

AN EXPERIMENTAL STUDY USING COMPRESSED SPEECH
THEORY IN CONTINUING EDUCATION FOR TEACHERS

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Wittich and Schuller (1979) concluded from research findings that nearly 50 percent of a typical student's time is spent in listening. They noted that in higher grade levels more time was spent in listening, with college students spending as much as 90 percent of their time listening to lectures and discussions.

Orr (1968, p. 29) noted that "anything that has the potential for improving the efficiency of education today, even if it does not improve the quality, has great significance." The innovation of rate-accelerated (compressed) speech and the technological refinement of the process of producing compressed speech offers possibilities for agricultural teacher educators to increase the efficiency of the continuing education process. Challes (1973), Dailey (1974), and Silverstone (1974) reported the normal or average rate of speech to be between 100 and 175 words per minute (wpm). Silverstone (1974) further noted that the average listener's thought can accept messages at about 400 wpm.

Friedman, Graae, and Orr (1967) with college age students; Fairbanks, Gutman, and Miron (1957) with young adult male Air Force trainees; and Nath (1978) with pharmacists in inservice programs have demonstrated success with speech compressed by 50 percent or more. However, compression greater than this rate reduced comprehension and/or generated learner resistance. Nath further concluded that the difficulty level of material, up to a 75 percent compression rate, did not affect the comprehension level of pharmacists.

The conclusion drawn regarding research on compressed speech is not that persons necessarily learn more or comprehend better, but that persons can learn and comprehend just as much in a reduced period of time. For example, a 50-minute audio lesson recorded at a normal rate of speech (150 wpm) can be compressed to a rate of 250 wpm for a 30-minute audio lesson, a tremendous time saving for both the agricultural teacher educator and the student.

Purpose

The purpose of this study was two-fold: (1) to determine the effect of 50 percent compression rate of speech on high school vocational agriculture teachers' comprehension of technical agricultural material, and (2) to determine the attitude of those teachers toward the use of compressed speech for continuing education.

Hypotheses

The following null hypotheses were formulated:

- H₀1 - There is no significant difference in comprehension by vocational agriculture teachers listening to audio tapes at a 50 percent compression rate (Group I) and those listening at a normal speech rate (Group II).
- H₀2 - There is no significant difference in attitude of the compressed speech group (Group I) and the normal speech group (Group II) after listening to tapes, when rating:
- H₀2_a - That they had no trouble understanding the audio tapes.
 - H₀2_b - That the audio tapes were too fast.
 - H₀2_c - That the audio tapes held their interest.
 - H₀2_d - That the orientation tape session helped them understand the full-depth audio tapes.
 - H₀2_e - That they would retain the information presented on the audio tapes.
 - H₀2_f - That the audio tapes were effective vehicles for presenting complex information.
 - H₀2_g - That the audio tapes were effective learning vehicles.
 - H₀2_h - That they would be willing to receive continuing education programs via audio tapes recorded at the same speed.
 - H₀2_i - That if audio tapes reduced time spent in continuing education activities, they would be willing to use tapes as a supplemental means of acquiring continuing education.

Methodology

Research Design

This study used a pretest-posttest control group design. An equal number of subjects (16) was randomly assigned to each group, which was then randomly assigned to treatments. Following is a graphic representation of the research design:

Groups

Experimental, Group I (N=16)	R	O ₁	X ₁	O ₃	O ₅
Control, Group II (N=16)	R	O ₂	X ₂	O ₄	O ₆

where,

O₁, O₂ = Pretest on comprehensive instructional material
("The Pork Carcass" and "Swine Health Management")

X₁ = 50 percent compressed tape,

X₂ = Normal speech tape,

O₃, O₄ = Posttest on content material, and

O₅, O₆ = Audio tape attitude survey.

Population

The population consisted of 32 randomly selected teachers of vocational agriculture in Alabama who registered for credit or non-credit livestock classes with the Auburn University Agricultural Education Department during the summer quarter of 1980.

The degrees held by subjects included 34.4 percent bachelors, 59.3 percent masters, and 6.3 percent AA (one year with masters). None of the subjects (all male) reported having a hearing deficiency. Mean age was 33.2 years, with a standard deviation of 9.8. Mean years taught was 9.3, with a standard deviation of 8.6.

Instrumentation

A cognitive test and an attitude scale were used to secure information for the study. The literature search yielded no standardized test related to "The Pork Carcass" and "Swine Health Management," the content material included in the study. Development of the cognitive test consisted of compiling 42 multiple choice, completion, and true-false test questions from the instructor's manual and from chapters 23 and 25 of the textbook, *The Science of Animal Husbandry, Second Edition* (Blakely and Bade, 1979). These were the two chapters reproduced in audio tape form and used in the study.

Content validity was established through a jury of experts. The jury was asked to read chapters 23 and 25 of the text and "inspect" and "evaluate" each test item concerning basic content validity. Results indicated a 100 percent positive agreement among the jury concerning (1) clarity, (2) content correctness, and (3) content covered in the text. The jury was then asked to give an overall rating of the instrument from 1 to 100 on content validity criteria, with 100 being the most positive rating. The criteria and average of jury ratings were: (1) Items repre-

sented content area from which they were drawn - 94 percent; (2) Items proportionally sampled the content area covered - 88 percent; and (3) Items would measure the knowledge of subjects in the designated content area - 98 percent.

On the cognitive test, a Pearson product moment correlation coefficient of .95 was established between a test-retest involving 22 vocational agriculture teachers in a pilot study. The Kuder-Richardson Formula 20 value for the first administration of the instrument was .82, representing the internal consistency of the instrument.

Nath's (1978) survey for assessing attitude toward the audio tape was adapted, again using a jury of experts. The pilot study involving 22 vocational agriculture teachers was used to establish the reliability coefficient for the adapted instrument. The Spearman-Brown Prophecy Formula yielded a .93 estimate, while the randomized split-half method yielded a coefficient of .85, representing internal consistency of the instrument. The instrument was scored by subjects on a five-point scale as follows: (1) Strongly disagree, (2) Disagree, (3) Neutral, (4) Agree, and (5) Strongly agree.

Data Analysis

The Statistical Analysis System (SAS) was used in analyzing the data. On the cognitive test, an analysis of variance was used to test differences between pretest means of the two groups and to analyze the influence that age and number of years subjects had taught vocational agriculture had on the pretest means. Analysis of variance was also used to test mean score gain differences of the experimental and control groups.

The chi-square statistic was used to compare group responses to the attitude scale. All hypotheses were tested at the .05 alpha level.

Treatment

An audio technician at Auburn University provided the technical assistance in developing the tapes. To further insure clarity of the tapes, a professional drama and broadcasting personality read the script for the taping. To accomplish a 50 percent compression of the tapes, the Varispeech II Audio Tape Compressor, produced and marketed by Lexico Corporation, Waltham, Massachusetts, was used.

The normal speech tape was 23 minutes and 22 seconds in length, at 142 wpm, while the 50 percent compressed speech tape was 11 minutes and 42 seconds in length, at 285 wpm. Tapes were recorded on cassettes and played on a Bell and Howell (Model 3085) cassette tape player. Material presented in the tapes covered chapters 23 and 25 from the Blakely and Bade (1979) text.

Chapter 23, "The Pork Carcass" covered the topics of Marketing Classes and Marketing Pork, Slaughtering and Dressing Hogs, Measurements of Carcass Quality, Carcass Grades and Grading, Wholesale and Retail Pork Cuts, and Pork By-Products. Chapter 25, "Swine Health Management" included the topics of Anemia, Atrophic Rhinitis, Brucellosis, Cholera, Dysentery, Erysipelas, Hypoglycemia, Leptospirosis, Transmissible Gastroenteritis, Vesicular Exanthema, Mycoplasma Pneumonia, and SPF Pigs. The reading level of the material was advanced college level, as measured by the Fry Readability Formula.

Five-minute orientation tapes were used to acquaint the groups with the speed of the tape to which they would listen. They covered material from the same textbook, but not related to the content used in the treatment.

The first day, all subjects were administered the pretest, then assigned an identification number to use on their materials in order that individuals might remain anonymous. The researcher and a monitor then retrieved all tests. Afterwards, the researcher conducted a brief orientation session explaining what was to take place and a trained treatment administrator and a monitor then accompanied the subjects who had been randomly assigned to one of the treatment groups to separate classrooms to begin the treatment. Group I, the 50 percent compressed speech group, and Group II, the normal speech group, listened to the orientation tapes and then to the respective treatment tapes.

The researcher also monitored to further insure that the experimental guidelines were being followed. Upon completion of the audio sessions, the subjects were administered posttests, demographic data forms, and attitude tests.

Results

Pretest means for Groups I and II were 37.78 and 40.01, respectively. Analysis of variance of the pretest scores produced an F value of 0.34, with a probability level of 0.56. Therefore, it was concluded that there was no significant difference between the two groups on the pretest. This indicated that the random assignment of subjects to equate the groups was successful.

Further analyses of pretest scores by age and number of years that subjects had taught vocational agriculture revealed no significant relationships. Mean ages for Groups I and II, respectively, were 33.44 and 32.88 ($F=.03$, $p=.87$). The mean number of years that subjects had taught agriculture for Groups I and II, respectively, were 9.94 and 8.69 ($F=.16$, $p=.69$). Therefore, it was concluded that there were no significant differences between groups relative to age and number of years of teaching experience.

Analysis of variance was also used to test for significant differences between the mean gain scores of Groups I and II and is reported in Table 1 with other associated statistics. The obtained F value from the analysis of variance was 1.67, with a probability level of 0.21. Therefore, no significant difference was indicated between Groups I and II, and H_{01} could not be rejected. It should be noted, though, that both Groups I and II showed considerable improvement on the posttest, with mean gains of 33.03 and 28.56, respectively.

Table 1
ANALYSIS OF VARIANCE AND ASSOCIATED STATISTICS RELATED TO
PRETEST MEAN DIFFERENCES FOR GROUP I AND GROUP II

Source of Variance	df	Sum of Squares	Mean Square	F Value	P
Groups	1	159.58	159.58	1.67	0.21
Error	30	2864.24	95.47		
Total	31	3023.82			

Means for Experimental Group I and Control Group II		
	Group I	Group II
Pretest	37.78	40.01
Posttest	70.81	68.57
Pretest-Posttest mean differences	33.02	28.60

The chi square test was used to determine relationships between Groups I and II associated with the sub-parts of H_{02} . For H_{02a} , a chi square value of 16.31 and a probability level of 0.0026 was reported, indicating a difference between the distribution of group responses. A significantly higher proportion of Group I (compressed speech) subjects disagreed with the statement that they had no trouble understanding the tapes. Thus H_{02a} was rejected.

Associated with H_{02b} , a chi square value of 7.773 and a probability level of 0.1003 was obtained, indicating no significant difference between the distribution of group responses on ratings of whether or not the tapes were too fast. H_{02b} was not rejected.

Most subjects in both groups agreed that the tapes held their interest. No significant relationship was exhibited with a chi square of 1.529 ($p=.63$) and H_02_c was not rejected. For H_02_d , a chi square value of 4.416 with a probability level of 0.2199 was reported, indicating that the two groups did not differ in their ratings of how much the orientation tape helped them understand their tape. Again, there was not a significant relationship between groups and their perceptions of how much information they would retain from the tapes ($X^2= 1.144$, $p = .5645$). H_02_e , in turn, was not rejected.

For H_02_f , a chi square value of 14.707 with a probability level of 0.002 was obtained, indicating a significant difference between the pattern of responses of the two groups. Significantly more Group II subjects agreed and Group I subjects disagreed with the statement that the tapes they heard were effective vehicles for presenting complex information. Thus H_02_f was rejected.

A chi square value, relating to H_02_g , of 5.022 with a probability level of 0.2850 was noted. Most Group I and II subjects agreed that the tapes they heard were effective learning vehicles and, with no significant difference, H_02_g was not rejected. A chi square value of 2.565 with a probability level of 0.6330 was obtained for H_02_h , indicating no significant difference between the groups' responses. Most subjects from both groups agreed that they would be willing to receive continuing education programs via audio tapes recorded at the same rate of speed they heard. H_02_h was not rejected.

Associated with H_02_i , a chi square value of 2.667 with a probability level of 0.6151 was reported, indicating no significant difference between the distribution of responses of the groups. Most, with an equal number from both groups, agreed that if the tapes reduced the time spent in continuing education activities, they would be willing to use tapes as a supplemental means of acquiring continuing education credit. H_02_i was not rejected.

Conclusions

The following major conclusions were drawn:

1. High school teachers of vocational agriculture can improve their knowledge of technical agriculture material by listening to audio tapes at normal rates of speech or at 50 percent compressed rates of speech.
2. The attitudes of the two groups did differ significantly on two measures, but did not differ on the other seven attitudinal measures. A larger percentage of Group I subjects (the compressed speech group) than Group II subjects indicated that they had difficulty

understanding the tape and that the tapes were not effective in presenting complex information.

3. Even though the agriculture teachers who listened to the tapes compressed to a 50 percent rate felt (1) they had difficulty in understanding the tapes, (2) the tapes were too fast, and (3) the tapes were not effective vehicles for presenting complex information, they did score as well as the control group in half the time.
4. The orientation tape assisted agriculture teachers in becoming acclimated to the faster compressed speech tape.
5. Vocational agriculture teachers would be willing to accept and continue tape instruction at the 50 percent compressed rate or at the normal speech rate. Also, at both speed rates, teachers would be willing to use the tapes as a supplemental means of acquiring continuing education if it reduced the time they spent in continuing education activities.

Recommendations and Implications

The following summary of recommendations and implications is offered:

1. To make more efficient use of time, agriculture teacher educators should consider using 50 percent compressed speech audio tapes to provide basic content information to teachers in continuing education activities. However, additional research should be done to ascertain if the findings of this study would be replicated with female teachers.
2. With more frequent use of individualizing instruction via audio tapes, a longitudinal study should be done to see if frequent use by teachers of audio tapes at 50 percent compression rates would reduce some of the negative attitudes toward the tapes.
3. Additional research should be done to evaluate knowledge retention between the normal speech and 50 percent compressed speech rate. Also, research is needed to evaluate the benefits of compressed speech for concept teaching.

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