for evaluating the educational relevance of short courses.

In order for a short course to have demonstrated relevance it should provide ABE teachers with a set of expectancies about student characteristics which are congruent with those attitudes and opinions gained from the teachers' own subsequent experiences in the actual instruction of students. Changes in attitude and opinion which are induced by course content should show signs of permanence. Relevance is assumed if a change in attitude or opinion, which results from training, persists in the face of actual teaching experience.

Two short courses were organized and conducted for non-professional ABE teachers. Teachers in each course were divided in half to form an experimental group and a control group. Experimental groups completed an attitude and opinion survey about ABE students after having actually taught ABE students; control groups did not. A multiple-time series design was used to measure change over-time since this design permitted the measurement of transition rates which showed shifts among responses when the same adults responded to the same questionnaire item on two different occasions.

A significant shift in teachers' responses was attributable to the short courses. The shift in responses resulting from the teaching experiences of the control group was stabilized. However, there was a significant shift in ABE teachers' responses of the experimental group after actual teaching experience; teaching experience had effected attitudes of the teachers. Moreover, the effects of training and experience were comparable in the amount of change which they had induced in teachers.

The study demonstrated that training programs can be evaluated by studying changes over-time of the attitudes of non-professional ABE teachers. In addition the study showed that the particular training courses being investigated were only qualified successes since they did not induce permanent change.

2. Introduction

In the organization of adult basic education programs at the local level, non-professionals have been recruited to serve as part-time teachers. This trend in the use of the non-professional will be accelerated, no doubt, with the dissemination of the Greenleigh Study (9) and its findings that high school graduates may do about as well as college trained teachers in teaching adult illiterates to read.

Non-professional recruits must be given at least rudimentary orientation and preparation. One of the consequences of their part-time involvement is that the teacher-training aspect of the program must be an abbreviated "cram" course, stressing only the essentials, if the start of the actual student instruction is not to be unduly delayed. To cite one specific example, an adult literacy program recently organized by the District of Columbia Public Schools was preceded by a Laubach Literacy workshop consisting of six three-hour sessions. Laubach Literacy has specialized in providing such workshops for several years.

The brevity of the training workshops imposes the necessity for a close and careful scrutiny of course content to eliminate all that is relatively unessential and irrelevant. An explicit recognition of this requirement raises two important questions:

1. How do we make an initial selection of course materials? What is the basis for deciding what is essential for literacy teachers to know?

2. How do we confirm that this selection was an appropriate one? What is the basis for evaluating the content of a short course in teaching fundamentals?

A recent and major attempt to provide guidance in the selection and presentation of course content for a short teaching fundamentals program is found in A GUIDE FOR TEACHER TRAINERS IN ADULT BASIC EDUCATION (10), compiled following three regional "trainer-of-trainees" workshops held during the summer of 1965. The GUIDE outlines in substantial detail the organization and content of a model five day training program, covering teaching methods and materials, student assessment and counseling, and the psychology of the disadvantaged adult.

Throughout the GUIDE, the editors and consultants stress the tentative and provisional nature of their curriculum proposals and suggestions, and are quick to acknowledge that "we still know so little about how to train in this field" (page v). Yet they also emphasize that, to obtain a valid assessment of program effectiveness, data must be systematically collected over a period of time, a procedure they characterize as being both "exhaustive and exhausting". In discussing feasible alternate approaches, the GUIDE's section on evaluative procedures (I:28-34) describes five methods for polling teacher trainees for their reactions to the program. It is unfortunate that all the methods discussed rely entirely upon the teachers' own subjective

judgments about what is relevant and useful. No method is offered for obtaining information which would permit an objective evaluation of course content. The omission is understandable, of course, since the "classic" experimental designs for evaluation studies involve quite elaborate provisions for follow-up.

A recent example is Withall and Fagan's (17) evaluation of an NDEA summer institute. The investigators content analyzed tapes of classroom verbal interactions, recorded before and after the teachers attended the institute. This analysis was supplemented by extensive data obtained during in situ observations of classroom behavior. Clearly, the commitment of resources necessary for such research is prohibitive for the ordinary teacher training program. What would usefully supplement the evaluative methods described in the GUIDE are a variety of relatively simple procedures of data collection and analysis which may be used on a continuing basis to provide feedback to guide the on-going revision of course content. The evaluative procedure should be incorporated as a continually functioning stage in the training process, very similar to the "quality controls" introduced into military training programs and described by Smith. (15,16)

Smith (15), in a state-of-the-art review, outlines a series of steps for controlling the quality of training programs. One of the first requirements in program planning and evaluation is the development of a measuring instrument for detecting those aspects of the program which fall short of the stated objectives. When these objectives are specific and well-defined, it is possible to develop quite sophisticated procedures for the planning and evaluation of the programs. A recent example is the Navy's TSA (Training Situation Analysis), an application of operations research to determine the optimal procedures for training military personnel to fire missiles, operate radar systems, and perform other complex tasks involving man/machine interactions. (3)

Needless to say, the skills needed to teach an illiterate to read cannot, at this time, be reduced to rigorously defined components and flow-charted as an orderly sequence of steps. The objectives of the training program for teachers must be stated more broadly. One of the advantages of the GUIDE is its statement of specific goals, a listing which provides a convenient starting point in the design of an evaluative procedure.

One of these key training objectives of the model workshop, as described in the GUIDE, served as the focus of the proposed research. That objective was to provide extensive information about the characteristics of adult illiterates so that the teachers could approach the instructional situation with some prior expectations of the illiterates' capabilities and limitations. The GUIDE asserts that

> information about the characteristics, background, and way of life of the disadvantaged must be a part of teacher-training programs (I-4)

and goes on to draw a social and psychological profile of the model illiterate, providing material suitable for inclusion in the training program curriculum.

The study attempted an empirical evaluation of this aspect of course content in a short-term training program for groups of non-professional volunteer teachers. In planning the curriculum for a brief teaching-fundamentals course intended for this population of teacher-trainees, there are reasonable grounds for questioning the relevance of this particular objective. First of all, the importance accorded the objective in the GUIDE is based on the assumption that one of the purposes of the training program is to acculturate teachers with middle class backgrounds for work with lower class, impoverished illiterates. The teacher training course outlined in the GUIDE is, in a very real sense, a retraining program intended to help teachers inexperienced in adult basic education to identify those attitudes, assumptions, and teaching practices which might impair their effectiveness. And even if we assume that some type of orientation might be valuable, it is questionable whether a short-term training program could effectively induce long-term modifications in their beliefs and opinions about the illiterates. The little time which is available for teacher training might be more wisely invested, for example, if devoted entirely to specific instructional materials, and the recommended ways of using them. Thus, we see that having decided upon one of the objectives of a teaching fundamentals course, there is a need for empirical evidence to support the relevance of the choice. And once supported, to demonstrate that the objective is being attained.

There are, of course, a number of criteria for judging the relevance of a training objective and its corresponding course content. The approach to evaluation to be pursued in the proposed research grows out of an assumption about the desired direction of change induced by the training program as it is observed over time (8) and leads to the following reformulation of the objective in a more operational testable form.

To have demonstrated relevance, the course content (and underlying training objectives) should provide teachers with a set of expectancies about student characteristics which are congruent with those generalized attitudes and opinions gained from the teachers' own subsequent experiences in the instruction of individual students. Changes in attitude and opinion which are induced by the course content should show signs of permanence, not transitoriness; they should be "locked in" by the subsequent teaching experience. Relevance is assumed if a change in attitude or opinion, which results from exposure to training course content, persists in the face of actual teaching experience.

3. Methods

(a) Workshop Groups

Two teacher training workshops were organized, to provide specialized training in literacy instruction. Originally 110 trainees took part in the training courses. The final number in the experimental group was 43 and in the control group 20.

The two workshops consisted of three class sessions, each of three hours duration. The course content and organization was based on suggestions found in Newton (13), Cortright (7), and the GUIDE (10).

For the purposes of this study, each of the two workshop groups was split in half, with teacher recruits assigned at random to one of two groups:

Group I (the experimental group) was given an attitude and opinion survey prior to the first workshop session (this administration of the survey is designated t_1). At the close of the third and final session, the teacher trainees were asked to complete the survey again (t_2). Then, after twenty hours of actual teaching experience in an instructional setting, the teachers responded to the survey a third time (t_3).

Group II (the control group) also completed the survey at three different times, with intervals corresponding to those between t_1 and t_2, and between t_2 and t_3. However, the control group did not engage in any teaching until teachers in the experimental group (I) responded to the survey a third time.

The inclusion of two experimental groups, each with corresponding controls had two purposes: As a means of replicating the findings, and as a hedge against high rate of attrition among the teachers. If either or both groups were subject to a damaging degree of participant drop-out, it might be possible to combine groups.

(b) Attitude and Opinion Survey

The attitude and opinion survey consisted of 100 short true-or-false items chosen to sample course content and included "informational" and "attitudinal" statements about the characteristics of illiterates and methods of teaching and motivating them, as drawn from the material in the GUIDE. A test for the reliability of the items of the Attitude and Opinion Survey was conducted among 40 teachers. The reliability coefficient was .90.

(c) General Design

The administration of the attitude and opinion survey at three different times to the experimental and control groups, with actual teaching experience intervening between t_2 and t_3 for the

experimental groups, corresponds to what Campbell and Stanley (3) have described as a multiple time-series design (with non-equivalent control groups.) One of the major advantages of a multiple time-series design is that it permits the effect of the independent variable to be twice demonstrated: once in comparison with the control group data, and once against the pre-experimental value (t_1) in its own series of repeated measures. In the present study the impact of actual teaching experience (the independent variable, the effect of which is measured at t_3) on the relative permanence or transitoriness of changes in attitude and opinion induced by the workshop was investigated. The multiple time-series design is diagrammed below:

Group I: t_1 --> workshop --> t_2 --> teaching experience --> t_3

Group II: t_1 --> workshop --> t_2 ----------> t_3

One of the problems in using the multiple time-series design, as Campbell (5) has pointed out, is the scarcity of appropriate statistical treatments for the data. Indeed, the methodological difficulties encountered in measuring change over time are formidable. Bereiter (2) prefaces his discussion of these difficulties by remarking that promising research often has been abandoned "solely because the statistical problems seemed to be insurmountable." It was of more than routine interest, then, when Coleman (6) recently proposed a stochastic model suitable for the description and analysis of over time changes and illustrated this model with data from a study of the effects of an orientation lecture upon soldiers' expectancies about the duration of World War II. The design of this experiment, conducted by Hovland, Lumsdaine, and Sheffield (11), is comparable to the study described in this proposal.

(d) Data Analysis

Coleman's "continuouse time, discrete-state model with random shocks" permits the measurement of transition rates in a turnover table, showing the shifts among response categories when the same subjects respond to the same questionnaire item on two different occasions. Some of the results of a pilot study have been previously reported (12) and described in the journal article attached as Appendix Two.

4. Results and Findings

(a) There was a significant shift in teachers' responses (for both experimental and control groups between t_1 and t_2), a shift attributable to the effect of the training course.

The McNemar test for significance of changes was used. For the experimental group, $x^2 = 56.824$, $df = 1$, $p < .01$. For the control group, $x^2 = 23.265$, $df = 1$, $p < .01$.

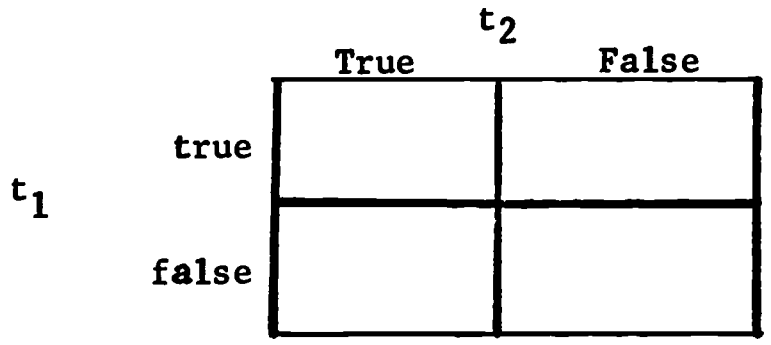
The following items exhibited significant shifts in responses between t_1 and t_2, as determined by a binomial test computed for each item. Transition rates show the direction of the shift.

ITEM	T→F	F→T	T_1T_2 for Experimental and Control Groups
3	.038	.572*	It is better to never openly correct an adult student when he makes a mistake.
7	.082	.489*	Students are apt to suffer from speech defects such as stuttering.
8	.00	.592*	Students often secretly resent their teachers' education and higher social status.
16	.00	.595**	Students usually know the alphabet before they begin literacy instruction.
23	.082	.489*	Students usually blame their illiteracy on unpleasant school experiences.
27	.046	.400**	Illiterates tend to be socially isolated, without many friends or acquaintances.
28	.00	.592*	Illiterate adults tend to come from very large families.
34	.00	.548*	The successful teacher is very patient and never bears down on her students.
35	.044	.484**	Illiterates do not venture outside their own neighborhoods much; they tend to be geographically isolated.
45	.051	.407*	Adult illiterates are more highly motivated to learn than are school children.
46	.046	.400*	Illiterates usually were born and raised in rural areas in the Southern states.
50	.039	.551**	Adults find it easier to learn to read than do children.
62	.042	.508**	Illiterates are often in poor physical health.
70	.051	.407*	Students are often too embarrassed to ask someone to help them with their homework.
71	.085	.465*	Illiterates often have no real appreciation of the advantages of being able to read.

ITEM	T→F	F→T	
91	.041	.530**	Most of the adults with whom an illiterate has close contact are at about the same level of reading ability as the illiterate himself.

* $p < .05$
** $p < .01$ as determined by computing the binomial test

The McNemar test for significance of changes, based on turnover tables is as follows (14):



(b) At the end of training (t_2), the experimental and control groups were homogeneous, i.e., there were no discernible sub-groups. The test used was an adaptation of Kuder-Richardson Formula Number 20, yielding a coefficient α, as an index of internal homogeneity.

$$\alpha = \frac{n}{n-1}\left[\frac{NEX^2 - (EX)^2 + EY^2 - NEY}{NEX^2 - (EX)^2}\right]$$

Where N = number of items, n = number of teachers, x = number of teachers, Y = number of items to which a particular teacher gave a "true" response.(1)

The coefficient α for experimental group 0.959 and the coefficient α for control Group 0.906. Note: If every teacher gave exactly the same response to every item, coefficient α would be 1.000.

(c) The shift in responses between t_1 and t_2 in the control group was stabilized in t_3. The training appeared to have a lasting effect.

Test: McNemar test for significance of changes - $X^2 = 2.656$, df = 1, n.s.

Only one item exhibited a significant shift in responses between t_2 and t_3 for control group: Item #50 (Adults find it easier to learn to read than do children.) Transition rates and results of binomial test are given below:

T→F	.065	
		t_1t_2
F→T	**.710	
T→F	*.548	
		t_2t_3
F→T	.000	

*p < .05 binomial test, **p < .01 binomial test

(d) There was a significant shift in teachers' responses between t_2 and t_3 in the experimental group; teaching experience had an effect on attitudes. Test: McNemar test for significance of changes.

$$x^2 = 46.652, \text{ df} = 1, p < .01$$

The following items exhibited significant shifts in response, between t_1 and t_2, as determined by a binomial test computed for each item. Transition rates show direction of shift.

ITEM	T→F	F→T	T_2T_3 for Experimental Groups
1	.403**	0.000	Students are often handicapped by poor vision and the lack of eye glasses.
3***	.508**	.042	It is better to never openly correct an adult student when he makes a mistake.
7***	.440*	.088	Students are apt to suffer from speech defects such as stuttering.
25	.472*	.118	Students sometimes distrust the motives of their teachers.
27***	.534**	.076	Illiterates tend to be socially isolated, without many friends or acquaintances.
35***	.403**	0.000	Illiterates do not venture outside their own neighborhoods much; they tend to be geographically isolated.
37	.403**	0.000	Class sessions cannot be too long because students get tired and bored.
48	.400**	.046	Many illiterates suffer from mental illness.
49	.434*	.048	Students are often handicapped by hearing defects.
71***	.377*	.054	Illiterates often have no real appreciation of the advantages of being able to read.
73	.457*	.152	Illiterates tend to live in the worst housing in the slum areas.
76	.414*	.092	Students are quickly and easily bored when they have difficulty understanding the lesson material.

ITEM	T → F	F → T	
84	.414*	.092	It is hard for illiterates to learn the social role of "student" in the student-teacher relationship.
91***	.489**	.082	Most of the adults with whom an illiterate has close contact are at about the same level of reading ability as the illiterate himself.

* $p < .05$ as determined by oomputing binomial test

** $p < .01$ as determined by computing binomial test

*** Items common to change from t_1 to t_2

(e) Approximately the same number of items exhibited shifts between t_2t_3 as between t_1t_2 in the experimental group. Test:

t_1 \ t_2	t	f
t	a	b
f	c	d

t_2 \ t_3	t	f
t	a	b
	c	d

This test compared the sum of shift cells (b+c) for the two turnover tables.

Mean shift for t_1t_2 = 20.070 items.

Mean shift for t_1t_3 = 20.140 items.

t test - 0.079, N.S.

The effects of training and experience were comparable in the amount of change induced.

5. Conclusions and Recommendations

The results of the project indicated that adult basic education training programs can be evaluated by studying the changes over time of the attitudes of non-professional ABE teachers. The fact that the control group changed significantly from t_1 to t_2, but did not change significantly from t_2 to t_3, showed that the effects of training were "permanent". However, the fact that the attitudes at t_2 for the experimental group eroded at t_3 suggested that the training program was not effective in maintaining "permanency". Moreover, about half of the items in the control group which changed from t_2 to t_3 were the same as the items which changed from t_1 to t_2. This fact indicated a certain lack of effectiveness of the training program; if there had been two sets of different items, or if the changes

at t_2 had remained the same at t_3 as in the control group, then the training program might have been considered effective. Therefore, an implication of this study was that the training program was only a qualified success. This study tended to confirm the fact reported in the study in Appendix Two that a short-term training course for adult basic education teachers does not effect permanent change of attitudes.

The implications for future adult basic education training programs are that training designs should include both information about those items which had changed from t_2 to t_3 as well as those items which also had changed from t_1 to t_2 so that adult basic education teachers might be more adequately prepared for their teaching roles.

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7. Appendix One - Computer Programs

TRATES

This program will give for each item a turnover table, the transition rate for True to False at t_1t_2, and t_2t_3, the transition rate for False to True at t_1t_2 and t_2t_3, an association measure between responses at t_1 and t_2, and t_2t_3, and chi square. A turnover table for combined data, a chi square for combined data, and a modified Kuder Richardson formula 20 are computed. The transition rate formula is

$$\sqrt{\frac{TF}{V}\left(\frac{TF}{TF + FT}\right)} \qquad \sqrt{\frac{FT}{V}\left(\frac{FT}{FT + TF}\right)}$$

where TF is the change from True to False and FT is the change from False to True. V is the number of subjects. The association measure formula is $\dfrac{(TT + FF) - (TF + FT)}{V}$

where TT is the number of True-True responses, TF is the change from True to False and FT is the change from False to True, and FF is the number of false-false responses. V is the number of subjects.

SHIFT

This program will give, for each subject, a turnover table and the sum of the shift cells (TF and FT). Over all subjects, the sum of the shift cells, the number of subjects, the mean, the variance, and the standard deviation are computed.

INPUT

The data preparation is the same for TRATES and SHIFT. Punch one item per card. The item number is punched in card columns 1 - 3, card column 4 is blank and all subjects responses for one item are punched in the remaining columns. A True response is represented by a 1 and a False response is represented by a 0. In TRATES line #171. (a format statement) must be altered appropriately. In SHIFT line #137. (a format statement) must be altered appropriately.

When ready to run the data T_2 must precede T_1 for each item. The input order would be as follows:

item # 1 T_2
item # 1 T_1
item # 2 T_2
item # 1 T_1

item # n T_2
item # n T_1

8. Appendix Two

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ATTITUDE CHANGES AMONG LITERACY TEACHERS COINCIDENT WITH TRAINING AND EXPERIENCE

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RICHARD W. CORTRIGHT,
AND JESSIE V. COOPER

ABSTRACT

The effects of a short-term training course in changing the attitudes of teachers toward illiterate adults was evaluated by administering an attitude survey at three different times. The magnitude of attitude change was then compared. It was found that the greater shift in attitude coincided with the period of actual teaching rather than the training course. These results indicated that a short-term course is not effective in inducing long-term changes in teacher attitudes. This conclusion is a qualified one, however, because: (1) the course may have had a selective "sleeper effect" on some attitudes wherein the occurrence of observable change was delayed, and (2) it may be feasible to moderate negative or unfavorable attitudes toward illiterate adults during the time available in a short-term course.

BACKGROUND

Teacher training courses in adult basic education typically devote a substantial block of time to the "psychology" of the illiterate so that inexperienced teachers can approach the instructional situation with some prior expectations of the illiterates' capabilities, limitations, and levels of motivation. As stated in *Adult Basic Education: A Guide for Teachers and Teacher Trainers*, "information about the characteristics, background, and way of life of the disadvantaged must be part of teacher-training programs." (6:1-4) This emphasis, found even in short-term training (the *Guide* describes a model five-day training program), reflects the widely held assumption that a determinant of success in teaching an illiterate to read is the extent to which the teacher is informed, insightful, and empathic about the student. While the validity of this assumption seems secure (see 3), there are strong grounds for doubting that brief exposure to course content can lead to enduring and significant modifications in teacher attitudes and opinions. Longitudinal studies using the Minnesota Teacher Attitude Inventory indicate, for example,

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that the attitudes of education majors may undergo marked changes as a result of college courses in education, but that once they begin to teach, their attitudes gradually revert to those held at the very start of their training. Several of these studies were summarized by Yee. (8)

The design and measurement difficulties inherent in studies of attitude change are so formidable that unequivocal conclusions are a rarity. But if an accumulation of evidence (however tentative and conditional) tends to support the view that it is unrealistic for a short-term training course to try to induce changes in attitude and opinion, the outcome might be a significant revision of the content of teacher training courses as well as a consideration of the possibility that teachers be screened, prior to training, in order to eliminate those whose attitudes and opinions might limit their effectiveness.

The study reported here is a description of the changes observed among literacy teachers in responding to an attitude survey at the beginning and end of training, and again after several months of teaching experience in a public school setting. The interrupted time series design which we used is quasi-experimental (see 1) since there was no control group, and in planning the study we were indebted to Coleman's discussion (2) of a mathematical model suitable for the description and analysis of shifts among discrete response categories (*e.g.*, true or false) when the same subjects respond to the same questionnaire items on several different occasions.

METHOD

Two of the authors (Cortright and Cooper) conducted an eighteen hour training course in adult basic education, sponsored by the public school system of a large eastern city. The initial enrollment was 23, of whom 18 were Negro women. Most of them had attended college, but none was experienced in literacy instruction. A 100 item true-or-false survey of attitude and opinion was administered during the first session (designated T_1) and again during the final session, six days later (T_2). The teachers then instructed small classes of illiterate adults three evenings a week under the supervision of school personnel. After four months of teaching experience, the survey was administered again (T_3). However, there was a 48 per cent attrition between T_1 and T_3, and consequently we retained for analysis only the response data from those 12 teachers who were still participating in the literacy program at T_3.

Responses to each item of the survey, as they were observed during the three administrations, were analyzed by constructing a pair of turnover tables. In Fig. 1 are shown the two turnover tables for item 89 from the survey.

"Adult students often forget to bring their textbooks to class."

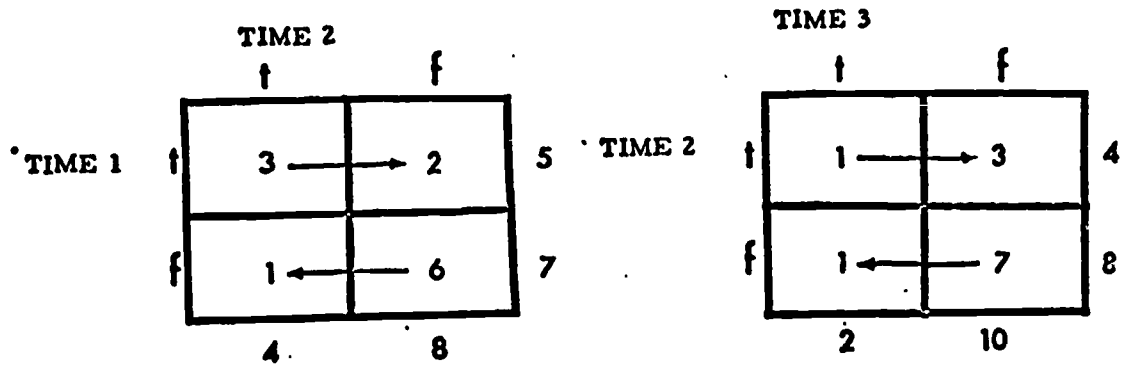

FIG. 1. Turnover tables showing responses to item 89 observed over three administrations of the survey.

Response frequencies are entered in the cells, with the upper left-hand and lower right-hand cells showing the number of teachers who did not change their responses to item 89 on the two occasions. The upper right-hand cell shows the number who said that the item was true, but subsequently changed their response to false. The lower left-hand cell shows the number who changed from false to true. We referred to these two latter cells as the "shift cells."

Once turnover tables had been compiled for every item, we summed the frequencies of the two shift cells in a table to obtain a gross measure of the magnitude of change over time, disregarding the direction of the change. We also calculated the transition "rates" from true-to-false and from false-to-true between T_1 and T_2 and between T_2 and T_3. The formula for the transition rate (S) from true to false is:

$$S_{tf} = \sqrt{\left(\frac{T}{N}\right)\left(\frac{T}{T+F}\right)}$$

where T = the number of respondents who switched from true to false (*i.e.*, the entry in the upper-right hand cell), F = the number who switched from false to true (*i.e.*, the entry in the lower-left hand cell), and N = the total number of respondents. Thus, for item 89, the transition rate from true to false between T_1 and T_2 was

$$\sqrt{(2/12)\ (2/3)} = .3333$$

Similarly, the transition rate from false to true was

$$S_{ft} = \sqrt{\left(\frac{F}{N}\right)\left(\frac{F}{T+F}\right)} = \sqrt{(1/12)\ (1/3)} = .1664$$

The S value is a weighted proportion which approaches 1.0 when nearly all the respondents shift, and everyone shifts in the same direction (*e.g.*, when all respondents shift from true to false). Conversely, S approaches zero when most of the respondents do not change over time, and there is no marked response bias among those few who do change.

Four transition rates were computed for each item of the survey: the change from true to false and from false to true, both between T_1 and T_2 and between T_2 and T_3.

RESULTS

The response data lent themselves to several kinds of analyses and the findings are reported below.

1. Changes occurred with greater frequency between the end of training (T_2) and the conclusion of four months of teaching experience (T_3), than between the first and last days of the workshop (T_1 and T_2). Between the beginning and end of the training workshop, a mean of 3.43 teachers changed their responses to an item, either from true to false or from false to true. In comparison a mean of 3.94 teachers changed their responses between the end of workshop and four months of teaching experience (again, disregarding direction). A test of significance of the difference between two means in a correlated sample yielded a t of 4.712, $p < .001$.

2. Responses to certain items (at any given time) tended to be intercorrelated and a calculation of the degree of relatedness between all pairs of items led to the detection of attitude "clusters" which were interpretable and well-defined. Contingency coefficients were calculated as a measure of inter-item response similarity and the 4,950 coefficients provided the input to a computer-oriented clustering procedure (see 4) which enabled us to detect clusters and determine their memberships. For example, we identified five major clusters in the teachers' responses to the attitude survey at the end of training (T_2).

Cluster I contained items related to the illiterates' awareness of their limitations and sense of inadequacy. Among them were:

> Many illiterates come to class because they are embarrassed that they cannot read.
>
> The adult illiterate often feels extremely handicapped by his inability to read.
>
> Students often doubt whether they have the perseverance and stick-to-itiveness to learn to read.
>
> Students tend to overestimate the difficulties of learning to read.

Cluster II consisted of statements which described the family life of illiterates. Found in this cluster were items such as:

Illiterate adults tend to come from very large families.

Illiterates do not venture outside their own neighborhoods much; they tend to be geographically isolated.

If one or both of the parents are illiterate, communication among members of the family is apt to suffer greatly.

Cluster III items pertained to the emotional stability of illiterate adults. Representative items were:

Illiterates tend to be emotionally immature.

Illiterates are very vulnerable to the appeals of fanatic hate groups.

Adult illiterates are prone to physical violence when they become angry.

Many illiterates suffer from mental illness.

Cluster IV statements described the illiterates' standards of social conduct in the classroom. Examples were:

It is hard for illiterates to learn the social role of student in the student-teacher relationship.

Adult students come to class dirty and unkempt.

Adult students often come to class under the influence of liquor.

Cluster V contained items which described the relationship between student and teacher, and included:

Students sometimes distrust the motives of their teachers.

Teachers find it difficult to hold the interest of adult literacy students.

Adult students are often tardy in coming to class.

3. Attitude clusters differed in the magnitude of change observed in their member items. The members of certain clusters exhibited greater shifts over time (disregarding direction) than did the members of others. For example, an analysis of variance of the shifts among members of the five clusters during the interval between T_2 and T_3 yielded an $F = 2.912$, $p < .05$. The five clusters, ranked in order of their average changeabilities, were: Cluster III (with a mean of 3.818 changes, either from true to false or from false to true), Cluster IV (3.727), Cluster V (3.538), Cluster II (2.541), and Cluster I (2.520).

The mean frequencies of change for Clusters III, IV, and V all differed significantly from the means of either Cluster I or II.

The rank order of these means may have reflected an underlying continuum along which the five clusters were positioned. Clusters I and II, toward one end, consisted of statements which were sympathetic and supportive toward illiterates, while toward the opposite end are the items belonging to Clusters V, IV, and III which tended to be harsh and disapproving in content. Likelihood of change appears to have been related to the locus of an item along this evaluative dimension; frequent changes tended to be associated with statements which expressed negative attitudes rather than with those expressing positive ones. Such a tendency is consistent with the research findings of Johnson and Gross (5) using the semantic differential which indicate that concepts unpleasant or "bad" in their connotations are more apt to change in meaning over time than are concepts which are pleasant or "good." It may follow that negative attitudes toward illiterates are more susceptible to change than those which are more positive, and that moderating at least some negative attitudes may be an attainable goal for a short-term training course.

4. While there was a significant change in attitude and opinion, induced through exposure to training course content, the change often was transitory since, at T_3, teachers were found to have reverted to many of the views held at the time of the first survey (T_1). As a test of the effectiveness of the training course in giving teachers an attitudinal orientation which later was confirmed or "locked in" by subsequent teaching experiences, we evaluated the transition rates (from true-to-false and from false-to-true between T_1 and T_2, and between T_2 and T_3) using a joint criterion. The rationale for a joint criterion in studies of attitude change has been put forth by Schein (7) who considered it to be a fairly stringent, yet practical, way to handle the problem of response reliability. The two criteria in our study were:

(a) The direction of the shift observed between T_1 and T_2 had to remain constant from T_2 to T_3. There could be no reversion at T_3 toward the original T_1 distribution of responses. Instead, there had to be a continued shift at T_2 and T_3 to new distributions even further removed from the original one at T_1. The unidirectionality of change in distributions can be observed in the turnover tables in Fig. 1, where one can observe the converging consensus on the "false" response over time. The true-to-false transition was larger than the transition from false to true, for both turnover tables, thus providing evidence of a growing consensus among the teachers that it was

untrue to say that adult students forget to bring their textbooks to class. Of course, the group might have reached a consensus that the statement was true, in which case the transition from false to true would have been larger than the shift from true to false for both turnover tables.

In contrast, the erosion of the short-term effect of the workshop on teachers' attitudes and opinions, with a drift back to the original distribution, can be observed in Fig. 2, which shows the two turnover tables for item 14 of the survey.

"Teachers should not be overly discouraged because most of their students dropout after a few lessons."

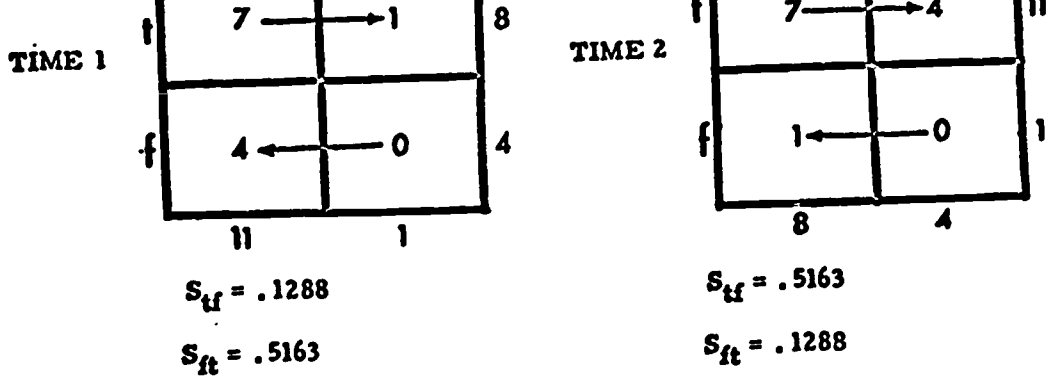

FIG. 2. Turnover tables for item 14, showing change in direction of transitions over time.

Here there is a discontinuity or reversal of direction in the shift from T_1 to T_2, when compared with the shift from T_2 to T_3. The false-to-true transition was larger than the transition from true to false in the first table, but was the smaller of the two in the second.

(b) The second criterion was a corollary of the first. When a consistent migration was observed over time, the rate of change running counter to the dominant trend had to show a corresponding reduction over time. To refer again to Fig. 1 (item 89), the effect of the training course and teaching experience appeared to induce a dominant shift from true to false. Concomitantly, the transition rates from false to true decreased from .1664 (between T_1 and T_2) to .1442 (between T_2 and T_3). Thus, most of the migration was observed among those teachers who at T_1 said that item 89 was true. Among those who originally responded "false" to the item, there was relatively little

> defection to a "true" position. The rate of transition in a direction countervailing to the dominant trend was inhibited.[1] An examination of the turnover tables for all 100 items of the survey found only 15 which met the joint criterion of convergent consensus. As a rule, changes which seemed to coincide with the training course did not persist, but were transitory and unstable. By T_3, many of the teachers had returned to the attitudes and opinions held at the very beginning of the study. These findings are similar to the research experience with the Minnesota Teacher Attitude Inventory, which were cited earlier in the paper.

5. For the 15 items which showed a cumulative consensus over time, changes occurred with greater frequency between T_2 and T_3 than between T_1 and T_2. A mean of 1.93 teachers shifted responses between the beginning and end of training, while 3.40 teachers changed between the end of training and the conclusion of four months of teaching experience. The difference was statistically significant ($t = 4.825$, $p < .01$). There are alternate and equally plausible explanations for the fact that the period of greatest change coincided with the time teachers were engaged in actual literacy instruction, even when the change was unidirectional. One conclusion which might be drawn is that "experience is the best teacher," that day-to-day involvement with illiterates in actual instruction has greater impact on attitudes and opinions than has formal training. A second, less obvious explanation is suggested in Coleman's review (2:149) of a study of Hovland, Lumsdaine, and Sheffield which investigated the effects of an orientation lecture upon soldiers' expectations about the duration of World War II:

> Most changes in information seemed to take place immediately, while most changes in attitude had a "sleeper" effect, showing more change rather than a regression as time went on.

Coleman interpreted the results as indicating that attitudinal change was contingent upon the prior acquisition of factual information relevant to the attitude. A "general strain toward consistency," or the reduction of dissonance, was seen to motivate the subjects either to realign their attitudes with the new facts or cause them to forget any information which was at variance with already established attitudes. However, in the case of the literacy teachers, the situation may have been complicated by a possible interaction between training and experience. The content of the training course may have induced cognitive change (and perhaps some marginal or short-term attitude change) by providing information about the psychology and learning characteristics of illiterates. This information content of the course may have been a

seeding for later attitude change which lay dormant until the teachers had been exposed to day-to-day instructional experience. Whenever the information content of the course was congruent with the teachers' accumulated experience in dealing with adult illiterates, long term attitude change was observed to occur. This hypothesis would make the sleeper effect a somewhat more rational and less autistic process.

What conclusion, then, may we draw from the finding that the greatest change among survey items exhibiting cumulative consensus occurred between T_2 and T_3? Did the training course have less effect on attitudes than teaching experience, or was its effect merely delayed? The design and data of the present study do not provide a basis for choosing between the two alternative interpretations. Future studies should manipulate course content, giving to an experimental group information which is withheld from the control group in order to assess the long-range effect of the information on attitude change. Until experiments are conducted which control for the availability of information, it is not possible to deny some role for short-term training in the modification of teacher attitudes. But the evidence at hand tends to cast doubt on such a role.

FOOTNOTES

1. To facilitate the use of the procedure, we prepared a package of computer programs for compiling turnover tables, computing transition rates (S_{ii} and S_{ij}), and listing those items which show response convergence over time. The programs have been written for the IBM 1401, a business-oriented computer which is widely accessible at low hourly cost, and Johnson's cluster analysis (4) may also be performed on this machine. The program package with accompanying documentation may be obtained upon request from the first author at the American Institutes for Research, 8555 16th Street, Silver Spring, Maryland 20910.

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