

## A PRE-POSTTEST EVALUATION OF LIVESTOCK MANAGEMENT INSTRUCTIONAL MATERIALS

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### Abstract

*A set of instructional materials on Total Quality Management livestock practices was evaluated by pre-posttest measures of attitudes. The posttest was administered one year after the pretest, and students were paired on three measures, gender, grade in school, and whether or not they raised livestock. Contrary to researchers' expectations, attitudes after use of the materials tended to be lower than attitudes before use of the materials. But when ratings on the posttest were compared with a control group of students, there were significant differences favoring those taught with the new materials. Females rated their use of TQM livestock practices higher than males as did those with livestock compared with those without. Also, the 10th and 11th graders had higher ratings than 12th graders. This study illustrated some of the difficulties in evaluating instructional materials without disrupting the flow of classes. Historical factors and differential selection are two of the extraneous variables cited as affecting this pre-post study. Recommendations for future evaluations of instructional materials are to use a variety of methods to assess their value.*

Collections of instructional materials are an integral part of high school agriculture departments, and a well-equipped department will have an abundance of teaching materials gleaned from a variety of sources (Phipps & Osborne, 1988). A basic pedagogical skill of good teachers is the use of appropriate resources (Mundt, 1991). Resource materials include bulletins, magazines, videos, computer programs, and textbooks.

National and state curriculum centers, the National Council for Agricultural Education, the FFA Foundation, and private industry all are in the business of developing new instructional materials for use in high school agriculture departments. Some of these materials have been evaluated (Foster, Bell, & Erskin, 1995; Birkenholz, Baker, Garton, & Ribble, 1996); however, many instructional materials do not receive adequate evaluation, and very seldom is time or money spent to acquire acceptable information about performance (Worthen & Sanders, 1987, p. 96). Suggestions for evaluation of instructional materials

are to use a jury of experts or to assess their effectiveness by the use of pre-post procedures. In pre-post procedures, student knowledge, attitudes, or skills are assessed before and after the materials are used, and those ratings are compared.

Cook and Campbell (1979), building on previous work of Campbell and Stanley (1963), discussed twelve extraneous variables that may cause problems with internal validity when applying experimental methods to educational situations. Two of the twelve are of specific concern to pretest-posttest studies: history and differential selection. History refers to the opportunity for other events to occur besides the treatment, especially when the pretest and posttest are separated over a long time. Differential selection refers to problems with choosing who takes part in the pretest and posttest. Because school situations deal with intact groups, there are inherent difficulties in selection of subjects.

Some of the previously-mentioned difficulties were present in the evaluation of an award winning set of instructional materials, "Total Quality Management for Youth Producers" (TQM, 1993). These materials were produced under a multi-state grant from the United States Department of Agriculture and have been used in agriculture departments across the nation. The set includes seven videotapes and a handbook with seventeen learning activities focused on the role of youth in producing safe food of high quality. The question is, were there differences in students' attitudes toward their livestock practices after the use of the new materials?

### **Purpose**

The purpose of the study was to determine whether or not a new set of instructional materials affected students' attitudes toward the use of TQM livestock practices. A related purpose was to assess the effect of gender, grade level, and raising of livestock on students' attitudes toward TQM practices. Specific objectives were:

1. To describe respondents by gender, grade level, and whether or not they raised livestock.
2. To assess differences in students' ratings of their livestock practices before and after the use of the new materials.
3. To assess relationships among students' ratings of livestock practices and gender, grade in school, and whether or not they raised livestock.

### **Methodology**

This was a quasi-experimental study, and the population was defined as 255 Iowa community high schools with approximately 10,000 agriculture students. Because of limitations of time and budget, a random sample of 66 schools was determined by using a table of random digits. To avoid bias in the experiment, schools of six teachers who initially reviewed the questionnaire for content validity were eliminated from the selection. Also serving as reviewers for content validity were

faculty and staff at the university, students, and authors of the materials. The researchers mailed a cover letter, 50 questionnaires, and a return envelope to each of the 66 randomly selected schools in the spring of 1994. A follow-up letter to nonrespondents yielded a total of 1,099 responses from 45 schools for a 68% return rate. A year later, in the spring of 1995, a cover letter, 50 questionnaires, and a return envelope were mailed to the 45 schools who had been part of the pretest study. A total of 732 students from 27 schools completed the questionnaires. Two of the schools whose students completed the pretests had not used the materials; their students completed posttest questionnaires and were used as a control group. Their ratings were compared to paired pretest-posttest ratings of students in two randomly selected schools that had used the new materials.

Data were analyzed using the Statistical Package for Social Science, Personal Computer Version (SPSSx/PC+). A Cronbach's alpha reliability test for the entire instrument resulted in a coefficient of .95; coefficients for the eight constructs ranged from .72 to .81. Analyses of data included means, standard deviations, paired t-tests, independent t-tests, and analysis of variance. Before running the analyses, the level of significance was set at .05. For purposes of analysis, students who completed the posttest were paired with students from the pretest by grade, gender, and whether or not they raised livestock. The individual matching resulted in 419 pairs of students with similar characteristics. Individual matching is preferable to aggregate matching, although it often results in a drastic drop in number of cases. Some critical differences not considered in the matching might have affected the results (Rossi & Freeman, 1993).

### **Findings**

Table 1 displays demographic data on the students in the study. When students were matched by grade, gender, and whether or not they raised livestock, the total number of usable responses was

Table 1. Description of Respondents by Gender, Grade, and Whether or Not They Raised Livestock (n = 419)

Item	Description	Total		Raised livestock			
				Yes		No	
<b>Gender</b>	Male	338	81	155	46	183	54
	Female	81	19	43	53	38	47
	Total	419	100	198	47	221	53
<b>Grade</b>	Freshman (9th)	122	29	41	34	81	66
	Sophomore (10th)	125	30	72	58	53	42
	Junior (11th)	90	21	47	52	43	48
	Senior (12th)	82	20	38	46	46	54
	Total	419	100	198	47	221	53

419. The usable responses included 122 agricultural students in grade nine (29%), 125 students in grade ten (30%), 90 in grade eleven (21%), and 82 in grade twelve (20%). There were more males (81%) than females (19%) in the sample. Only about half of the students raised livestock, 46% of the males and 53% of the females.

Respondents' scores on the pretests in the spring of 1994 and posttests in the spring of 1995 were compared by using paired t-tests (Table 2). Responses to individual items were grouped by construct before t-tests were run to help reduce the error that occurs from multiple t-tests (Hinkle, Wiersman; & Jurs, 1994). If t-tests had been run on all 46 individual items, it is likely that two or more of the items would have shown a significant difference just by chance.

There were three significant differences, and mean scores tended to be lower on the posttest than they were in the pretest. This finding was contrary to what the researchers expected. A possible explanation is that teachers were devoting more

time to topics such as horticulture and environmental concerns in the second year of the study and were spending less time teaching about livestock. Overall, there was no significant difference in the pretest and posttest ratings, and students tended to agree (3.86 and 3.81) with the constructs making up quality management of livestock. The constructs receiving highest ratings by the high school students were producing a quality product and sanitation of animals. Those constructs receiving lowest ratings included genetics and implanting.

The questionnaires in this study were designed to be completed by intact groups of students during their agriculture classes. These classes would include both boys and girls and students with livestock projects and those without. Table 3 displays the ratings from the pretests and posttests, showing that there was a significant difference by gender with females having significantly more agreement with quality livestock management practices than males. Students involved with raising animals were significantly more positive (Table 3) than those who were not

Table 2. Means, Standard Deviations, and Paired t-tests of Pretest & Posttest Attitudes Toward Livestock Production (n = 4 19)

Constructs	Pretest	Posttest	t-value
	M SD	M SD	
Handling of animals	3.91 0.64	3.77 0.73	-3.12*
Planning and managing of animals	3.78 0.59	3.72 0.67	-1.24
Selecting chemicals for animals	3.85 0.72	3.74 0.84	-2.03 *
Selecting vaccinations and medications for animals	3.93 0.62	3.90 0.63	-0.64
Implanting of animals	3.74 0.66	3.74 0.79	0.00
Sanitation of animals	3.99 0.67	3.89 0.72	-2.12*
Genetics of animals	3.74 0.72	3.75 0.73	0.14
Producing a quality product	3.94 0.79	3.97 0.81	0.49
Total attitude score	3.86 0.53	3.81 0.59	1.32

Note: Scale: 1=Strongly Disagree; 2=Disagree; 3=Unsure; 4=Agree; 5=Strongly Agree; \*p < .05

involved; however, in all instances, students' attitudes were in agreement with quality livestock production practices.

Table 4 displays the results of analysis of variance of students' attitudes by grade. Analysis of variance was performed to determine if students in different grades had differences in their overall attitudes toward livestock production. In the pretest, the highest mean scores ranged from 3.79 (11 th grade) to 3.91 (10th grade). There were no

significant differences in the pretest scores among the grade levels in students' overall attitudes toward use of quality livestock production practices. In the posttest however, there was a significant difference (at the .05 level) in students' overall attitudes toward livestock production by grade. The mean ratings of sophomores (3.89) and juniors (3.90) were significantly higher than seniors' ratings (3.65). Students in the 10th and 11th grades more strongly agreed with quality livestock management practices.

Table 3. Pretest/Posttest Means, Standard Deviations, and t-tests of Respondents' Overall Attitudes toward Livestock Production by Gender and Whether or Not They Raised Animals (n = 4 19)

	Pretest			Posttest		
	n	Mean SD	t-value	n	Mean SD	t-value
Gender						
Male	338	3.82 0.54	2.64*	338	3.78 0.60	2.03*
Female	81	4.00 0.44		81	3.98 0.54	
Raising Animals			3.81*			2.46*
With	198	3.96 0.47		198	3.88 0.56	
Without	221	3.77 0.56		221	3.74 0.61	

Note: Scale: 1=Strongly Disagree, 2=Disagree, 3=Unsure, 4=Agree, 5=Strongly Disagree; \*p < .05

There were two schools in the study that did not use the new materials including student activities and videotapes on total quality management of livestock. The scores of these students on the posttest were not included in the analyses of the matched data but were used as a control group, and their scores were compared with students in two schools randomly selected from those using the new materials (Table 5). Overall, the students in the schools that used the materials had ratings significantly higher than students in the schools that did not use the materials. For three of the eight constructs, the students with the new materials had significantly higher ratings. The number of students in the two schools that did not use the materials was larger (74) than the number (24) in the randomly selected two schools because the matched pairs procedure eliminated a large number of students.

### Summary and Conclusions

The use of the new award-winning instructional materials on livestock care and management, which focused on concerns of consumers as suggested by the Total Quality Management movement, produced posttest ratings no higher than pretest ratings. Female students, tenth and eleventh graders, and those who raised livestock were more likely to agree with overall quality management practices. There were significant differences (at the .05 level) by gender, grade in school, and whether or not they raised livestock.

It is unclear whether these instructional materials made any difference in students' attitudes toward livestock management practices. Although the ratings of those who used the materials were higher than those without, the pretest ratings tended to be higher than the posttest ratings. Other instructional materials evaluation efforts have also found that materials were unsuccessful in

Table 4. Analysis of Variance by Grade Level of Respondents' Overall Pretest & Posttest Attitudes Toward Livestock Production (n = 4 19)

Grade Level	Pretest			Posttest		
	n	Mean SD	F-value	n	Mean SD	F-value
9th	122	3.87 0.49	1.20	122	3.79, 0.62	4.70*
10th	125	3.91 0.48		125	3.89, 0.51	
11th	90	3.79 0.52		90	3.90, 0.55	
12th	82	3.83 0.65		82	3.61, 0.65	

Note: Scale: 1=Strongly Disagree; 2=Disagree; 3=Unsure; 4=Agree; 5=Strongly Agree; Means in the same column that do not share subscripts, differ at  $p < .05$  by the Sheffe' analysis; \* $p < .05$

significantly changing student attitudes, either between experimental and control groups or within groups between pretest and posttest scores (Whent & Williams, 1990; Hosseini, 1982; Birkenholz, 1982). According to Campbell and Stanley (1963, p.23), "the great bulk of educational experiments show no significant differences, and hence are frequently not reported." These new livestock instructional materials may have been excellent, but the results of this study offer no proof.

### Recommendations

The following recommendations to researchers in agricultural education are based on a review of literature and the findings from this study:

1. Use a variety of methods to assess the value of instructional materials, rather than a Pretest/posttest measure alone.
2. Survey both teachers and students as to the value of instructional materials.

3. Do not assume that new materials are without value, simply because there are not significant changes in students' attitudes. Without the new materials, there could have been a significant decline in ratings.
4. Consider using a jury of experts and a set of consumer criteria to evaluate new instructional materials.

### Significance of the Study

The study was generalizable only to the schools in the study, but may have implications for the profession as a whole as we strive to provide current, appropriate materials for classroom instruction. There are still unanswered questions on how to determine the value of materials, and this paper illustrates some of the difficulties in trying, as there was no control over which students completed the questionnaires. The researchers were able to control the selection of the schools and the time of year, but the teachers may have used the questionnaires with different classes or may have

Table 5. T-tests of Respondents' Posttest Attitudes Toward Livestock Production by Schools With and Without New Materials(n = 98)

Constructs	M	M	t-value
	SD	SD	
	With new materials (n = 24)	Without new materials (n = 74)	
Handling of animals	3.78 .80	3.80 .78	-1.14
Planning and managing of animals	4.00 .63	3.59 .78	2.33*
Selecting chemicals for animals	4.09 .69	3.69 .93	1.95
Selecting vaccinations and medications for animals	4.02 .52	3.79 .79	1.65
Implanting of animals	3.97 .62	3.44 1.23	2.77**
Sanitation of animals	4.13 .51	3.91 .76	1.34
Genetics of animals	4.07 .65	3.55 1.00	2.41*
Producing a quality product	4.18 .74	3.78 1.00	1.80
Total attitude score	4.03 .49	3.69 .70	2.17*

Note: Scale: 1=Strongly Disagree, 2=Disagree, 3=Unsure, 4=Agree, 5=Strongly Disagree; \*p < .05

taught the livestock unit in a different manner or in a shorter time frame. Also, their previous instructional materials may have been of equal or better quality than the new set of livestock videos and student activities.

A prime consideration in this study was how to test the value of the materials without disrupting the flow of a class. Is there some way to do a more controlled experimental study? Would these students have done just as well with whatever materials the teachers had used the previous year? Or would those materials have been outdated by the next year? Does what students learn depend more

on the skill of the teachers than on the quality of the instructional materials? Would a jury of teachers and/or teacher educators do a better job of assessing the value of materials than a measure of changes in student attitudes?

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