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ABSTRACT

A pilot study to evaluate the effectiveness of multi-image audiovisual teaching showed this technique to have a definite advantage over conventional single-image audiovisual aids. The multi-image technique involved using two or more visual aids designed to interact with and to amplify each other. Experimental and control groups of college students were given courses utilizing the different audiovisual approaches. On a post-experiment test the experimental group scored higher at a significance of .05. Females seemed to outscore males generally. Opinion tested by a questionnaire was mostly favorable. (RB)

TEACHING A BASIC AUDIOVISUAL COURSE BY THE MULTI-IMAGE TECHNIQUE

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THE PROBLEM Several research studies have investigated the use of the multi-media or, more specifically, multi-images in the teaching of college level courses. Surprisingly, there has been a paucity in the reporting of this research and particularly whether this technique has resulted in significant differences when compared to classes taught by more traditional methods. In a review of multiple-image communication research, Perrin (1969) makes no specific reference to statistically reliable differences in the studies discussed.

Certain articles have been in conflict relative to the mind's capability of absorbing several inputs of communication at a time. Saettler (1968) saw no conceptual support that a combination of two input channels to the mind is more efficient than one. Millard (1964), however, enumerated types of situations in which he believed simultaneous images could be presented more effectively than sequential images. Multiple inputs would be of more value when presented slowly, according to Travers (1966). Severin (1967) believes learning is increased as the number of cues or stimuli are increased. Kappler (1967) and Joel (1967) observed multiple images could teach through feeling and emotion as well as factually.

Additional problems are evident as indicated by Allen (1969). Exclusive use of a particular approach in presenting a course is unsound, just as inadequate room and projection facilities can be detrimental to the learning situation.

Careful preparation of multi-image units or a complete course results in motivation of students according to Lawson (1971) and Sedlik (1971). Considerable saving of instructional time without loss of material is reported by the U.S. Army (1959), Hubbard (1961), and Sedlik (1971) for the Air Force Academy.

These apparent contradictions and certain similarities have a bearing upon the effectiveness of the multi-image technique in the teaching-learning process. For that reason, in this research several images were presented simultaneously, but each was discussed singly.

It was the purpose of this pilot study to determine if this technique would be significantly superior to traditional methods of teaching.

Students in the study were comprised mostly of college juniors and seniors. Both an experimental section and a control group were taught by each of two instructors, Jurgemeyer and Ingli. Experimental classes met in Lawson Hall, a facility with ten auditoria built around a central core with controls for the rear projection of multiple images on screens 12 and 20 feet in width depending on the seating capacities of the rooms. In addition, a large screen for overhead projection was used. Control groups received instruction in a more conventional classroom.

All 167 students on which the research was based took a pretest consisting of true-false and multiple choice questions. The same test, but with a different sequence of items, was given as a posttest at the completion of the course. Students also wrote a midterm examination.

Complete information was obtained on 169 students, but two cases were excluded in the final data because of their evident lack of interest in writing the pretest. Possible scores on the midterm and on the pre- and posttests were 133 and 293 respectively. Test reliabilities were 0.75 for the midterm and 0.84 for the pre- and posttest. The opinions of the two class sections taught in an experimental situation were requested in an opinionnaire. Results of this tool are discussed later in this report.

Lectures for all units were dictated and transcribed. Notations were made at the appropriate points for the introduction of audiovisuals. Instructors controlled equipment from the lectern and lighting from a portable control panel. It must be made clear that lectures were not simply read to students but provided the basic material from which instructors could draw for their presentations and accompanying discussions.

As this was a pilot study, and for other reasons, only about one-fourth of the course units were prepared with a considerable number of audiovisuals--films, filmclips, slides, transparencies, etc. These were carefully correlated in lectures with several images on the screens simultaneously. Only one, however, was discussed at a time.

Such materials combined those locally produced and commercially prepared. It was the belief these audiovisuals served to interact and amplify one another. The materials on visuals, both printed and pictorial combinations, were

utilized both to explain the lecture and to intensify certain learnings even to the point of amplifying salient points through repetition. Preparation of such units by all people involved, sometimes accumulated to as many as 100 hours of work for each 50 minute lesson.

Data were processed to determine possible significances based on distributions of t for one-tailed tests. Variables included (1) instructors, (2) method, (3) sex of students, (4) year in college, (5) colleges of students, (6) academic majors of students, (7) grade point averages, (8) midterm examination scores, (9) posttest and (10) pretest scores. Information on the year of college was not used since students were nearly equal in numbers of juniors and seniors. The variable of academic majors provided such a variety of interests that this area was also excluded in the evaluations.

Of the 167 students in the study, 105 were in experimental sections and 62 in control groups. Females numbered 87 and males 80. Instructor A had a total of 77 students and instructor B a total of 90.

Insert Table 1 about here

Table 1

Interaction of Test Scores with Teaching Methods

Variables	n	Mean	S.D.	df	t	p
1. Pretest by C	62	174.50	16.5195	165	0.4247	<.05
1. Pretest by X	105	173.28	19.9612			
2. Midterm by X	105	93.16	9.5747	165	1.3861	<.05
2. Midterm by C	62	91.76	10.0220			
3. Posttest by X	105	207.97	19.3640	165	1.7632	.05
3. Posttest by C	62	202.66	19.2740			

Major results of the research shown in Table 1 demonstrate the individual interactions between the pretest, midterm, posttest, and method. Data on the interactions with grade point averages is excluded for reasons indicated later in this section.

Item 1 in Table 1 shows there was no significant difference between control and experimental groups on the pretest. Mean scores differed only by 1.22 points in a possible score of 293.

In 2, the experimental method apparently was responsible for a 2.40 point advantage on the midterms but not large enough on the 133 point examination to be significant at the .05 level.

Of overall importance was the significant difference at the .05 level of the experimental method over the more traditional approach on the posttest. Shown in 3, the mean scores were 207.97 and 202.66.

The data secured on grade point averages is not included in the report although a number of apparently significant differences did appear. On a five-point scale, mean differences between experimental and control groups amounted to only 0.13 of a point. Even in further breakdowns of data where differences between groups amounted to 0.30 of a point, significant differences should not be considered relevant since standard deviations were quite similar. The denominator in the formula for t then becomes so small that a distorted quotient or t results.

Insert Table 2 about here

Table 2

Interactions of Midterms with Sex, Method, and Instructor

Variables		n	Mean	S.D.	df	t	p
1. Midterm by	Female	87	94.87	9.0857	165	2.3936	.01
	Male	80	91.26	10.1967			
2. Midterm by X by	Female	60	95.53	8.4410	103	1.8971	.05
	Male	45	91.87	10.5466			
3. Midterm by A by	Female	33	94.18	10.2647	75	1.6917	.05
	Male	44	90.05	10.7471			

Table 2 shows interactions of midterm scores with other variables. Item 1 results indicate an advantage of females over males, reliable at the .01 level. In 2, the better scores of girls in experimental groups on the midterm were also significant. Females in A's classes were superior on the midterms at the .05 level.

Insert Table 3 about here

Table 3

Interactions of Midterms with Instructors and Methods

Variables		n	Mean	S.D.	df	t	p
1. Midterm by A by	X	47	94.60	10.3116	75	2.9844	.005
	C	30	87.47	10.7471			
2. Midterm by C by	B	32	95.78	8.2982	60	3.5085	.005
		30	87.47	9.9222			

In item 1 of Table 3, experimental students of instructor A did much better than his control students on the midterms, a reliable difference at the .005 level. In 2, B's control students were superior to A's control class. A significant difference of .005 resulted.

Insert Table 4 about here

Table 4

Interactions with Posttests by Sex and Instructor B

Variables		n	Mean	S.D.	df	t	p
1. Posttest by	Female	87	209.23	19.3907	165	2.3024	.025
	Male	80	202.49	18.2238			
2. Posttest by B by	Female	54	209.76	18.7153	88	1.8213	.05
	Male	36	202.64	17.4247			

In Table 4, item 1 showed a superiority of females over males on the posttest. The level of significance was .025. In 2, the females of B's classes were superior to the males on the posttest at the .05 level.

Insert Table 5 about here

Table 5

Interactions with Post- and Pretests by Instructors and Method

Variables	n	Mean	S.D.	df	t	p
1. Posttest	167	206.00	19.1392	166	24.7923	>.001
Pretest		173.73	18.7667			
2. Posttest by C	62	202.66	18.2740	61	14.6724	>.001
Pretest		174.50	16.5195			
3. Posttest by X	105	207.97	19.3640	104	20.4708	>.001
Pretest		173.28	19.9612			
4. Posttest by A	77	204.94	19.7626	76	19.0699	>.001
Pretest		174.21	18.1370			
5. Posttest by B	90	206.91	18.5411	89	16.9561	>.001
Pretest		173.32	19.2797			

In Table 5, posttest results in all categories exceeded pretests resulting in very high t scores, all reliable in excess of the .001 level of significance. The extremely high t's would seem to be a function of the wide spread in scores as reflected in correspondingly small differences in standard deviations.

Insert Table 6 about here

Table 6

Interactions with Examinations by Colleges* and Methods

Variables	n	Mean	S.D.	df	t	p
1. Midterm by Other X	25	96.80	21.6181	85	1.7172	.05
1. Midterm by Ed. X	62	93.16	14.8607			
2. Midterm by Other X	25	96.80	21.6181	36	1.7662	.05
2. Midterm by C&FA C	13	91.15	28.0456			
3. Midterm by Other X	25	96.80	21.6181	40	2.3949	.025
3. Midterm by Other C	17	89.94	24.2440			
4. Pretest Other X	25	180.76	43.9349	85	2.2725	.025
4. Pretest Ed. X	62	169.69	28.6645			
5. Posttest Other X	25	215.96	47.3364	85	2.4502	.01
5. Posttest Ed. X	62	205.21	32.2520			
6. Posttest Other X	25	215.96	47.3364	55	2.1477	.025
6. Posttest Ed. C	32	205.34	41.4336			
7. Posttest Other X	25	215.96	47.3364	36	1.7634	.05
7. Posttest C&FA C	13	204.46	62.5911			
8. Posttest Other X	25	215.96	47.3364	40	3.7602	>.001
8. Posttest Other C	17	196.24	51.2209			

Variables		n	Mean	S.D.	df	t	p
9. Posttest	Ed. C	32	205.34	41.4336	47	1.6932	.05
	Other C	17	196.24	51.2209			

* Ed.--Education, C&FA--Communications & Fine Arts, Other--Other Colleges

One of the variables investigated after all other data had been processed was that of the colleges in which the 167 students in the study were registered. Three groups were considered--the 94 College of Education students, 31 from the College of Communication and Fine Arts and the 42 from many other colleges and schools.

Table 6 shows quite unique results from the interactions of colleges, methods, and tests. Reliable differences are as follows:

In item 1, midterm tests for experimental students from Other colleges compared to experimental students in Education produced a significant difference.

Items 2 and 3 on midterms showed advantages of experimental students in Other colleges in relation to control groups from Communication and Fine Arts and those students from Other colleges.

Mean scores on pretests ranged from 169.69 to 180.76 in the six control and experimental groups from the three variables of colleges. The two extremes in this range of mean scores were recorded for experimental groups in Education and in Other colleges respectively. Item 4 indicates the only significant difference in these interactions--Experimental Other over Experimental Education at the .025 level.

On the posttests, the experimental group from Other colleges showed the only significant differences when statistics were broken down by the variable of colleges.

Item 5 indicates a decided advantage of 10.75 points on mean scores for the Other Experimental group over Education Experimental resulting in a significant difference of .01.

A t test of 1.5319 indicated the advantage of Other Experimental over Communication and Fine Arts and Experimental but slightly less than the desired significance at the .05 level.

In items 6 and 7, data on Other Experimental students resulted in significant differences of .025 and .05 over Education Control and Communication and Fine Arts Control respectively.

Item 8 with a t test of 3.7602 and a significant difference of >.001 for the Other Experimental over Other Control, demonstrates the greatest superiority in the experimental approach to teaching-learning.

Item 9, Education Control students made mean gains of 31.56 points from pretests to posttest compared to 20.89 for Other Control. A significant difference of .05 is indicated.

Insert Table 7 about here

Table 7

Mean Gains from Pre- to Posttests by Methods and Colleges

Experimental Classes		Control Classes	
1. Education	205.209	Education	205.343
	169.693		173.781
	35.52 (Mean gain)		31.56 (Mean gain)
2. C&FA	206.388	C&FA	204.461
	175.222		175.153
	31.17 (Mean gain)		29.31 (Mean gain)
3. Other	215.960	Other	196.235
	180.760		175.352
	35.20 (Mean gain)		20.88 (Mean gain)

Mean gains from pre- to posttests by Methods and Colleges as indicated in Table 7 are worth considering. Item 1 shows Education students in the experimental class beginning with the lowest mean (169.69) score of all groups on the pretest but making the highest mean gain (35.52) from pre- to posttest. Education students in the control group also began with a low mean score and made a high mean gain from pre-to posttest.

In Item 2, the mean gain of students in Communication and Fine Arts was less than corresponding groups in Education.

In Item 3, the mean gain of Other students in the experimental group was high but still slightly less than that of the Education experimental students. The control group in Other colleges and schools made the lowest mean gain of all groups in the study.

Insert Opinionnaire about here

Insert Table 8 about here

Opinionnaire

College _____ Future Profession _____
Major _____ Male _____
Year of College _____ Female _____

Your opinions or evaluation on the following questions would be of help to us. On responding to them, please keep in mind the following:

1. Lawson Hall was planned for the use of the multi-media.
2. This section of I.M. 417 is a part of a "pilot" study research to investigate the effectiveness of instruction using the capabilities of Lawson Hall as compared to teaching in a typical classroom.
3. Unless equipment malfunction was a major deterrent or obstacle to the teaching-learning situation, please disregard it in your over-all evaluation of the course.

1. Very worthwhile _____
2. Worthwhile _____
3. No definite opinion _____
4. Not worthwhile _____

1. Considering your future profession, how much help has this course been to you?

Yes _____
No _____

2. Since Lawson Hall was planned for the concentrated use of audiovisuals, has it served its purpose in this class? If your answer is "No", please indicate briefly the difficulty.

_____

_____

_____

Very much so _____
Somewhat _____
No opinion _____
No _____

3. More visuals were used in this section of I.M. 417 than reasonably possible in the typical classroom. Did the use of these additional visuals help you in your understanding of the course.

Yes _____
No _____

4. Were the visuals left on the screen long enough so you could examine or transcribe them before the lecture continued?

Yes _____
No _____

5. Were the visuals adequately explained during the course of the lecture?

Yes _____
No _____

6. Do you feel more visuals could be used to advantage in such a course? If your answer is "Yes", what type would you suggest? _____

_____

If your answer is "No", what not? ___

_____

Yes _____
No _____

7. One of the major problems in any university is that of large class enrollments. Since it is difficult to "know" the students in a class this large, could not I.M. 417 be taught just as effectively in Lawson to much larger sections--250 to 300 students? If your answer is "No", please explain. _____

_____

Yes _____
No _____

8. Did you feel the transparencies for the over head and the slides on the big screen help "solidify" the points and examples the instructor was trying to get over to you?

Yes _____
No _____

9. Were the images on the large screen bright enough for your own satisfaction?

Yes _____
No _____

10. Did there seem to be a good balance between the visuals used--films or "film clips", transparencies for the overhead images on slides, definitions, phrases or listings on slides? If your answer is "No", please indicate your ideas for improvement. _____

_____

_____

_____

Yes _____
No _____

11. When certain units were taught with considerably more audio visuals, did this different approach to learning cause you difficulty?

12. Any specific suggestions for a better use of audiovisual materials? _____

_____

_____

_____

Table 8

Responses of Experimental Groups to Opinionnaire

Responses	Teachers		Other		No Response	
	n	%	n	%	n	%
1. Very worthwhile and worthwhile	64	76.5	12	31.3	9	33.3
2. Yes	64	89.1	16	87.5	9	77.8
3. Very much so and somewhat	65	85.9	16	87.5	9	77.8
4. Yes	64	87.5	16	81.3	8	66.7
5. Yes	64	98.4	15	87.5	9	88.9
6. No	62	63.5	16	50.0	9	78.8
7. Yes	64	75.0	16	75.0	9	77.8
8. Yes	64	92.2	16	93.8	9	77.8
9. Yes	64	96.9	16	93.8	9	88.9
10. Yes	64	92.2	16	87.5	9	100.0
11. No	64	84.3	16	93.7	9	87.8

Another phase of the study involved an opinionnaire which experimental classes were asked to complete. Replies were received from 85 of these 105 students.

The purpose of this tool was to determine students' opinions about I.M. 417 and the way it was taught in Lawson Hall. Responses were probably indicative of what participants felt since they were requested not to indicate their names. Three breakdowns were used in compiling responses--those hoping to teach, a small number suggesting other occupations or professions, and still fewer who did not respond to the particular item.

Reference to the above table and the opinionnaire indicate the following:

1. A high percentage (76.5) of prospective teachers considered the course very worthwhile or worthwhile. Fewer students of other groups seemed satisfied with the course.
2. Nearly all students considered Lawson Hall as serving its purpose for the class.
3. A decided majority of students indicated the additional audiovisuals helped in the understanding of the course.
4. Visuals were left on the screens long enough for transcription and/or examination.
5. Students seemed well satisfied with the explanation of the audiovisuals.
6. Over 50% of the students believed more visuals could be used to advantage in the course.
7. Three-fourths of the responses indicated the belief that I.M. 417 could be taught just as effectively to large sections.

8. Most students considered transparencies and slides helpful in solidifying important aspects of instruction.
9. Students seemed well satisfied with the brightness of images.
10. Nearly all students believed there was a good balance between the visuals used.
11. In units with more audiovisuals, the different approach to learning caused but little difficulty.

SUMMARY

Although only part of the I.M. 417 course was prepared with additional audiovisuals correlated with subject matter, an over-all significant difference at the .05 level resulted from the experimental method. Considering all data on the 167 students, no significant superiority appeared for experimental groups on the pretest nor on the midterm.

The scores of females were significantly better than those of males on the midterms in the experimental groups and for Instructor A.

Highly significant differences on midterms developed for A's experimental group over his control section. The control students of B were superior to A's control section on the midterm.

Interactions with the posttest by females and males showed a significant advantage for the former. This was also true of the females in B's classes.

Very high levels of significance resulted when comparing the variables of instructors and methods on post- and pretest results. Advantages $>$ .001 were in favor of the posttests.

The highest mean gain from pre- to posttest of the Education experimental class suggests the sophisticated multi-image approach was advantageous to them. It also seemed particularly helpful to the Other experimental group which made a

heavy mean gain compared to the Other control students. Since classes in Other colleges and schools experience the use of fewer audiovisuals than do students in the College of Education, it can be hypthesized the multi-image technique is advantageous to all.

Introduction of the college variable after other results had been obtained caused a re-evaluation of certain outcomes described previously. Significance of the experimental approach over the control method on posttest was true only for students from Other colleges. The same advantage for Other Experimental students over Education Experimental was true when based on midterms.

However, the Education Control students were significantly superior to the Other Control group on the posttest. Mean gains from pre- to posttest were 31.56 and 20.89 for these groups.

Opinionnaire returns were quite favorable towards the techniques used in Lawson Hall. Education students particularly seemed satisfied. There was the definite feeling that the multi-image technique could be well used for larger class sections.

INTERPRETATIONS AND RECOMMENDATIONS

The multi-image approach used in this pilot study proved very worthwhile for the experimental students from Other colleges. Most I.M. 417 students from the Colleges of Education and Communications and Fine Arts were advised into the course. Undoubtedly, the majority of students from Other colleges elected the course--possibly because of special interests in what the course could offer them.

This factor could partially account for the additional incentive needed for more desirable class work. In addition, the use of audiovisual materials is less common in many departments of Other colleges. Perhaps the uniqueness of the presentations better held the interest and attention of these students. This supposition seems to be substantiated by the lowest mean gains from pre- to posttest by the Other Control students as compared to the two other College groups.

Conversely, control and experimental groups from Education and Communication and Fine Arts did about equally well on mean gains as well as on posttests. These students are undoubtedly used to more audiovisual materials in their classes and may accept them too matter of factly without the concentration and consideration warranted.

The superiority of females over males is rather marked throughout the research except for pretest results. It would seem that college girls are often more precise in their work as a result of having acquired a more careful understanding of the details of assignments made by instructors. Higher test scores would logically result.

Since the greater number of teachers are females, perhaps it would also be logical to assume that they do better in the course since it should better fit into their training as future elementary and high school teachers.

The typical competition between the sexes could make itself manifest in the need for higher scholastic accomplishments by the females.

Two previously unmentioned advantages of the experimental technique must also be indicated. It is adaptable to larger class sections than normally taught in traditional classrooms. In addition, class time is saved by this procedure without

seeming to sacrifice the quality and extent of the teaching procedure. Experimental classes in the study completed course work in 85% of the time required for control groups.

This saving of class time is important considering the multi-image units involved about two and a half weeks of cumulative teaching time in an eleven week session. It would seem logical to assume the preparation of an entire course would result in a very considerable saving of teaching-learning time. In addition, the experimental classes were considerably larger than control groups.

Recommendations based on the results of this study are as follows:

1. Develop completely an entire course by this approach whenever units lend themselves to the technique.
   a. Use additional audiovisuals when pertinent to a unit.
   b. Use more than one audiovisual input at a time. Perhaps a number of aurals and visuals can be understood without each being explained singly.
   c. More desirable rear screen projection is mandatory since the constant dimming and restoring of illumination is distracting, time consuming, and not conducive to students' attention.

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