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PROGRAMMED LEARNING IN EXTENSION TRAINING, A COMPARISON OF THE EFFECTIVENESS OF PROGRAMMED SELF-INSTRUCTION AND WORKSHOP INSTRUCTION.

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TO COMPARE PROGRAMED SELF-INSTRUCTION WITH THE WORKSHOP METHOD THE FOLLOWING HYPOTHESES WERE TESTED-- (1) PROGRAMED SELF-INSTRUCTION IS AS EFFECTIVE AS THE WORKSHOP IN INCREASING THE EXTENSION AGENTS' KNOWLEDGE OF RADIO AS AN EXTENSION TEACHING METHOD, (2) PROGRAMED SELF-INSTRUCTION IS AS EFFECTIVE AS THE WORKSHOP METHOD IN DEVELOPING MORE POSITIVE ATTITUDES TOWARD THE USE OF RADIO, (3) PROGRAMED SELF-INSTRUCTION CHANGES EXTENSION AGENTS' SELF CONCEPT OF THEIR ABILITY TO DO RADIO TEACHING AS MUCH AS THE WORKSHOP METHOD, AND (4) AGENTS PARTICIPATING IN PROGRAMED SELF-INSTRUCTION IN RADIO WILL FEEL THAT SUCH SELF-INSTRUCTION SHOULD BE WIDELY USED IN INSERVICE TRAINING IN OTHER SUBJECT AREAS. PARTICIPATING AGENTS, A RANDOM SAMPLING FROM NAMES CHOSEN ON THE BASIS OF QUESTIONNAIRE RESPONSES FROM COUNTY CHAIRMEN, WERE DIVIDED INTO SELF-INSTRUCTION AND WORKSHOP GROUP, EACH COMPOSED OF EQUAL NUMBERS OF EACH SEX AND OF NEW AND EXPERIENCED AGENTS. BOTH GROUPS WERE PRE- AND POSTTESTED. FINDINGS SHOWED THAT PROGRAMED SELF-INSTRUCTION WAS AS EFFECTIVE AS WORKSHOP INSTRUCTION IN (1) INCREASING EXTENSION AGENTS' KNOWLEDGE OF RADIO, (2) DEVELOPING MORE POSITIVE ATTITUDES TOWARD THE USE OF RADIO IN EXTENSION TEACHING AND (3) CHANGING THE AGENTS' CONCEPT OF THEIR ABILITY TO DO RADIO TEACHING. PROGRAMED INSTRUCTION SEEMS TO OFFER POSSIBILITIES IN INSERVICE TRAINING BY ELIMINATING DIFFICULTIES CAUSED BY DISTANCE, VARYING EXPERIENCE AND LEVELS OF KNOWLEDGE, AND DELAY IN GETTING NEW AGENTS INTO GROUP TRAINING. (WB)

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and Workshop Instruction



North Carolina Agricultural Experiment Station

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# **Programmed Learning In Extension Training**

## **A Comparison of the Effectiveness of Programmed Self-Instruction and Workshop Instruction**

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# Programmed Learning In Extension Training— A Comparison of the Effectiveness of Programmed Self-Instruction and Workshop Instruction

## Introduction

The North Carolina Agricultural Extension Service has approximately 800 professional employees, of whom about 650 are county Extension workers. While all of these professional employees hold at least a Bachelor's degree, the Extension Service has the responsibility of providing inservice training that will enable its employees to develop and maintain the competence required to carry out the multitude of tasks with which they are faced in a broad-based Extension program.

Not only is the organization faced with the problem of providing training that will assure that its employees are among the most highly qualified technologists to be found in agriculture and home economics, it must also provide training to assure that agents are well qualified in such areas as management, marketing, social and economic development, 4-H, and in Extension programming and teaching.

Extension's staff of specialists has traditionally had inservice training of county personnel as a primary responsibility. However, in recent years the problem of providing adequate inservice training has become especially acute—in part because of the very rapid discovery of new knowledge and development of new technology, and in part because of the increased scope

of Extension's responsibility and the resulting greater range of competencies required to meet this responsibility.

In order to meet this growing need for inservice training, the Extension Service must be alert to new developments in teaching and actively experiment with new approaches to training. This publication is a report on the experimental use of one relatively new technique in training — programmed self-instruction.

While programmed instruction has its roots in many years of basic research in the psychology of learning, it has come to the forefront as a promising teaching technique within the last nine years. It has been extensively tested in classroom situations, especially at the secondary and elementary school level. The research has indicated that it is both an effective and efficient means of teaching in many situations.<sup>1</sup>

On the basis of preliminary research from 1954-1959, programmed instruction began to move rapidly from the psychological laboratories to the classroom during the 1960-61 school year.<sup>2</sup>

<sup>1</sup> See, for example, Wendell I. Smith and J. William Moore, *Programmed Learning*, D. Van-Nostrand Company, Inc., Princeton, New Jersey, 1962.

<sup>2</sup> "Out of the Laboratory, Into the Classroom," *Programmed Instruction*, May 1961, Vol. 1, Bulletin No. 1, p. 1.

By September 1962, 122 programs were available for use by educators.<sup>3</sup>

While the research to date appears to establish quite conclusively that programmed instruction is effective and efficient in many classroom situations, there has been little experimentation with the technique in Extension training.

However, Tait and Hatch of the Pennsylvania Extension Service prepared a program designed to teach radio broadcasting to Extension agents.<sup>4</sup> This program was then used to test the relative effectiveness of programmed self-instruction and of workshop teaching of the same material in training.<sup>5</sup> Tait's summary of the results of this study includes the following:

... the self-instructional program increased knowledge of radio more than the workshop method.

Self-instruction and the work-

shop changed the agents' attitude toward radio and their self-concept of their own ability to do radio. But, the difference between the two training methods was not significant.

An analysis of the performance of the self-instructional group indicates that the highest gains in self-concept came from those who had been in Extension the longest time, and from those with the heaviest current radio load. The data also showed that the longer a new agent had been in Extension, the lower was his attitude toward self-instruction.

New agents in general showed sufficient interest in self-instruction as a training method, so that further research can now be undertaken in which agents use self-instruction on the job rather than under laboratory conditions.

The findings in this study suggest that programmed self-instruction may have a place in the Extension inservice training program, but that much more research is needed.<sup>6</sup>

## Objectives of This Study

The general purpose of this study is to compare participation in programmed self-instruction and in a workshop as methods of increasing Extension agents' knowledge of radio in Extension teaching and in changing their attitudes toward its use in Extension teaching. More specifically,

the objective is to test the following hypotheses:

1. Programmed self-instruction is as *effective* as the workshop in increasing the agents' knowledge of radio as an Extension teaching method. This is true regardless of length of tenure of the agents.
2. Programmed self-instruction is as effective as the workshop method in developing more positive attitudes toward the use of radio. This holds regardless of length of tenure.
3. Programmed self-instruction changes agents' self-concept of their ability to do radio teaching as much as does the workshop

<sup>3</sup> *Programs '62*, United States Government Printing Office, Washington, District of Columbia, 1962.

<sup>4</sup> Elton B. Tait and J. Cordell Hatch, *Makes Radio Work for You* (Multilithed), The Agricultural Extension Service, The Pennsylvania State University, University Park.

<sup>5</sup> Elton B. Tait, *A Comparison of Self-instruction and a Workshop as Methods of Training Newly Hired County Extension Personnel in the Subject of Radio Broadcasting*, Extension Studies No. 15, Pennsylvania State University, University Park, Pa., August 1962. See also, Emory J. Brown, "Teaching Machines," *The Evaluator*, No. 19, June 1963, Pennsylvania Agricultural and Home Economics Extension Service, University Park, Pa.

<sup>6</sup> Tait, *op. cit.*, p. 1.

method. This is true regardless of length of tenure.

4. Agents participating in programmed self-instruction in radio will feel that such self-instruction should be widely used in inservice

training in other subject matter areas. However, there will be an inverse relationship between favorableness toward the use of programmed self-instruction and length of tenure of the agent.

## Research Design and Procedure

The basic design for testing hypotheses 1-3 above was to compare the changes taking place in a sample of agents participating in self-instruction with the changes in a sample of agents receiving instruction in a workshop. The program developed by Tait and Hatch<sup>7</sup> was used by the self-instructional group. The same material as that covered in the program was covered in a workshop on March 20 and 21, 1963. Similarly, the knowledge tests and the attitude scales developed by Tait and Hatch were used in this study.<sup>8</sup> Thus, in a number of respects this study is a replication of the Pennsylvania study, but two major variations were purposely introduced.

The basic design of the Tait study referred to above<sup>9</sup> was the comparison of changes in knowledge, attitude, and self-concept of three groups of agents: (1) those receiving self-instruction, (2) those receiving workshop instruction of the same material, and (3) a control group receiving no instruction. All agents in each group had been employed by the Extension Service for less than 20 months. All of these agents were invited to University Park to participate in the training. On the first afternoon all were given the battery of tests: the knowl-

edge test, attitude toward radio scale, and an attitude scale designed to measure each agent's self-concept of his ability to do effective radio teaching. The agents were then ranked on the basis of their scores on these tests and were assigned to the three groups by a stratified random sampling procedure.

The same battery of tests was administered the next morning to the control group; and following one day's instruction, to the other two groups. The self-instructional group worked with the program in private hotel rooms while the workshop group was taught by the two authors of the program in the traditional classroom setting.

The changes referred to above were based on changes in the knowledge test scores and in the attitude scale scores. In addition, the agents participating in self-instruction were also asked to indicate their reaction to the use of programmed self-instruction in Extension training.

In this study, the two major variations from the Pennsylvania design are as follows:

First. The agents participating in self-instruction worked through the programmed material on the job.<sup>10</sup> They were not brought into Raleigh as was the workshop group. Each of

<sup>7</sup>Tait and Hatch, *op. cit.*

<sup>8</sup>See Appendices 1-3.

<sup>9</sup>Tait, *op. cit.*

<sup>10</sup>This variation was suggested by Tait in Tait, *op. cit.* p. 1, and in conference with the North Carolina research group.

these agents was invited to meet the researcher and one of the radio specialists in small groups of from six to eight in a location convenient to their county during the week of March 25-29, 1963. At this time the pretests were administered and they were instructed in the use of the program. They were asked to work through the program during the following two weeks and then to return for the posttests and for the discussion of any questions that arose from the material. The posttests plus an attitude scale on the use of programmed self-instruction in Extension training were administered before the discussion of the subject matter took place.

For the Extension Service, one of the important possible advantages of self-instruction hinges on the reduced cost of training if agents can participate effectively without the cost required for bringing them together in Raleigh or in other out-of-county locations. Also, motivation appears to be especially crucial in self-instruction, and bringing the group together in an experimental situation is very likely to increase motivation. This is still probably a factor in this study, since the agents were necessarily aware that they were participating in an experimental study. However, this effect was presumably less than if they were brought together at a central location where they would be more directly competing with the workshop group.

Second. Rather than selecting only a sample of "new" agents as was done in Pennsylvania, two samples of 30 agents each were selected—one of 30 "new" agents and one of 30 "experienced" agents. Tait's study suggested that length of tenure may affect the agents' responses to self-instruction despite the fact that the range

in tenure was very small in the sample.<sup>11</sup> For this reason this variable was studied in more detail.

For purposes of this study "new" agents were defined as those employed between June 30, 1961, and December 30, 1962; and "experienced" agents, as those employed before January 1, 1958. Thus, at the time of training one group of agents had 20 months or less of Extension experience while the other group had more than five years of such experience. Of each sample of 30, 14 were home economics agents (or assistants) and 16 were agricultural agents (or assistants). It was necessary to stratify on the basis of sex because of the higher rate of turnover in home economics personnel resulting in a disproportionate number of women among "new" agents. Without such stratification the "new" sample would possibly have been predominantly women and the "experienced" sample predominantly men.

For both "new" agents and "experienced" agents the following sampling procedures were used:

1. A questionnaire was sent to all county Extension chairmen asking them to list the regular radio programs of the Extension staff in their county. They were also asked to indicate the average number of times per month that each staff member broadcast. Only those agents who were on the air two or more times monthly were considered eligible for training.
2. The dates of employment of the agents who were eligible on the basis of involvement in radio teaching were then checked. Thus, lists of eligible "new" agents and of eligible "experienced" agents were developed.

<sup>11</sup> *Ibid.*, p. 17.



3. Each of the lists was sampled (with stratification by sex) by the use of random numbers. In cases where the agents selected by this procedure were unable to participate in training because of conflicts in schedule or for other reasons, substitutions were made on a random basis. (It was necessary to substitute for about 20 percent of the original sample.)
4. After the total sample was selected, half of each tenure and sex group were randomly assigned to the self-instruction group and half to the workshop group.

In the Pennsylvania study the pretest scores were available before the agents were assigned to groups for training. This enabled Tait to use this information to assure that each group

had similar pretest scores. Since these scores were not available in this study before such assignment was made, the first step in the analysis was to determine if there were significant differences in the knowledge and attitude of the groups before training. Presumably both level of knowledge and attitude toward radio could have an important effect upon learning during the training session.

As indicated in the analysis below (Tables 2, 7, and 13), there were no significant differences between the self-instruction group and the workshop group or between the new agents and the experienced agents in their pretest scores. Thus, each group was at approximately the same level both with respect to knowledge and attitudes before receiving the training.

## Analysis and Findings

### Radio Knowledge

The primary objective of the training was to increase the agents' knowledge of the use of radio in Extension teaching and thus hopefully to increase the competence of the agents in the use of this medium.

As indicated above, the first step in the analysis was to determine if there were significant differences<sup>23</sup> between the pretest scores of the workshop and self-instruction group and between those of new agents and experienced agents.

As may be seen in Table 1, the differences between the scores of the

various groups were quite small; and as indicated in Table 2, these differences were not significant by the *F*-test. Not only was there no significant difference between the pretest scores of the self-instruction and workshop groups, the small differences between the scores of new agents and experienced agents were also insignificant. This was true despite the fact that many of the experienced agents had presumably been using radio for a number of years.

As may be seen in Table 3, both the self-instruction group and the workshop group increased their scores on the knowledge test significantly after they had participated in training. Those receiving training in the workshop setting increased their scores by an average of 16.63 points while those participating in programmed instruction increased their scores by an average of 19.33 points.

<sup>23</sup> Throughout this report either the *t*-test or *F*-test is used to test significance of differences. The .05 level of probability was used in decision as to significance. Where the differences between pretest and posttest scores are tested, the individual pretest and posttest scores were paired in order to eliminate the correlation effect. See George W. Snedecor, *Statistical Methods*, Iowa State College Press, 1953.

**Table 1. Mean Pretest Scores on Radio Knowledge Test by Type of Instruction and by Tenure of Agents**

Tenure	Type of instruction					
	Workshop		Self-instruction		Total	
	No.	Mean score	No.	Mean score	No.	Mean score
New agents	15	52.13	15	52.80	30	52.47
Experienced agents	15	56.53	15	54.80	30	55.67
Total	30	54.33	30	53.80	60	54.07

**Table 2. Analysis of Variance of Pretest Scores on Radio Knowledge Test by Type of Instruction and Tenure of Agents**

Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	3,136		
Type of instruction	1	5	5	.100 (ns)
Tenure	1	154	154	3.084 (ns)
Type of instruction x tenure	1	180	180	3.604 (ns)
Error	56	2,797	49.94	

*.05 level of significance.*

**Table 3. Mean Pretest Knowledge Scores and Mean Posttest Knowledge Scores of Agents by Type of Instruction Received**

Time of testing	Type of instruction			
	Workshop		Self-instruction	
	No.	Mean score	No.	Mean score
Pretest	30	54.33	30	53.80
Posttest	30	70.96	30	73.13
Difference		16.63		19.33
		$t = 13.86^*$		$t = 13.42^*$

*\* Significant at .05 level.*

The difference between these groups in gains, however, was not statistically significant (Tables 4 and 5). Thus, we cannot conclude that programmed self-instruction was any more effective than workshop instruction.

The new agents, however, apparently made greater gains in knowledge than did the experienced agents. In the workshop group, the new agents increased their score by an average 19.07 points as compared to a gain of 14.07 points by experienced agents—

**Table 4. Mean Gains in Scores on Radio Knowledge Test After Training by Type of Instruction and by Tenure of Agents**

Tenure	Type of Instruction				Total	
	Workshop		Self-Instruction		No.	Mean gain
	No.	Mean gain	No.	Mean gain		
New agents	15	19.07	15	23.40	30	21.23
Experienced agents	15	14.07	15	15.27	30	14.73
Total	30	16.63	30	19.33	60	17.98

**Table 5. Analysis of Variance of Gains in Scores on Radio Knowledge Test After Training by Type of Instruction and by Tenure of Agents**

Source of variation	Degress of freedom	Sum of squares	Mean square	F
Total	59	3,169		
Type of instruction	1	109	109	3.71 (ns)
Tenure	1	634	634	21.61*
Type of instruction x tenure	1	783	783	26.69*
Error	56	1,643	29.34	

\* Significant at .05 level.

a difference of 5.00 points. The new agents participating in programmed instruction made even greater gains than did the experienced agents—23.40 points as compared to 15.27. As shown in Table 5, these differences between tenure groups were statistically significant. Similarly, the significant interaction effect (type of instruction x tenure) indicates that the differences in gains by tenure groups were significantly greater in the self-instruction group than in the workshop. That is, while new agents learned more than did experienced agents in a workshop situation, the differences between new agents and experienced agents were even greater in the programmed self-instruction group.

### Attitudes toward the Use of Radio in Extension Teaching

The extent to which agents feel that radio may be used effectively in Extension teaching presumably varies widely. Some agents feel that it is of little value in an Extension program while others are convinced that it can be used to do many teaching jobs very effectively. The attitude scale was designed to give some measure of how favorably the agents viewed radio as an Extension teaching tool. (Appendix 1). (It should be pointed out perhaps that the most positive possible attitude may be just as unrealistic as a very negative attitude. That is, the agent who feels that radio is the most effective means of

**Table 6. Mean Pretest Attitude Scores by Type of Instruction and by Tenure of Agents**

Tenure	Type of instruction					
	Workshop		Self-instruction		Total	
	No.	Mean score	No.	Mean score	No.	Mean score
New agents	14	40.71	14	41.93	28	41.32
Experienced agents	14	43.85	14	44.93	28	44.39
Total	28	42.29	28	43.43	56*	42.86

\* This number varies from that in the previous tables because certain attitude scales were incorrectly filled in and thus not usable.

**Table 7. Analysis of Variance of Pretest Attitude Scores by Type of Instruction and by Tenure of Agents**

Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	55	2,791		
Type of instruction	1	19	19	.397 (ns)
Tenure	1	132	132	2.757 (ns)
Type of instruction x tenure	1	151	151	3.154 (ns)
Error	52	2,489	47.87	

.05 level of significance.

teaching in almost every situation is no more realistic than the agent who feels it has no place in Extension teaching.)

While the training was designed primarily to increase knowledge, some impact on attitudes was also anticipated.

The mean pretest attitude scores are shown in Table 6. The small differences between the scores of the various groups were not significant (Table 7). Thus, there was apparently little difference in the attitude of the groups toward radio prior to training.

Both the workshop group and the self-instruction group apparently became more favorable in attitude to the use of radio as a result of training. The attitude scores of both groups

increased significantly (Table 8).

There was no significant difference between the workshop group and the self-instructional group in their gains in attitude score (Tables 9 and 10). Thus, there appears to have been little difference between the effectiveness of the two methods of instruction in changing attitudes.

In contrast to the case in changes in knowledge, the "new" agents made no significantly greater gains in attitude scores than did the "experienced" agents.

Thus, while the attitudes of all groups became more favorable as a result of training, neither type of instruction nor tenure appears to have been related to degree of change.

**Table 8. Mean Pretest and Posttest Scores on Attitude Scale by Type of Instruction Received**

Time of testing	Type of instruction			
	Workshop		Self-instruction	
	No.	Mean score	No.	Mean score
Pretest	28	42.29	28	43.43
Posttest	28	48.04	28	49.43
Mean gain		5.75		6.00
		$t = 3.885^*$		$t = 5.660^*$

\* Significant at .05 level.

**Table 9. Mean Gains in Attitude Score After Training by Type of Instruction and by Tenure of Agents**

Tenure	Type of instruction				Total	
	Workshop		Self-instruction		No.	Mean gain
	No.	Mean gain	No.	Mean gain		
New agents	14	5.86	14	6.85	28	6.36
Experienced agents	14	5.64	14	5.14	28	5.39
Total	28	5.75	28	6.00	56	5.87

**Table 10. Analysis of Variance of Gains in Attitude Score After Training by Type of Instruction and by Tenure of Agents**

Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	55	2,513		
Type of instruction	1	1	1	.02 (ns)
Tenure	1	13	13	.27 (ns)
Type of instruction x tenure	1	21	21	.44 (ns)
Error	52	2,478	47.65	

.05 level of significance.

Training presumably increases one's confidence in his ability to perform the task for which the training is given. One of the purposes of this study was to determine the relative impact of programmed learning and the workshop upon the agents' conception of their ability to do radio

teaching.<sup>19</sup> The agents' conception of their ability to do radio teaching was measured by an instrument that will

<sup>19</sup> It should again be emphasized that the primary objective of the training was to increase knowledge. If the primary objective had been to increase the agents' confidence in his ability to do radio teaching, it would probably have been desirable to provide opportunities for doing specific tasks under supervision. This was not done.

**Table 11. Mean Pretest Self-Concept Scores by Type of Instruction and by Tenure**

Tenure	Type of Instruction					
	Workshop		Self-Instruction		Total	
	No.	Mean score	No.	Mean score	No.	Mean Score
New agents	15	16.40	15	17.60	30	17.00
Experienced agents	15	16.33	15	18.60	30	17.47
Total	30	16.37	30	18.10	60	17.23

**Table 12. Analysis of Variance of Pretest Self-Concept Scores by Type of Instruction and by Tenure**

Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	1,085		
Type of instruction	1	45	45	2.633 (ns)
Tenure	1	3	3	.176 (ns)
Type of instruction x tenure	1	80	80	4.681*
Error	56	957	17.09	

\* Significant at .05 level

be referred to as the "self-concept scale" from here on (Appendix 2).

In this case, too, there appears to have been little difference between either the tenure groups or the workshop and self-instructional groups in their confidence in their ability to teach via radio (Table 11 and 12).

Similarly both those receiving training in the workshop and by programmed self-instruction made small gains in self-concept scores (Table 13). These gains while small were great enough to be statistically significant. Thus, both types of training apparently resulted in some increase in the agents' confidence in their ability to teach by radio.

However, there appears to be little difference between the effectiveness of the two methods of instruction in increasing self-concept scores (Tables 14 and 15). Similarly, there was no significant gain between the two ten-

ure groups as to their gain in self-concept.

The discussion to this point has centered upon the *relative effectiveness* of programmed self-instruction—that is, the extent to which self-instruction actually brought about changes in knowledge and attitudes. Another important consideration in choosing teaching methods is the relative efficiency of each method. For example, even if all the methods under consideration are known to be effective, one might bring about the desired changes more rapidly than the others. That is, it may be more *efficient* than the other methods.

On the basis of the data presented thus far it cannot be concluded that there was any difference between the *effectiveness* of the workshop and self-instruction. However, programmed self-instruction does appear to have been substantially more *efficient* than

**Table 13. Mean Pretest Self-Concept Score and Mean Posttest Self-concept Score of Agents by Type of Instruction Received**

Time of testing	Type of instruction			
	Workshop		Self-Instruction	
	No.	Mean score	No.	Mean score
Pretest	30	16.37	30	18.10
Posttest	30	17.87	30	20.00
Difference		1.50		1.90
		$t = 2.336^*$		$t = 2.396^*$

\* Significant at .05 level of probability.

**Table 14. Mean Gains in Self-concept Score After Training by Type of Instruction and by Tenure of Agents**

Tenure	Type of instruction					
	Workshop		Self-Instruction		Total	
	No.	Mean gain	No.	Mean gain	No.	Mean gain
New agents	15	.87	15	2.80	30	1.83
Experienced agents	15	2.13	15	1.00	30	1.56
Total	30	1.50	30	1.90	60	1.70

**Table 15. Analysis of Variance of Gains in Self-Concept Scores After Training by Type of Instruction and by Tenure of Agents**

Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	727		
Type of instruction	1	19	19	1.593 (ns)
Tenure	1	1	1	.984 (ns)
Type of instruction x tenure	1	39	39	3.269 (ns)
Error	56	668	11.93	

was the workshop. The actual time devoted to instruction in the workshop was 9.5 hours. (This excludes the time taken for testing, coffee breaks, and introductions.) The average time required by the self-instruction group to cover the same material was 6.18 hours. Thus, the self-instruction group spent 35 percent less time

in training than did the workshop group. This, of course, does not take into account the time required for travel to and from Raleigh in order to participate in the workshop.

The time required for agents to work through the self-instructional program varied widely with one agent completing the program in less than

four hours and another taking more than 10 hours. (The agent requiring more than 10 hours was the only agent taking as much as the 9.5 hours that was spent on the workshop teaching.) The distribution of agents by the time spent on self-instruction is shown in Table 16.

The attitude of agents toward programmed self-instruction might well affect the extent to which it could be used in inservice training. In order to obtain some indication of agents' feelings about self-instruction, an "attitude toward self-instruction scale" was administered to agents. Table 17 shows a summary of the agents' responses to the scale items. Most of the agents apparently felt that programmed self-instruction could play an important role in inservice training. While the reaction to possible use of self-instruction rather than workshop in specific types of training varied widely, there was widespread agreement that much inservice training could be done by programmed self-instructional devices if such devices were available. For example, 70 percent of the agents either "agreed" or "strongly agreed" that Extension should do half its inservice training through self-instructional devices (Item 8, Table 17).

**Table 16. The Distribution of Agents by Time Spent on Self-Instruction**

Hours	Agents	
	Number	Percent
Total	30	100.0
Less than 4	1	3.3
4.00 - 4.99	8	26.7
5.00 - 5.99	7	23.3
6.00 - 6.99	7	23.3
7.00 - 7.99	0	0.0
8.00 - 8.99	4	13.4
9.00 or more	3	10.0

As indicated earlier, the Pennsylvania study suggested that the longer an agent had been in Extension, the lower was his attitude toward self-instruction. In order to test this hypothesis the attitude scores of the new agents and experienced agents were compared. The mean score of new agents was 14.60 while that of experienced agents was 13.27. The difference between these scores, however, was not significant at the .05 level by the one-tailed *t*-test. Thus, the difference may well have been due to sampling error so it cannot be concluded that new agents reacted to self-instruction more favorably than did experienced agents.

## Summary and Conclusions

Hypotheses 1-3 as stated on page 4 are supported by the data. That is, programmed self-instruction proved to be as effective as workshop instruction in increasing knowledge of radio, in developing more positive attitudes toward the use of radio in Extension, and in changing the agents' concept of their ability to do radio teaching.

In general, these findings are simi-

lar to those of Tait.<sup>14</sup> In contrast to the Pennsylvania situation, however, agents participating in self-instruction did not increase their knowledge of radio significantly more than did the workshop group.

An unanticipated result was the discovery that new agents made greater increases in knowledge than

<sup>14</sup> Tait, *op. cit.*



Table 17. Summary in Percentages of the Reaction of Agents Participating in Self-Instruction to "Attitude Toward Self-Instruction" Scale

Items on scale	N	Strongly agree	Agree	Don't know	Disagree	Strongly disagree
1. A person is more likely to learn more from the programmed self-instruction method than he does from a straight textbook.	30	63.3	30.0	3.3	3.3	—
<b>Men only</b>						
2. You'd get more help on <i>farm business analysis</i> in a training meeting than from a self-instruction device.	16	6.2	56.3	6.2	31.3	—
3. You'd get more help on livestock feeding from a self-instruction device than in a training meeting.	16	6.2	31.3	12.5	43.8	6.2
<b>Women only</b>						
4. You'd get more help on <i>household management for the beginning homemaker</i> from a self-instruction device than in a training meeting.	14	21.4	35.7	—	35.7	7.1
5. You'd get more help on a <i>refresher course in nutrition</i> from a training meeting than from a self-instruction device.	14	21.4	21.4	—	42.9	14.3
<b>Both men and women</b>						
6. You'd get more help on <i>training 4-H leaders</i> by the self-instruction method than you would from a training meeting.	30	10.0	26.7	10.0	50.0	3.3
7. You'd get more help on <i>how to do television</i> from a training meeting than you would from a self-instruction method.	30	13.3	40.0	13.3	26.7	6.7
8. It has been suggested that Extension do half its inservice training by using the self-instruction devices instead of using the traditional training methods such as training meetings and conferences. How do you feel about this?	30	23.3	46.7	10.0	20.0	—

Each of the scale items was scored 4, 3, 2, 1, or 0, with the highest score being given to the response which showed the most favorable attitude. On the basis of a 24-point scale the self-instruction group averaged 13.93.

did experienced agents. This difference was greater among those participating in self-instruction than among those participating in the workshop. This difference may indicate that it is somewhat more difficult to change understandings if trainees have the opportunity to develop extensive preconceptions on the basis of long experience before training. In this connection, it should be noted that somewhat different material was emphasized in this training than had been emphasized in previous training activities. Thus, as was indicated by the similarity in pretest scores, much of the material was as new to experienced agents as it was to new agents.

While the effectiveness of the programmed self-instructional method and of the workshop method was similar, self-instruction was substantially more efficient than was the workshop. This was true on the basis of time required for instruction alone; and if time required for travel and the cost of travel and subsistence were also considered, the advantages of self-instruction would be far greater.

This analysis did not take into account the cost of developing the programmed material. Developing programs is a very time-consuming and costly process, and the apparent advantages of self-instruction would be offset by the cost of program preparation unless the programmed material was such that it could be used quite extensively.

Most agents participating in self-instruction felt that programmed self-instruction could be used effectively in inservice training. However, the hypothesis that new agents would be more favorable to self-instruction than experienced agents (page 4) was not supported by the data.

The findings of the Pennsylvania study and of this study as well as the large body of research on programmed learning in other situations indicate that the Extension Service should give serious consideration to the role that programmed learning should play in inservice training. With a staff that is dispersed over great distances, the cost (both in staff time and in travel and subsistence) of training in workshop or classroom settings is very expensive. Also, a frequent complaint of both specialists and agents is that participants in training conferences often have very different backgrounds of experience and differing levels of knowledge. Thus, material that is too advanced for one trainee may be needless repetition for another.

Programmed material may offer a way out of the dilemma posed by this situation. For example, if a two-day workshop on radio were to be held, one approach might be to ask the participants to work through the program before coming to the workshop. Thus, the agents would presumably come into the workshop with a common background in basic material and be prepared to participate in a true workshop situation in which they could concentrate upon preparation of script, delivery, etc., with appropriate critiques.

Another basic problem in Extension training is that of enabling new employees to become productive as rapidly as possible. With traditional methods it is very difficult to provide adequate training quickly since new personnel are continuously being employed and it is often months after employment before group training can be provided. Programmed materials appear to offer real possibilities of providing more training earlier for such employees.

There appears to be little doubt that there are many situations in which programmed self-instruction can be used effectively in inservice training. However, the problems inherent in providing appropriate materials is so great that few good programs are likely to become available unless the Extension Service makes a serious effort to encourage the development of such materials.

The writing of programs is a highly specialized task, often requiring close collaboration between a subject matter specialist and an expert in programmed learning (usually a psychologist). The writing of such material is so different from the writing

of other Extension materials that it requires quite different skills. Very few subject matter specialists are likely to be able to write such materials without extensive study of programmed learning and without extensive consultation with specialists in the field.

The advantages offered by such materials appear to be so great that the training officers and administrators of Extension Services, as well as specialists, should give the problem serious consideration. This would appear to be an enterprise in which several states and the Federal Extension Service might very profitably cooperate.

# APPENDICES

## Appendix 1

### Attitude Toward Use of Radio in Extension Teaching

#### Schedule A, 1

1968

Read each of the following statements. Mark one point on the five-point scale which would indicate how you feel about each statement.

1. An Extension worker is not making good use of his time to drive 10 miles once a week to do a 13-minute live radio program.  
Strongly agree\_\_\_ Agree\_\_\_ Don't know\_\_\_ Disagree\_\_\_ Strongly disagree\_\_\_
2. If a news story breaks (such as one of your 4-H members being named champion), the first news medium you would contact would be the radio station.  
Strongly agree\_\_\_ Agree\_\_\_ Don't know\_\_\_ Disagree\_\_\_ Strongly disagree\_\_\_
3. The time you spend on radio is well worth it.  
Strongly agree\_\_\_ Agree\_\_\_ Don't know\_\_\_ Disagree\_\_\_ Strongly disagree\_\_\_
4. You can't justify buying a tape recorder out of county funds solely for the purpose of doing a daily radio program.  
Strongly agree\_\_\_ Agree\_\_\_ Don't know\_\_\_ Disagree\_\_\_ Strongly disagree\_\_\_
5. People in general are responsive to radio programs.  
Strongly agree\_\_\_ Agree\_\_\_ Don't know\_\_\_ Disagree\_\_\_ Strongly disagree\_\_\_
6. It is not worth spending an hour's time in preparation for a 10-minute broadcast.  
Strongly agree\_\_\_ Agree\_\_\_ Don't know\_\_\_ Disagree\_\_\_ Strongly disagree\_\_\_
7. One Extension worker gets up three times a week to do a 6:45 A.M. broadcast. He's justified in doing this.  
Strongly agree\_\_\_ Agree\_\_\_ Don't know\_\_\_ Disagree\_\_\_ Strongly disagree\_\_\_
8. County agents (agricultural and home economics) do radio more because pressure is put on them by radio stations and supervisors, not because radio is an effective means of doing Extension.  
Strongly agree\_\_\_ Agree\_\_\_ Don't know\_\_\_ Disagree\_\_\_ Strongly disagree\_\_\_

(Each question received a score of 0, 1, 2, 3, or 4. The maximum score was given to the response that indicated the most favorable attitude toward radio.)

**Schedule A, 2  
1963**

Suppose you were confronted with each of the situations listed below. They require that you communicate with people.

Rank the four Extension methods in the order you think they would be appropriate to do each Extension job listed below.

<b>Job to be done</b>	<b>County-wide meeting</b>	<b>Circular letter</b>	<b>Newspapers</b>	<b>Radio</b>
To inform people about a Jap beetle outbreak	_____	_____	_____	_____
To promote the 4-H Achievement Day	_____	_____	_____	_____
To tell working women how to prepare a one-dish meal	_____	_____	_____	_____
To report your year's Extension activities	_____	_____	_____	_____
To change the attitude of consumers toward farmers	_____	_____	_____	_____
To give women a simple Easter egg recipe	_____	_____	_____	_____
To report Mr. Doe's success with a new corn variety	_____	_____	_____	_____
To report that your county 4-H judging team won at the State contest	_____	_____	_____	_____
To tell what one group of women did about weight control	_____	_____	_____	_____
To report an election of officers of 4-H County Council	_____	_____	_____	_____

(Only the rank assigned to radio was scored. The following scores were assigned to the rank given for each job: rank 4, scored 0; rank 3, scored 1; rank 2, scored 2; rank 1, scored 3. The attitude score was arrived at by totaling the scores on schedule A, 1 and schedule A, 2. Thus, the attitude scores could range from 0 to 62.)

## Appendix 2

### Self-Concept Scale

**Schedule S-C  
1963**

**In your opinion, how capable do you think you are to do the jobs listed below which are sometimes required in Extension?**

**Please rate each item whether you have performed it or not.**

	Very capable	Fairly capable	Not very capable	Not at all capable
Ad-libbing a radio program from notes	_____	_____	_____	_____
Writing a circular letter	_____	_____	_____	_____
Selecting a news story suitable for radio	_____	_____	_____	_____
Reading a prepared radio script on the air	_____	_____	_____	_____
Making a farm or home visit	_____	_____	_____	_____
Writing a one-minute spot	_____	_____	_____	_____
Writing your annual report	_____	_____	_____	_____
Evaluating the effectiveness of your radio programs	_____	_____	_____	_____
Speaking to your 4-H leaders' meeting	_____	_____	_____	_____
Doing an on-the-spot taped radio interview	_____	_____	_____	_____
Doing a beep phone report from a 4-H event	_____	_____	_____	_____
Writing a personal newspaper column	_____	_____	_____	_____
Operating a tape recorder for a co-worker	_____	_____	_____	_____
Interviewing a local person in radio studio	_____	_____	_____	_____
Speaking to a local service club	_____	_____	_____	_____
Writing a script for a 10-minute radio program	_____	_____	_____	_____

**(Only the 10 radio-related items were scored. These were scored as follows: very capable, 3; fairly capable, 2; not very capable, 1; not at all capable, 0. These scores were totaled to give the self-concept score. Thus, the score had a possible range from 0 to 30.)**

## Appendix 3

### Attitude Toward Programmed Self-Instruction

#### Schedule SIM

1963

You have just been exposed to a self-instructional method of inservice training. This type of instructional device is designed for self-study in your county at times which would be convenient to you.

Please help us to evaluate this method of inservice training by answering the following questions exactly as you feel about them right now.

1. A person is more likely to learn more from the programmed self-instructional method than he does from a straight textbook.

Strongly agree\_\_\_ Agree\_\_\_ Don't know\_\_\_ Disagree\_\_\_ Strongly disagree\_\_\_

Let's suppose you needed training in the following subjects. Suppose each of them was put into a self-teaching device similar to the one you've just completed on radio, and was also put into a good, traditional training meeting. Which would you think you'd get the most help from?

#### Men only

2. You'd get more help on farm business analysis in a training meeting than from a self-instructional device.

Strongly agree\_\_\_ Agree\_\_\_ Don't know\_\_\_ Disagree\_\_\_ Strongly disagree\_\_\_

3. You'd get more help on *livestock feeding* from a self-instructional device than in a training meeting.

Strongly agree\_\_\_ Agree\_\_\_ Don't know\_\_\_ Disagree\_\_\_ Strongly disagree\_\_\_

#### Women only

4. You'd get more help on *household management for the beginning homemaker* from a self-instructional device than in a training meeting.

Strongly agree\_\_\_ Agree\_\_\_ Don't know\_\_\_ Disagree\_\_\_ Strongly disagree\_\_\_

5. You'd get more help on a *refresher course in nutrition* from a training meeting than from a self-instructional device.

Strongly agree\_\_\_ Agree\_\_\_ Don't know\_\_\_ Disagree\_\_\_ Strongly disagree\_\_\_

#### Both men and women

6. You'd get more help on *training 4-H leaders* by the self-instructional method than you would from a training meeting.

Strongly agree\_\_\_ Agree\_\_\_ Don't know\_\_\_ Disagree\_\_\_ Strongly disagree\_\_\_

7. You'd get more help on *how to do television* from a training meeting than you would from a self-instructional method.

Strongly agree\_\_\_ Agree\_\_\_ Don't know\_\_\_ Disagree\_\_\_ Strongly disagree\_\_\_

8. It has been suggested that Extension do half of its inservice training by using the self-instructional devices instead of using the traditional training methods such as training meetings and conferences. How do you feel about this?

Strongly agree\_\_\_ Agree\_\_\_ Don't know\_\_\_ Disagree\_\_\_ Strongly disagree\_\_\_

(The response most favorable to self-instruction was scored as 4, the one next most favorable as 3, and so on with the least favorable response scored as 0. The total score for men was the sum of the scores on questions 1, 2, 3, 6, 7, and 8; and for women, on questions 1, 4, 5, 6, 7, and 8. The possible range in scores was 0 to 24.)