A Pretest-Posttest Comparison Involving Community College Agriculture Students

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Teachers need effective teaching materials. Agriculture teachers are faced with the perpetual problem of keeping instructional information current. Educational media, particularly audio-visual curriculum materials, can be used to improve the delivery of agricultural information. Slide/tape sets can be tailored and updated easily (Brown, 1969).

Arnheim (1969) suggests that man thinks visually, and that the visual makes verbal thinking possible. By utilizing visual and verbal techniques of instruction, students learn more effectively (Grady, 1979).

Hetzel (1980) investigated the use of the audio-tutorial format for a service course in farm machinery. Previously taught by the traditional lecture-laboratory method, the course was developed into audio-tutorial modules with supplementary laboratory exercises. The researcher concluded that students learning by the audio-tutorial modules performed as well as those taught by traditional methods. In this experiment, both the time saved in the classroom and the ability to reach more students justified the investment in time and resources. Slide and tape (audio-visuals) media are effective instruments to use to disseminate new information in agriculture.

New technical information in agriculture must be provided to programs of agriculture. The Illinois Institute of Natural Resources provided funds to the Department of Agricultural Education and Mechanization at Southern Illinois University to develop and field test new pesticide use and water quality curriculum materials for Illinois agriculture programs. These curriculum materials were developed for the purposes of providing knowledge of regulations on pesticide use in Illinois and the relationship of pesticides to the environment. Industry personnel, agriculture teachers representing high school and community college programs, and state regulatory staff were used to develop and validate the new curriculum materials. A Pesticide Use and Water Quality booklet (53 pages) and slide/tape set (80 slides, approximately 19 minutes) were the result of this effort.

The problems researched were as follows: How effective was cognitive achievement of new curriculum materials in community college agriculture programs? How effective was slide/tape media in comparison with printed materials? Were selected independent variables (student sex, pesticide use, class level, and farm or non-farm location) related to cognitive achievement of new curriculum materials?

The objectives were:

1. Determine the level of cognitive achievement of community college students using new curriculum materials.
2. Compare the effectiveness of slide/tape media with that of printed material in the cognitive achievement of new curriculum materials.
3. Determine the association of selected independent variables (class level, sex: female or male, farm status: live on-farm or off-farm, pesticide use) to the dependent variables, pretest and post-test scores.

Two tests were used to collect the data. Pretest and posttest questions were identical. Twenty content questions were based on the recommendations of consultants representing the pesticide industry, agriculture teachers, and regulatory personnel.

The test's content validity was further assessed by a panel of curriculum specialists. Reliability of the test was assessed by the test-retest technique. The reliability coefficient of the test was .79. The researcher taught both methods to all groups.

The printed material group consisted of five community college agriculture programs (102 students), and the slide/tape group consisted of five community college agriculture programs (95 students).

The printed material group received the following instruction:

5 minutes -
Introduction to Pesticide Use and Water Quality
10 minutes - Pretest
20 minutes - Printed material - booklet/lecture
10 minutes - Posttest
5 minutes - Summary

The slide/tape group received the following instruction:

5 minutes -
Introduction to Pesticide Use and Water Quality
10 minutes - Pretest
20 minutes - Slide/tape media
10 minutes - Posttest
5 minutes - Summary

Analysis

The Statistical Package for the Social Sciences (SPSS) (Nie and Associates, 1975) was used to analyze the data.

The data were used to. 1) determine the cognitive achievement effectiveness of new agriculture curriculum

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(pesticide use and water quality) in community college agriculture programs, 2) determine the effectiveness of slide/tape media in comparison to printed material on the cognitive achievement of new curriculum material presented, and 3) determine the association of selected independent variables to the dependent variables, pretest and posttest scores.

To determine which independent variables were significantly related to the dependent variables (pretest and posttest scores), the t test was used. Decisions were made using an alpha level of .05. The objectives were restated into null hypotheses and tested.

Findings

1. There was a significant difference between the community college students' pretest scores and posttest scores (Table 1). Agriculture students scored significantly higher (.05 level) on the posttest than they did on the pretest.

TABLE 1. T TEST COMPARISON OF COMMUNITY COLLEGE AGRICULTURE STUDENTS' PRETEST/POSTTEST SCORES IN ILLINOIS.

	N	Mean	s	t
Pretest	197	11.1777	3.037	
				17.59
Posttest	197	14.8731	3.079	

A t test using the polled variance estimate at the .05 level of probability was used to ascertain significant differences.
t.05 = 1.960, the critical value.

2. There was no significant difference in cognitive learning ability between the scores of the experimental group and the scores of the control group (Table 2).

TABLE 2. T TEST COMPARISON OF SLIDE/TAPE MEDIA AND PRINTED MEDIA INVOLVING COMMUNITY COLLEGE STUDENTS IN AGRICULTURE.

	Media	N	Media	s	t
Pretest	Slide/Tape	95	11.473	3.094	1.32
	Printed Booklet	102	10.902	2.974	1.32
Posttest	Slide/Tape	95	14.989	2.937	.51
	Printed Booklet	102	14.764	3.216	
Gain Score	Slide/Tape	95	3.516	2.689	.83
	Printed Booklet	102	3.862	3.175	

A t test using the pooled variance estimate at the .05 level of probability was used to ascertain significant differences.
t.05 = 1.960, the critical value.

3. The pretest scores and the posttest scores, compared with the independent variables, class level, and pesticide use, were significantly different at the .05 level. The results (Table 3) indicated that the scores of freshman students were significantly higher than those of sophomore students.

TABLE 3. T TEST COMPARISON OF COMMUNITY COLLEGE AGRICULTURE STUDENTS PRETEST/POSTTEST SCORES BY CLASS LEVEL IN ILLINOIS.

	Class Level	N	Mean	s	t
	Freshman	10	10.0990	2.938	
					5.17
Pretest	Sophomore	89	12.1910	2.641	
Posttest	Freshman	101	14.1287	3.042	3.37
	Sophomore	89	15.5955	2.957	

A t test using the pooled variance estimate at the .05 level of probability was used to ascertain significant differences.
t.05 = 1.960, the critical value.

4. Students who had used pesticides scored significantly higher pretest and posttest scores (Table 4) than students with no prior experience with pesticide use. Students need practical experiences in using pesticides. The independent variables, sex and farm status, had no significant (.05 level) effect on pretest and posttest scores.

TABLE 4. T TEST COMPARISON OF COMMUNITY COLLEGE AGRICULTURE STUDENTS' PRETEST/POSTTEST SCORES BY USE OF PESTICIDES IN ILLINOIS.

	Pesticide Use	N	Mean	s	t
	Had Used Pesticides	120	11.6667	3.179	
Pretest	Had Not Used Pesticides	75	10.4667	2.632	2.73
Posttest	Had Used Pesticides	120	15.3833	2.891	2.89
	Had Not Used Pesticides	75	14.1067	3.182	

A t test using the pooled variance estimate at the .05 level of probability was used to ascertain significant differences.
t.05 = 1.960, the critical value.

Summary of Conclusions

1. The community college students scored significantly higher on the cognitive posttest than they did on the pretest.
2. Students' cognitive achievement level did not differ significantly when using the printed material versus the slide/tape media.
3. Sophomore students demonstrated a higher cognitive achievement score.
4. Students with prior experience in using pesticides achieved higher cognitive scores.

Recommendations

1. Provide the students with practical experiences to increase cognitive achievement.
2. Printed material and slide/tape media should be viewed as equivalent to traditional classroom methods of disseminating agriculture information to community college students.
3. New curriculum materials should be evaluated to determine the effectiveness of the curriculum for specific grade levels.

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A Philosophy Revisited for the 1980's: Integrating Teaching and Research

Ronald A. Brown

For faculty members of Land-Grant institutions, the topic of integrating teaching and research may seem trite. After all, we are aware that Land-Grant institutions are institutions of the people, and that teaching, research, and service are primary functions. However are we currently successful in merging the functions of teaching and research for the mutual benefit of all?

Certainly, as a teaching faculty member at any college or university we should see our major function as teaching and our major goal as facilitating learning. Therefore, let's look closer at integrating teaching and research as a way of improving learning in the 1980's.

I would like further to structure this discussion by operationally defining teaching and research. To me, teaching can be broadly defined as directing the learning experience. This definition assumes, again, that our role is to cause, encourage, or facilitate learning; learning then, is our goal and teaching is a way to reach that goal. This definition may be easy to accept at first glance, but it quickly becomes a philosophical issue when we consider our orientation to teaching. If we accept the definition, it means that we have objectives for each course we teach that are stated in terms of the students. We will be successful when students achieve a certain learning level (when the objectives are achieved). The procedures that we use may be varied and are selected to facilitiate the achievement of stated objectives. Our goal is to "cause" learning.

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On the other hand, many teaching faculty have "teacher" objectives, as can be judged by their teaching behavior. If we are in this category, our focus is on "covering" a certain amount of material. We see our role as one of exposing students to all of this text or covering this much material in English I because English II starts on page X. In such cases, instructional procedures are usually less varied; most teachers lecture because that procedure is quicker (covers more material) and is easier.

Another aspect of this issue is the academic preparation of teaching faculty. Most university teaching faculty are competent in their subject matter fields, but have never been taught "how to teach." This situation enhances the idea that "I know my subject, I'll cover this material, and those students who can get it will; those who cannot won't (and maybe shouldn't)." In such a role, teachers are not teaching, but are serving as a screening agency to measure innate ability and motivation of students. The position taken in this paper, though, is opposed to this idea. Teaching faculty should direct the learning experience. We should do the things necessary to see that students learn — not just expose them to an opportunity to learn.

Research is also a means to the same end — learning. It may be defined as critical, disciplined inquiry which varies in technique and method according to the nature and conditions of the problem identified, and is directed toward clarification and/or resolution of a specific problem or toward the discovering of new information/knowledge. From this perspective then, both teaching and research are to stimulate learning. There is certainly merit in utilizing the research method in cases where the answer may already be known by others; e.g., such activities profoundly influence learning in the affective domain, and learning how to scientifically answer questions or solve problems is a valuable skill in itself.

Rationale

If teaching and research are both to stimulate learning, should the two be integrated and will this lead to an improvement in instruction? The following are supportive ideas that we may want to consider:

1. Research results provide first-hand instructional material which makes our instruction more up-to-date, realistic, and interesting — to us and our students. Certainly, we must recognize that all research cannot be brought into the classroom, but this surely doesn't mean that none can be.

2. Research is a part of our professional responsibility, even though position descriptions vary. Our involvement may range from directing an undergraduate special problem study or a masters thesis to directing a doctoral dissertation or an externally-funded research project.

The extent of instructional faculty involvement in research will depend on limitations such as semester hour teaching load, experience and competence of the teacher, and other responsibilities. However, if you are thinking that no research is involved in your position, I'd surely hate to be in a course that you teach because you

are virtually assuring me that it will be dry, boring, and probably out-of-date.

3. Research and teaching are mutually supportive. They are two faces of the same coin, with research providing ideas for teaching and teaching providing ideas for research. Without an integration of the two, both lack life.

4. Research enhances professional development of faculty and provides a source of renewal and enrichment for both faculty and students.

5. Research allows for graduate student training and teaches them an important source of information.

6. Research improves the professional image of faculty members — on and off campus. This image determines to a large extent the type of students that attend, especially at the graduate level.

7. Research is a source of material for publications, which are beneficial to our various publics.

8. The integration of teaching and research is compatable with principles of learning and with the goals we should be striving to achieve. To me, this is the best justification for integrating teaching and research — improvement of instruction. Our posture on this issue is guided largely by our goals. Are we seeking for our students a mastery of subject matter content or are we concerned with students being better able to deal effectively with society and the future?

Certainly we are to teach subject matter content, but if that becomes, by purpose or by accident, our major goal, we are doing great harm to our students and our profession. We are charged, at least implicitly, with much more than teaching subject matter content. Dr. Neil Harl, who is the Charles F. Curtiss Distinguished Professor of Agriculture and Professor of Economics at Iowa State University, and also a member of the Iowa Bar, identified three key abilities needed by every university graduate (December, 1980). They are:

a. The ability to think and reason creatively, analytically, and thoroughly. This requires an insatiable curiosity and a sense of great impatience with the status quo. We can help students develop these qualities by:
   1. encouraging them to search out the issues
   2. helping them learn how to analyze the issues
   3. helping them draw justifiable conclusions and communicate the results of analyses clearly and effectively.

b. The ability to communicate in writing accurately and precisely.

c. The ability to speak effectively.

Too many of us use only one technique for directing the learning experience — we stand in front of our classes and lecture while our students sit and take notes. Periodically we give a test to see how much of what we told our students can be regurgitated. These procedures are effective for low-level cognitive learning, yet our students need to be able to analyze, synthesize, and evaluate. The skills of analysis, synthesis, and evaluation require practice and are best taught in association with research.

Method

If integration of teaching and research offers the previously mentioned advantages, how can it be done? I believe that an essential requisite is the general attitude or spirit of inquiry. This is the element that makes teaching interesting and effective. It is the element that goes beyond training and prepares our students to cope effectively with a diverse and constantly changing society.

1. Research invigorates instruction and makes it alive. This "aliveness" is a result of the approach of the teacher — such as "I wonder whether...?," "Why does such and such...?" and "It would be fun if..." The attitude is both sophisticated and child-like. The methodology, design, and analysis techniques are rigorous and sophisticated. The child-like, yet mature, attitude is responsible for some of the most successful children's stories which were written by noted researcher-teachers, such as Lewis Carroll, C.S. Lewis, and J.R.R. Tolkien. This sophisticated inquisitive attitude should be our goal — for ourselves as teachers and for our students.
2. Use the results of research in your subject area as subject matter. This will help to keep the curriculum relevant.
3. Conduct research related to your subject area. This will keep you involved and on the "cutting edge" of your profession.
4. Use the results of educational research to improve instructional methodology.
5. Use research as a teaching technique by having students conduct research. This practice:
   a. provides students an opportunity to work more actively and independently than does the traditional lecture alone.
   b. helps students learn to identify and solve problems.
   c. helps students improve their skills in writing and exposition of ideas.
   d. teaches the attitude and skill of disciplined inquiry.
   f. teaches the place of cause/effect and correctional conclusions.

Summary

Accepting these kinds of responsibilities will demand more time and commitment; however, our students, our university, and our profession will benefit.

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Resources for Teaching and Learning

Wesley J. F. Grabow

There's Meaning in Color

How important is color in the teaching/learning process? The field of Visual Literacy identifies color as one of ten basic elements of visual communication. These elements are the substance of what we see. They are the dot, line, shape, direction, tone, **color,** texture, dimension, scale, and movement of all visual information that we receive. These raw materials of visual data appear in selective choices and combinations in all the teaching/learning resources we utilize in Education. To be visually literate, we need to understand the importance of these elements in establishing meaning and understanding.

Each element, through sight, plays its vital role in establishing meaning and relationship to the real world around us. Color is no exception. A basic fact, already made evident, is that the more realistic the experience, the better the understanding or meaning. This relates to Dewey's "We learn best by doing" or Dale's "Cone of Experience" that identifies the most direct and purposeful experience as the best experience or resource for establishing meaning and understanding. So, truly, the best visual reproduction or vicarious experience of what we are to teach or learn needs to utilize all of these elements that are necessary in representing the real thing or event to provide the most purposeful experience. As Doris A. Dondis states in her book **A Primer of Visual Literacy,** "It is possible to think of color as the aesthetic frosting on the cake, rich, and in many ways useful, but not absolutely necessary for creating visual messages. That would be a very shallow view of the matter. Color is, in fact, loaded with information and one of the most pervasive visual experiences we all have in common. It is, therefore, an invaluable source for visual communications."

The common experience is basic to teaching/learning. We share the association of meanings in the environment around us, such as sky, grass, and trees, to the point that we can see color, also, as a common stimulus. We also share the symbolic meanings of color, such as red signifying danger and anger. In fact, color has been found to be vital in creating successful emotional experiences capable of changing behaviors and attitudes in the affective domain. Our choices of colors tell those around us a great deal whether we realize it or not. To understand the emotional effect of color is indeed relative to the teaching/learning process.

Color theories are numerous. Much research is needed to better understand the role of color in relation to visual communications. The three dimensions of color that can be defined and measured are **hue,** the color itself (of which there are more than a hundred); **saturation,** or purity of color from hue to gray; and the **brightness,** or tonal gradations of color from light to dark. Little is known about how these dimensions relate to the process of visual communication.

We have in the main used color in our teaching/learning resources as a frosting on a cake or as a sprig of parsley on a dish. At times, through observation, we discover the value of color in specific environments or experiences. It's time we document and search for more information that will guide our use of color in the teaching/learning process.

Color as a coding tool or technique has proven invaluable in the labeling and identification of graphs and charts to more meaningfully present data and other information. This becomes a problem for the one in twenty-five of our population who is color blind. Therefore, some other form of coding should be integrated with the color to establish meaning for persons who are color blind. To be aware of the role of color is indeed important. Not only the positive, but also the negative aspects need to be identified.

Researchers studying dreams tell us that only 5 percent of the population dream in color. This says something about the lack of reality of most dreams. I always thought that those day dreaming or sleeping in my class were turning to something more interesting or realistic than I could provide, especially if the experiences or resources I chose were dull and less than realistic.

Motivation is an emotion that can only be experienced or initiated by the individual. You really only learn what you want to learn. Realism, including realistic color, does effect emotions so it would seem to be an effective element in an environment or experience that would help set the stage for or encourage in some other way the motivational process.

Photography, especially color photography, has been one of our most effective visual arts or resources because what it creates is believable. The photograph usually is realistic and does not distort any of the aforementioned basic elements of visual communication. The color motion picture presented in stereo sound and 3D, when properly used, is one of the most meaningful reproductions of real experience. To understand how im-

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