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DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of the Ohio State University

By

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* * * * * *

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CHAPTER I

INTRODUCTION

The purpose of this study is to appraise empirical program development procedure on the content of creative problem solving to determine if it can increase the effectiveness of instructional television (ITV) programs to a statistically significant degree.

The Background for the Study

Experimentation in developing courses for ITV has been concerned mainly with studies of the relative effectiveness of ITV compared with conventional classroom lecture.\(^1\) In most cases, no significant difference was found between conventional classroom lecture and ITV.

These results are valuable because they give the educational administrator some confidence in alternate methods of instruction. Experiments have demonstrated

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ITV's excellent distributive powers, its economic advantage, and its ability to offer courses that would otherwise be unavailable.

In one respect these studies are disappointing. ITV lessons often involve many additional man hours of work in preparation, production, and use of expensive equipment. It would seem that the time is approaching when comparison studies would favor the ITV lesson. Campbell commented in the *NAEB Journal* that:

> It is encouraging and refreshing to note the increasing number of voices beginning to question the effectiveness and efficiency of the "traditional" approach to instructional television material design and production.\(^2\)

Wade, also writing in the *NAEB Journal*, points out that a great deal of experimentation has been done with ITV, but there appears little evidence that production agencies have availed themselves of the research documented procedures of auto-instructional programing in building television programs.\(^3\)

There are a few studies of ITV which seem to offer a ray of hope in changing the "no significant difference" trend. These studies may also hold promise for


non-instructional programs. Such studies look to the areas of learning principles, programed learning, and other such research to offer clues to answer the question of how ITV programs can be improved to the point where they will be superior to conventional lecture. Such studies are based on a series of steps which test, develop the program, re-test, and improve the program based on information gained from the test. The goal is to determine the best way to present a subject to meet the needs of the audience so that they achieve the desired behavioral change. It is in many respects similar to the pre-testing that is common in marketing research today, and used in the development of programed learning courses.

A study in 1966 by Komoski of Columbia University developed a production procedure from trial and error which is a series of steps designed to improve ITV:

1. Develop statement of objectives.
2. Design pre- and post-tests.
3. Outline sequence of the lesson.
4. Test the group to see if they possess the prerequisite knowledge assumed in the lesson.
5. Draft a script and develop visuals for it.
6. Test the script (by reading the audio script and describing the visuals) on a small number of the group individuals.
7. Revise the script and "lock it up" for the first video tape.
8. Record the audio for the lesson.
9. Create and locate visuals specified by the script.
10. Produce the video tape lessons.
11. Test students (include pre- and post-test).
12. Analyze the data and evaluate the performance of the lesson.
13. Revise the lesson.
14. Redesign and reproduce the lesson until criterion performance is reached, or reasonably approximated in light of time and money limitation.

The purpose of the Komoski study was to demonstrate group-paced programed television in the form of a short series of lessons. It was designed to enable the learner within a specific target population to learn a specific set of instructional objectives.4

The Komoski procedure is similar to a procedure suggested by Greenhill, Director of the University Division of Instructional Services at Pennsylvania State University. In the introduction of a 1967 book that summarized 333 studies in ITV and film Greenhill suggests a procedure which he feels has most potential for improving televised instruction. He calls the procedure "empirical course development" and it involves:

4 P. Kenneth Komoski, A Demonstration Project of Television Instruction (New York: Columbia University, 1966).
1. Defining course and lesson objectives in terms of detailed descriptions of desired terminal behavior of students.

2. Building, testing, and refining adequate measures of student performance.

3. Selecting content and presentation methods which appear to be appropriate to the stated objectives, and recording these on videotape.

4. Exposing students to the televised course and administering the criterion test or tests.

5. On the basis of analysis of test performances and on the basis of interviews with students, making modifications in the original lessons and revised versions.

6. And finally, comparing the effects of the original version and the revised version on the performances of students randomly assigned to the two treatments.

Wade, station manager of KTEH, suggests still another procedure in a 1967 article in the NAEB Journal. Discussing the purpose of ITV programs Wade states:

Instructional television programs are, or should be, produced for one major purpose—to change student behavior in some manner, such as acquisition of knowledge or new skill in performance. Unless the school buyer is provided with a measure based on extensive pre-testing of the change that a given program has brought about in students similar to his, he has next to nothing.

The procedure Wade suggests is similar to the others, but includes several new ideas:

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5Reid, pp. 14-15.

6Wade, 79.
1. Define the program's target audience. For instance, spell out the audience's grade level, ability range, relevant socio-economic characteristics, and previous subject area experience.

2. Specify with precision the instructional objectives of the program. Describe in behavioral terms just what the student will be doing when he is demonstrating that he has achieved the program's stated objectives . . . it must be done in measurable terms.

3. Prepare the criterion examination . . .

4. Prepare a list of prerequisites. These prerequisites will provide the programer with an ever-present list of his assumptions concerning students' prior knowledge of the subject . . .

5. Prepare the outline of program content. The outline is simply a listing by the programmer of the subject information he believes the student must have in order to progress from his state of relative ignorance at the outset of the program--as defined by the list of prerequisites to a state of relative competence--as defined by program objectives and the criterion examination.

6. Prepare a preliminary content sequence. The programmer's idea of logical content sequence may be good, but it may differ considerably from that which a potential student may find to be logical and useful for learning. At this point in the procedure, the programmer should find a student who is willing to cooperate, show him the program objectives, and have him ask the questions he needs to ask in order to reach those objectives. A typical member of the intended target audience would be appropriate.

7. Select the programming strategy to be followed. There is less than total agreement among the auto-instructional program group today concerning strategy . . .
8. Write the first draft. Television production is expensive. Therefore, the programer might wish to employ some medium other than television for the preparation, production, and presentation of early program drafts . . . 35 millimeter slides with accompanying sound on audio tape, or simple index cards with picture sketches and typed information or . . . low-cost . . . portable video tape machine . . .

9. Test the first draft. Corral a small group of two to five students who are typical members, not just the brightest or dullest, of the target audience. Use their responses as a guide for revising the first draft . . . If the students in the small group make errors at various points in the program, it is the fault of the program, not the students . . .

10. Prepare the second draft. When it is prepared, try it out on another small sample of typical target students and revise if necessary. Repeat this cycle until the program does a job of teaching that is as nearly perfect as the science of auto-instruction currently permits—90 per cent of the students who view the television program score 90 per cent or better on criterion performance examination.

11. Prepare the program in final form and telecast it to students . . .

Using a set procedure seems to be a relatively new concept in the development of ITV and only a few studies have actually attempted to employ it. The Komoski study seems to be the first which actually produced a program. Another study based on Komoski and also emphasizing the combining or programed learning and ITV was done by Prutsman who emphasized the importance of specific behavioral

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7Ibid., pp. 82-84.
objectives. A more extensive and comprehensive study done by Smucker emphasized the importance of the empirical procedure, part of which carefully states objectives in behavioral terms, and resulted in the production of one program and testing it to see if the program reached the carefully stated objectives.

Building on the Smucker study was a Schwartz-Smucker research project which produced two programs using the empirical procedure to improve the second program. Schwartz indicates that the empirical procedure used in their study was the result of the New Media Conference held in Washington in 1965 and also Pennsylvania State University Campus.

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8Thomas D. Prutsman and Dorothy S. Laird, Development of Techniques to Implement the Principles of Programed Video Instruction (Boca Raton, Florida: Florida Atlantic University, May, 1969), ED 030 329.


11Letter from Alice M. Schwartz, Project Director Meaning in Art, Associate Professor--Art Education, Pennsylvania State University, University Park, Pennsylvania, June 6, 1968.
Their procedure is reviewed in Chapter II. All procedures are an attempt to improve ITV.

Need for the Study

A review of the status of ITV was sponsored by the Ford Foundation. Alvin C. Eurich, President of the Aspen Institute for Humanistic Studies, points out two prime causes for ITV's limited acceptance: "the quality of the transmitted instruction, and the way it is used in the classroom." Later he points out:

The primary goal of ITV in the future must be to raise quality and improve classroom utilization. Here, as elsewhere in education today, mere expansion of present practices is not enough. The way forward is necessarily a new way. To create the new, some of the old must be constructively destroyed.12

Dr. Richard H. Bell, Corporate Education Counsel to Ampex Corporation, points out that the real challenge of ITV is: "... to create a new and improved system of instruction, based on the realities of modern knowledge, modern society, and modern needs."13 Perhaps empirical program development will be a new improved system of instruction that can make a contribution to education and communication.


A study is needed which tries to use the empirical program development technique to improve to a significant degree the quality of ITV programs. Such a study is needed because it holds promise of changing the "no significant difference" finding of the great majority of ITV studies. If this is possible it should effect the production of all ITV programs, and possibly other informational programs intended for large audiences. In turn, perhaps a re-evaluation of the procedures presently used in ITV programs may take place.

Creative Problem Solving

Creative problem solving was selected as a subject because it is a developing field that seems ripe for this approach. Literature in the area of creative behavior research from January, 1966 to June, 1966 equals that of the preceding five years which in turn matches that of the preceding ten years.14 Because this is a new area with few qualified instructors, there will be a probable need to communicate information about it to large instructional audiences. This may take the form of instructional lessons via ITV. A course of instruction has been developed by

the Creative Education Foundation, and this has also been prepared in the form of programed learning.15

Creative problem solving has been the subject of at least three ETV series. In 1963 a series on creativity and education was produced by the Educational Television Department of the Division of Curriculum and Instruction, Milwaukee Public Schools and the Milwaukee Vocational and Adult Schools in cooperation with the School of Education of the University of Wisconsin, Milwaukee. A second series on creative problem solving and management was produced on video tape by the South Carolina Educational Television Network in the mid 1960's. This was done in cooperation with the Educational Resources Foundation and Southern Bell Telephone and Telegraph Company. A third series of forty half-hour programs designed to show that creativity and imagination are part of elementary English was produced in Minneapolis, for elementary English teachers. This was a project of the National Council of Teachers of English and TV station KTCA Minneapolis.16

Definition of Terms

The following special terms are used in this study: empirical program development, creativity, creative behavior, 


16Ibid., 298.
creative problem solving, fluency, flexibility, originality, and elaboration. The following are the definitions of these terms:

**Empirical Program Development**

Empirical program development is a procedure which requires the identification of exact behaviors desired from students after exposure to a program, an analysis of student performances on tasks related to these behavioral objectives, and the revision of the lesson until the pre-determined criteria of success are attained.

**Creativity**

E. Paul Torrance has done extensive work in the area of creativity and defines creativity as:

> . . . a process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on: identifying the difficulty; searching for solutions, making guesses, or formulating hypotheses about the deficiencies; testing and re-testing these hypotheses and possibly modifying and restating them; and finally communicating the results.17

Another somewhat simpler definition of creativity is offered by College President W. W. Culp: "Creativity is the struggle for improvement--the rearrangement of variables

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which the human can change in search for improvement." Parnes expands on this idea and to simplify it further compares the act of creativity to a kaleidoscope. In this, knowledge is compared with the pieces of glass in the kaleidoscope, the act of being creative is compared with rotating the glass to produce many designs and form new patterns, and judgment or evaluation is the act of stopping the kaleidoscope at one pattern to examine it. Parnes indicates that "inherent in this process are experience (knowledge), imagination, and evaluation." 

Creative Behavior

Parnes defines creative behavior as that behavior which demonstrates both uniqueness and value in its product. He indicates that the product can be of value to a group, organization, society as a whole, or just to the individual who creates the idea.

Creative Problem Solving

Creative problem solving is the concerted effort by the individual to use his individual creativity to behave in a creative way to overcome obstacles and achieve goals.

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19Ibid., 16.
20Sidney J. Parnes, Creative Behavior Guidebook.
It employs any one of a number of techniques which have been developed to stimulate creativity.²¹

Fluency, Flexibility, Originality, Elaboration

Fluency, flexibility, originality, and elaboration are creative traits and are those used in the Torrance tests.

Fluency

Fluency is the ability to generate a relatively large number of ideas in the area in which the individual is acting creatively. This will lead to the other traits associated with creative behavior: flexibility, originality, and elaboration.

Flexibility

Flexibility is the creative ability to develop ideas in many categories outside of the usual ones. It is shifts in thinking, generating different categories of questions, causes, or consequences which represent a mental leap or a departure from the commonplace.

Originality

Originality is the uniqueness of a response to a test item.

Elaboration

Elaboration is the creative ability to give detail and specificity to an idea. When a person elaborates on an idea, implements it, and spells out in detail incorporated into the response to a test item, he is demonstrating elaboration.

Behavior

Behavior refers to any visible activity displayed by the student.

Terminal Behavior

Terminal behavior refers to behavior the learner should be able to demonstrate at the time the influence of the program ends. It is the observable act which will be accepted as evidence that the learner has achieved the objective of the program.

Summary

This chapter has considered: the purpose of the study which is to appraise empirical program development on the content of creative problem solving, the background in which this study took place, the need for the study, and a definition of the special terms which are used in the study. The next chapter will briefly review related research in ITV.
CHAPTER II

RELATED LITERATURE

This chapter deals with a review of related literature in the two areas of behavioral objective statement and significant ITV film research. The clear statement of behavioral objectives is at the foundation of the empirical procedure. The development of thought on behavioral objective statements in the twentieth century helps set the stage for this study. The review of experimental research that produced significant results in ITV film helps develop possible alternative procedures to be used in the ITV production of the programs which use the empirical procedure. The behavioral objective statement literature review will be considered first.

Behavioral Objective Statements

Stating the objectives of an educational lesson in behavioral terms is nothing new. In the 1920's Franklin Babbitt developed theories of curriculum based on mastering the activities of civilized man. He suggested educational institutions discover and define activities as follows:
state each activity in terms of what the pupil will do or experience. One should avoid stating what he will know or be, since these latter are neither activities nor experience. ¹

In 1926 the Winnetka Plan tried to carefully define each goal and develop sequential programs of instruction.²

In the 1940's a seven-step program for effective assessment of education development by Ralph Tyler focused on the statement of objectives:

1. Formulation of objectives.
2. Classification of objectives.
3. Defining objectives in terms of behavior.
4. Suggesting situations in which the achievement of objectives will be shown.
5. Selecting and trying promising evaluation methods.
6. Developing and improving appraisal methods.
7. Interpreting results.³

During the Second World War the government and the various services sponsored research on improving training devices.


The approach used to develop these devices was based on the behavioristic tradition of psychology, part of which was concerned with objectives.

In the 1950's clear statements of behavioral objectives became an integral part of the writing procedure for programed instruction. Robert Gagne suggested ideas concerning not only programed instruction but the conventional classroom. His definition of learning makes behavioral change an integral part:

Learning is a change in human disposition or capability, which can be retained, and which is not simply ascribable to the progress of growth. The kind of change called learning exhibits itself as a change in behavior, and the inference of learning is made by comparing what behavior was possible before the individual was placed in a "learning situation" and what behavior can be exhibited after such treatment.\(^4\)

Gagne also suggests six major categories of objectives: knowledge, comprehension, application, analysis, synthesis, and evaluation. He goes on to describe each of these categories:

**Knowledge.** This category is measured by requiring the recall of specific facts, methods, and practices, patterns, structures, ... 

**Comprehension.** This class indicates transitional (supplying equivalent responses for previously acquired identifications), interpretations (formulating a statement representing a set of events), and extrapolation (predicting consequences of a course or courses of action).

Application. Applying general principles and abstract concepts to specific model situations.

Analysis. Distinguishing the kinds of elements in a communication, such as facts and hypotheses; recognizing the facts and assumptions essential to a major thesis, and distinguishing the relevant from the irrelevant statements; identifying general thought patterns (or organizational principles).

Synthesis. Producing a total communication plan or set of operations, giving the essential components.

Evaluation. Making reasonable accurate judgments, correspondence with certain criteria.\(^5\)

Robert Mager suggests how these behavioral objectives are to be worded. He discusses terminal behavior which is simply what the student is to be able to do after the instructional program. These are to be actions that are visible and overt. Ambiguous statements that could hold different meanings for different people such as: to appreciate, to know, and to understand, could lead to misunderstandings and are best not used, Mager suggests.\(^6\)

In the 1960's Asahel Woodruff pointed out that the definite objective is the nucleus of teaching and that: "An objective should usually consist of one clearly stated


Behavioral objectives are an integral part of his model for teaching activities:

... behavioral objectives are so closely aligned with the basic principles of human behavior ... that they offer a way of making instruction easier to plan and carry out, and more effective in influencing human life.8

Nine identifiable mediating variables shape instructional behavior, and it is possible to find manifestations of all of them in most of the behaviors sought in education. These are:

1. Structural concepts of objectives of all kinds.
2. Structural concepts of patterns and arrangements.
3. Concepts of events and procedures.
5. Concepts of the feeling and wants of persons.
7. Data memorized and repeated in association with concepts.
8. Conditioned motor behavior patterns (operants), available to be used to carry out intentions.
9. Classical conditioned response to external signals.9

8 Asahel D. Woodruff, "First Steps in Building a New School Program" (Salt Lake City, 1968), p. 15. (Mimeographed.)
9 Ibid., p. 16.
After the behavioral objectives are clearly stated, their components are inventoried, stated for communication to students, and sequenced. This is then developed into an instructional unit organized upon a framework of classes of mediating variables. Concepts and behavior form an inseparable interrelationship in the education model.

The objectives:

... are assumed to consist ideally of a concept the students are to acquire or an instructional behavioral competence they are to develop within the scope of one instructional plan.\(^{10}\)

David Krathwohl suggests objectives can be divided first with the general goal of education, then into the goals of the instructional unit, and finally into the specific behavioral objective.\(^{11}\) The levels of specificity of the objectives would depend upon the level of the statement. Therefore, Krathwohl suggests all goals of instructional units may not lend themselves to statements in behavioral terms and thus there may be other ways to implement intermediate goals.\(^{12}\)

\(^{10}\) Asahel D. Woodruff, "A Guide to Effective Teaching" (Salt Lake City, 1968), p. 2. (Mimeographed.)


\(^{12}\) Ibid., p. 86.
Arthur Cohen suggests both goals and objectives be used in course statements. He first identifies educational purposes in relation to the whole educational instruction. Then at the course level goals are broad and generalized statements. Terminal and interim performance statements are finally prepared. He states:

It is not necessary for one to accept an instructional system based exclusively on defined goals; the undefinable, the unmeasurable will be with us, I expect, for generations. But as beginning points for assessing impact of the curriculum, as minimum levels to which we can commit our resources, specific instructional objectives must be considered...

Albert A. Canfield proposes that the rationale or justification for performance objectives be included with the statements. This is to help overcome resistance from both faculty and students to the objectives when objectives are just presented and not explained or defined. These objections may develop because there is no explanation as to why the learner should achieve them.

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Such rationales can generally enhance the effective utilization of behavioral objectives as they require both the instructor and the students to develop an understanding of "why" the student should accomplish this learning.¹⁵

The Dade County Board of Public Instruction, Miami, Florida bases its approach to validation of ITV programs on a clear statement of objectives. Mr. James Pearson, Validator, has completed validation of a program series on sixth-grade accelerated math, *It Figures*, and in March 1970 was working on validation of a Florida social studies program series.

Thus far literature which emphasized the importance of the statement of objectives in behavioral terms has been considered. Next a brief review of two ITV studies which not only used carefully stated behavioral objectives, but an empirical procedure as well will be considered.

**Experimental Studies That Used Empirical Procedure**

Before reviewing the studies with elements that produce significant results, two studies which used an empirical procedure will be considered. These studies, done at the Pennsylvania State University, employ an empirical procedure on an ITV art instruction program. Thomas Smucker, in his dissertation: *Model Testing*

Procedures to Implement Empirical Development of Televised Art Instruction, developed the behavioral objectives, a criterion test of these objectives, and finally one ITV program to meet these objectives. In experimental portion of the study he compares students who viewed the program with students who did not view the program in order to determine if the ITV program improved performance on the criterion tests to a significant degree.\(^{16}\)

The 20-minute program on Metal Sculpture was viewed by 82 fourth-grade students, and the criterion tests administered to them and 111 other students who did not view the program. Each student was interviewed and given the criterion measure individually. All were randomly assigned into either the control or experimental groups. From the analysis of information on the criterion test of behavioral tests the investigator was able to formulate a judgment of the effectiveness of the ITV program. There were 16 behavioral tests, and three showed positive differences between the non-viewers and the viewers at the .05 level.

The Smucker study served as a pilot for a more extensive use of the empirical procedure by Schwartz and Smucker: The Development of an Empirical Model for an Instructional Telecast in Art. The purpose of the study was to

---

investigate a method of developing televised art instruction by an empirical system of content development. The two programs produced followed a six-step procedure:

1. The development of behavioral objectives for a model television program on relief prints for an intermediate grade.

2. The development, scripting, production, videotaping, and broadcast of a 20-minute instructional television lesson entitled "Work Block Prints."

3. A development and administration of a televised test to evaluate the effectiveness of a televised program producing the desired student behavioral change.

4. The analysis of the results of the testing in order to develop a revised taped version of the lesson on relief prints.

5. The comparison of the relative effectiveness of the two versions on a randomized group of learners.

6. The analysis and interpretation of the data as it applies to the problem of this study: An Empirical Method for the Development of Instructional Television in Art.17

Several interesting results of the Schwartz study were reported. The method of developing ITV programs for art by the empirical system was both feasible and productive. Lesson objectives could be refined to terminal behavioral statements. The design and production of the ITV testing instrument proved to be an effective evaluation

device. However, the strengthening of selected concepts in the revised version necessitated restriction in other areas. Therefore, significant improvement on the test item was evident only on specific test items related to the revised content, but not overall between the two programs. This study made only one revision of one program.

Introduction to a Review of Elements That Produced Significant Results in ITV and Film Experimental Research

Many experimental research studies have been made of ITV and film. Most of these have attempted to find if ITV does as well as classroom lecture in communicating information to students. The majority of these have shown that there is no significant difference between ITV and classroom presentation when almost the same lecture is presented in both situations.

In preparing this chapter, over 450 ITV and film experimental research studies were reviewed. Each was examined to see if its results were significant. Only 75 of the 450 studies examined, or 16 per cent, had statistically significant results.

No attempt is made in this review to judge the adequacy of the experimental design. A study by Stickell of 250 comparisons of ITV and classroom presentation based on rather rigorous requirements for adequate experimental design showed 217 studies classified as uninterpretable,
23 studies were partially interpretable because of defects in experimental design, and only 10 studies were classified as interpretable. All of the 10 interpretable studies indicated no significant difference in learning at the .05 per cent level.\textsuperscript{18}

Two important research sources were the main base of this review. The first is the work by Reid and MacLennan which reviews 333 ITV and film experimental studies. This is a milestone in the compilation of research in ITV and film, and should be a basic source for all ITV and film researchers, producers, directors, and writers. The second important source was ERIC. The establishment of the Educational Research Information Clearinghouses (ERIC) and their monthly publication Research in Education which gives summaries and makes available the full text of recent research was a great help. Through information from Research in Education, communication was possible with Schwartz and Smucker at Pennsylvania State University who were conducting another study of the empirical procedure. Other research sources consulted were the latest "Research Reviews" formerly the "NAEB Fact Sheets" from the National Association of Educational Broadcasters, and research reported in the AV Communications Review.

A summary of this review, and attempts to select from the significant experimental research the elements which caused the significant difference will now be reported. These elements will serve as alternatives in the modification of the original lessons on creative problem solving. The elements will be introduced into the programs in the developing stages to determine if they will significantly improve the program. The hope was that the combination of the elements with the empirical procedure will result in programs which are significantly improved.

Significant Elements

Animation

At least seven studies have considered the use of animation rather than real persons or objects in instructional programming. A study by Lumsdaine, Sulzer, and Kopstein compared animated with nonanimated film and found that:

Groups having the animated film learned significantly more than groups having the nonanimated film, regardless of the pretesting, number of examples, or whether or not they saw the supplementary film.  

This was found to be true for both above and below average intelligence, and the researchers suggested that trainees in the lower and middle intelligence range may have learned the most.

**Attitude of Students**

More than 150 studies have considered the student's attitude toward ITV and the subject being taught. Borich found that attitude toward ITV was a predictor of academic performance. A significant difference between student attitude in ITV and direct instruction existed, and there was a direct and significant relation between this difference in attitude and academic performance.  

Scallon in another attitude study found that communicator relationship to the group changed attitudes to a significant degree when the communicator identified with the audience reference group.

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Black and White vs. Color

At least eleven studies have considered the value of black and white vs. color ITV and instructional film. One study by Fullerton indicated that student scores in the black and white film group were significantly higher than the student scores in the color film group on both immediate and delayed posttest. Other studies have found color slightly, but not significantly better, and many have found no significant difference.

Dramatic Presentation

Dramatic presentation of material has been considered in more than five studies. One study by Martin concerning the relative effectiveness of teaching dramatic understanding using either dramatic presentation by ITV or direct instruction by reading in conventional classrooms, it was found that students taught by ITV dramatization did

\[^{22}\text{Ibid., No. 88, citing Billie J. Fullerton, "The Comparative Effect of Color and Black and White Guidance Films Employed With and Without 'Anticipatory' Remarks Upon Acquisition and Retention of Factual Information" Dissertation Abstracts 16 (1956), 1413.}\]
significantly better than students taught by direct instruction. The ITV dramatization students also had significantly different appreciation of the dramatic play.23

**Empirical Procedure**

At least two studies have used an empirical procedure in developing ITV programs. A study by Schwartz and Smucker discussed earlier in this chapter was able to improve to a significant level selected concepts in the revised version of program in the area of art instruction on wood block prints. They also found, however, that strengthening of some concepts necessitated restriction of others. Therefore significant improvement on test items was evident on the strengthened concepts, and not on test items for the whole program.24

**Enthusiasm of Classroom Teacher**

A study by Garry and Maurello of an ITV French language series indicated that classroom teachers


24Schwartz, p. 21.
enthusiastic toward French had classes which scored significantly higher than those classes who had a non-enthusiastic classroom teacher and who saw the same ITV programs.\textsuperscript{25}

This seems to support the idea of ITV as part of a team effort, and emphasizes the vital importance of the classroom teacher. The Denver-Stanford project completed in 1964 reported that:

A well trained and motivated classroom teacher was the most effective single learning aid. Both interest and experience of the classroom teacher influenced learning. When teacher interest was high, pupil performance was directly related to teacher preparation and experience. When teacher interest was low, pupil performance was inversely related to teacher preparation and experience.\textsuperscript{26}

\textbf{Error Presentation}

Dreyfus in a discussion of significant research points to a study by Jaspen. Jaspen found that presentation of an error which is then pointed out and corrected had significant value in learning.\textsuperscript{27} Such a finding is

\textsuperscript{25}Ibid., No. 91, citing Ralph Garry and Edna Mauriello, \textit{Summary of Research: Parlons Francais I, II, III (Videotape Edition) and Parlons Francais I (Film Edition) n.p., n.d./ (Mimeographed).} See also: \textit{Summary of Research on "Parlons Francais": First-year Program. USOE Grant No. 719021, 09, (September 14, 1960) and Summary of Research on "Parlons Francais": Year Two. USOE Grant No. 719112 n.d./ Both Published at Boston; Massachusetts Council for Public Schools. (Mimeographed.)}


especially valuable for ITV where the techniques of TV close-up, field of view, and moving demonstration can clearly show both incorrect and correct procedure clearly and often better than direct observation.

**Experienced TV Instructor**

At least two studies have demonstrated the significant superiority of using experienced ITV instructors rather than inexperienced instructors in the classroom. Over twenty-eight studies have considered the element of instructor experience.

A study by Cobin and Clevenger in 1961 using a basic course in oral interpretation found that the mean score for a TV-taught group viewing an experienced instructor was significantly higher than median scores of the face-to-face group taught by less experienced graduate assistant instructors.²⁸

Another research experiment by Gordon found that

ITV instruction of remedial speech for third-grade students

by a trained speech correctionist produced significantly more improvement (.001 level) than face-to-face teaching of remedial speech by regular classroom teacher.29

**Film and Laboratory Instruction**

Combining viewing of instructional film with laboratory practice produced significantly higher scores than either film viewing only or laboratory practice only. Harris in a study on developing problem-solving abilities and learning relevant-irrelevant information through film and TV versions of a strength of materials testing laboratory found instructional film combined with laboratory practice to be the most effective method of instruction.30

**Filmstrip vs. Motion Picture**

A 1954 study by Ortgiesen comparing filmstrip with motion picture found the filmstrip significantly more effective than sound motion pictures in teaching ninth-grade

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30 Ibid., No. 116, citing Charles O. Harris and others, Development of Problem Solving Ability and Learning of Relevant-Irrelevant Information Through Film and TV Versions of a Strength of Materials Testing Laboratory USOE Grant No. 7-20-040-00 (East Lansing: College of Engineering, Michigan State University, November 5, 1962) (Offset.)
soil conservation as part of social studies. In addition, both the filmstrip and sound motion pictures were more effective than printed material.  

An earlier study by Slatter in 1953 had similar results. In a social studies fifth-grade class filmstrips produced significantly greater learning than sound motion pictures. Participation in filmstrips did not seem to increase learning significantly. At least three other researchers have studied the use of filmstrips.

Focus of Attention

Dreyfus reports a study by Vernon in which film excerpts focused undue specific attention and interfered with teaching a generalization. This would seem to indicate that visuals should be selected and shown in close association with the objectives of the instructional lesson. Visuals for the sake of having something to see, and extreme close-ups might be avoided or changed to meet the particular instructional objectives.


33Dreyfus, 2.
Generalization

Where should a generalization be made in an ITV program? The Vernon study, reported above, found that when teaching generalizations essential to the main argument the generalization is less likely to be remembered if placed at the end of the program.34

Home Viewing

Should ITV programs be viewed at home or in classrooms equipped with TV monitors? Twelve studies have considered this question of the value of home viewing. Abbey and others in a study of Health Science Education using nurses as subjects found that those who viewed at home had significantly higher achievement scores when compared with those who viewed as a group in a hospital.35

Erickson and Chausow in another study of home ITV viewing compared with direct instruction in the Chicago Junior College found at-home students doing significantly better in eight courses than their direct-instruction classmates in the same course. One course found direct-instruction students significantly higher than home

34 Ibid.
35 Reid, No. 1, citing June C. Abbey and others, Home and Hospital Viewing of Continuing Education Broadcasts Under Three Presentation-Response Conditions, Theodore S. Grant and Irving R. Merrill, Television in Health Sciences Education, USOE Project No. 164 (San Francisco: University of California, San Francisco Medical Center, September 30, 1963), p. 8-21. (Offset.)
students, and twelve courses showed no significant difference between students who viewed at home and those who attended direct instruction.  

Motivation

More than twenty-four studies have considered student motivation in the ITV and instructional film situation. A study by Weisgerber showed that motivational films exerted a significant influence on tenth-grade student preference for taking a science course at a later time. The films also significantly influenced the student's attitude.

Another motivation study by McNiven on Effects on Learning of the Perceived Usefulness of Material to be Learned showed that students who were told they would be tested (use material from film) learned significantly more from the film. McNiven concluded: "The nearer the goal


for using the information, the greater the learning."\(^{38}\)

The method of instruction can also affect motivation. A study by Glock of three methods of improving reading: tachistoscope, film, and determined effort discovered that the determined-effort group had significantly higher reading rate and comprehension after four months. This group used interesting reading material, studied vocabulary, and listened to periodic talks on the importance of reading improvement.\(^{39}\)

Note Taking

Ash is one of fourteen researchers who has considered note taking in ITV and instructional film. He found that note taking interfered with learning to a significant degree (.001 level), and indicated this was probably due to the films not having pauses and repetition necessary for note taking.\(^{40}\)


\(^{40}\)Ibid., No. 14, citing Philip Ash and B. J. Carlson, The Value of Note-Taking During Film Learning, SDC 269-7-21, Instructional Film Research Reports (Port Washington, Long Island, New York: U.S. Naval Special Devices Center, 1951).
Observation

Twenty-three studies have considered ITV and film as means of student observation of a situation from which they can learn. Rumford found that students who observed elementary education school methods by television had significantly higher grades on daily observation sheets than the students who were present and observed directly. No significant difference was found on other measures such as final grades, lecture scores, or post-tests. 41

Optical Effects

A number of optical effects such as dissolves, fades, and wipes, are easily available to the ITV director. Do these effects increase learning? A study by Mercer considered the relationship of optical effects and film literacy to learning from instructional films. He found a slight, but not significant increase in learning when cuts only were used. 42


Pre-Post-tests

At least eighty-three studies have used pre- and post-tests. Stein considered the effect of a pre-film test on learning from an educational sound motion picture. Using analysis of covariance the most effective means of instruction was a complete knowledge of the results of the pre-test with questions ordered in the same manner as material to be presented, and a post-test identical to the pre-test.43

Pacing

Four studies have considered pacing which is the rate of development of material. One 1953 study by Ash and Jaspen studied The Effects and Interaction of Rate of Development, Repetition, Participation, and Room Illumination on Learning From a Rear Projected Film. They found that a slowly paced film was appreciably better than a

fast-paced one in all comparable conditions, and they found that the rate of development had a significant effect on repetition and participation.\footnote{Ibid., No. 16, citing Philip Ash and Nathan Jaspen, The Effects and Interactions of Rate of Development, Repetition, Participation, and Room Illumination on Learning from a Rear Projected Film, Technical Report SDC 269-7-39, \textit{Instructional Film Research Reports} (Fort Washington, Long Island, New York: U.S. Naval Special Devices Center, 1953).}

**Planned Visual Continuity**

Schwarzwalder investigated the effectiveness of the following specific TV techniques on learning: visual continuity (planned and unplanned), visual reinforcement (supering or no supering), and visual manipulation (as in a lecture or TV situation). He found that students did significantly better when they had planned continuity and visual reinforcement which was the result of a team approach to using ITV effectively.\footnote{Ibid., No. 263, citing John C. Schwarzwalder, 
\textit{An Investigation of the Relative Effectiveness of Certain Specific TV Techniques on Learning}, USOE Project No. 985 (St. Paul, Minnesota: KTCA-TV, September, 1960) (Offset.)}

**Programed ITV**

The first chapter mentioned that the use of the techniques of programed learning would be an essential part of this study. At least twelve studies have been made of...
programed learning and instructional media. An element of programed learning is response which will be considered as an individual category.

In 1961 Gropper and Lumsdaine compared conventional ITV with programed ITV requiring active response by the students. The researchers found significantly higher scores for the group viewing the programed ITV lesson. The key variables were programed and conventional ITV presentations, learning, retention, and ability.46

Preview Remarks

Preview or anticipatory remarks made before the viewing of an instructional program were the subject of at least four studies. Fullerton in his 1956 dissertation found scores significantly higher when elementary and twelfth-grade students saw only the film without any preview, anticipatory, or introductory remarks. This was true on the immediate and delayed posttest.47


A later 1962 dissertation by Murphy found no significant difference between groups who received introduction and those not receiving introduction to a seventh-grade science film. ⁴⁸

Repetition

Fifteen studies have considered the effect of repeated student viewings of the same instructional programs. Eight studies have been concerned with review, and nineteen studies have considered the number of viewings. McTavish in a 1954 doctoral dissertation found a significant increase in learning for two viewings over one (.001 level) and three viewings over two (range for .01 for college freshmen to .05 for ninth-grade students). ⁴⁹

A study of review by Miller and Kanner in 1952 indicated that massed review produced significantly greater learning than spaced or no review. ⁵₀

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⁴⁸Ibid., No. 215, citing Francis Eugene Murphy, "The Relative Effectiveness of Filmed Introductions to a General Science Motion Picture," Dissertation Abstracts 22 (1962), 3121.


Response

Active student response is an important part of programmed learning. The audience does more than watch passively. They are expected to think and recall information given them in the instructional presentation. Eleven studies have considered either overt or covert response.

A 1967 article by Mayers suggests the important role of the classroom teacher in the ITV response situation:

... classroom teachers can enhance learning by increasing responsiveness. Showing the pupils that she is aware of and interested in their responsiveness may be sufficient to achieve the effect under certain conditions. Post facto analysis suggests, however, that observation and counsel should be supplemented by appropriate cueing of responses by teacher so that responses are made properly, in unison, and do not overlap with the feedback provided by the television instructor.51

A 1961 Gropper study found that active student response significantly increases achievement scores on both immediate and delayed posttest.52

51 Allan E. Mayers, "The Effects of Student Location and Teacher Role on Learning From ITV," AV Communications Review, XV, No. 2 (Summer, 1967), 175.

Revised Version

Another Gropper study examined the value of revising ITV programs based on student response to an achievement test. After a lecture and posttest, careful analysis of the test was made to determine points in the lecture that were poorly learned by the students. The lecture was then revised accordingly. A t-test indicated that students who saw the revised version had significantly higher posttest scores than those who watched the first lesson.53

Self Viewing

Students can learn by viewing television recordings of themselves in an activity. Television has been used to permit student teachers to view themselves in the classroom and learn from this experience. Robert Burns had a wish and expressed it in these lines:

Oh wad some power the giftie gie us
To see oursels as others see us!
It wad frae monie a blunder free us,
An' foolish notion.54


Perhaps Smith and Clifton were thinking of this when they investigated self-viewing of motor skills and its effect upon expressed concept of self in movements. A t-test indicated that subject's evaluation was significantly more favorable after viewing films of themselves. Those who viewed individual films of themselves had significantly more positive self-perception than those who viewed group film.\(^{55}\)

**Speech Delivery**

The importance in the quality of speech delivery was examined in a 1963 dissertation by Skinner. Using an actor as instructor he found that the actor using good speech delivery produced significantly higher immediate and delayed retention scores than did the actor using poor speech delivery. Skinner used a semantic differential to determine the relationship of the instructor to the students' concept of an ideal speaker. The students were in an American History course. They rated the good speaker significantly closer to their concept of an ideal speaker.\(^{56}\)

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\(^{55}\)Reid, No. 278, citing Hope M. Smith and Marguerite A. Clifton, *The Viewing of Oneself Performing Selected Motor Skills in Motion Pictures and Its Effect Upon the Expressed Concept of Self in Movement*, USOE Grant No. 704105 (Los Angeles: University of California, August, 1961) (Mimeographed.)

Step Presentation

The problem of whether to teach by ITV in one large step or several smaller steps was examined by Blacheri and Merrill. Two groups of dental students were equated by tests. The step group viewed step one then practiced it, then step two and practiced, and so on through five steps. The other group viewed the entire process then practiced it. A t-test indicated that the step group did their lab work in significantly less time than the inclusive-presentation group (.01 level). There was no significant difference between the two groups in work quality.  

Student Ability

At least eighty-six studies have considered student ability and the use of ITV. One study by Jacobs and Bollenbacher compared sixth-grade science students by high, middle, and low ability levels. The results indicated that ITV instruction was significantly better for high-ability students.  

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57 Ibid., No. 29, citing Raymond L. Blancheri and Irving R. Merrill, The Step Presentation of Dental Technic Instruction, Theodore S. Grant and Irving R. Merrill, Television in Health Sciences Education, USOE Project No. 064 (San Francisco: University of California, San Francisco Medical Center, September 30, 1963), p. 34-37 (Offset.)
students, and that direct instruction was significantly better for low-ability students. There was no significant difference between methods of instruction for the middle-ability students.\textsuperscript{58}

**Supplements to ITV Lectures**

What learning activity in addition to ITV will best assist student achievement? Lane in his 1963 dissertation examined this question. The three supplements to ITV were: Kinescope of solutions to exercises and review of concepts, teacher-assisted instruction where the teacher answered questions and helped with the homework, and programmed booklets. An analysis of covariance indicated that the programmed-booklet group did significantly better in both achievement and study time.\textsuperscript{59}

**Team Approach**

The team approach emphasizes the role of many individuals in the planning of an ITV program. A study by Schwarzwalder combined the elements of planned continuity, 

\textsuperscript{58}Ibid., No. 141, citing James N. Jacobs and Joan K. Bollenbacher, "An Experimental Study of the Effectiveness of Television Versus Classroom Instruction in Sixth Grade Science in the Cincinnati Public Schools, 1956-57," Journal of Educational Research 52 (1959), 184-189.

\textsuperscript{59}Ibid., No. 147, citing F. Craig Johnson and others, An Investigation of Motion Picture Film and the Program Analyzer Feed-back to Improve Television Teacher Training, USOE Project No. 334 (Athens, Ohio: Ohio University, April, 1960). (Mimeographed.)
visual reinforcement, and team approach. He found through analysis of covariance that pupils generally did significantly better (.05 level) on the science content test when these elements were combined. 60

The ITV teacher and the classroom teacher have been looked at as a team. The importance of the classroom teacher was mentioned previously under the heading Enthusiasm of Classroom Teacher.

Talkback

Almsted and Graf examined the use of talkback equipment in the classroom to permit the student to communicate with the ITV teacher during the program lecture. Comparing direct instruction and ITV students with talkback equipment the researchers found that even though direct-instruction students had higher IQ scores before the instruction, the ITV group scored significantly higher on the criterion in five out of six comparisons. 61

60 Ibid., No. 263, citing John C. Schwarzwalder, An Investigation of the Relative Effectiveness of Certain Specific TV Techniques on Learning, USOE Project No. 985 (St. Paul, Minnesota: KTCA-TV, September, 1960). (Offset.)

Time

How much time should be devoted to an ITV series? How many lessons should there be in a series? Enders studied the use of ITV as a supplement to instruction. He found that a group that viewed twelve ITV programs showed significantly greater improvement over a group that viewed twenty ITV lessons.62

Titles and Subheadings

The use of titles and subheadings to emphasize and organize the content of the lecture was studied by McIntyre in 1954. He compared the following three versions of the same film: 1) humorous treatment, 2) titles substituted for the humorous parts of the film, 3) no titles or humorous treatment. The results indicated that trainees learned significantly more from the film with titles.63

Television vs. Audio Only

At least six studies have been made comparing television with audio only to gain a better understanding of the relative potential of the audio-visual presentation.

62 Ibid., No. 74, citing Donald Earl Enders, "Academic Achievement in Grade Six Science Resulting from Supplementary Instruction by Open Circuit Television," Dissertation Abstracts 21 (1960), 131.

of ITV compared with the audio only presentation of radio, audio tape, and language laboratories.

Frank in his 1955 dissertation examined audio only compared with television which had the same audio. He found that trainees receiving weather instruction by television had significantly higher (.01 level) scores on an information test.64

Williams and Ogilvie compared TV, radio, reading, and face-to-face communication using immediate and delayed retention tests. The exact same material was presented by the medium to different groups. On the immediate posttest ITV was significantly superior (.01 level). On a delayed posttest eight months later ITV was still superior, but face-to-face instruction had moved up from fifth place rank to second place.65

Visual Reinforcement

Schwarzwalder in a previously mentioned study of the effectiveness of specific TV techniques on learning


found that visual reinforcement combined with planned continuity and the team approach produced significant results (.05 level). 66

In another study by Ulrich, students who saw a presentation with visuals scored significantly higher (.05 level) than students receiving lecture only. However, there was no difference on the delayed posttest given thirty days after the presentation. 67

Summary

This chapter has attempted to select from over 450 research studies in ITV and film those elements which produced significant results. These elements served as alternatives for the research that will be reported in the fourth chapter.

The research goal is to appraise empirical program development to determine if it can increase the effectiveness of ITV programs to a statistically significant degree. The elements reported in this chapter will serve as alternatives in the modification of the original lessons. It is hoped that the combination of empirical program development


67Ibid., No. 263.
with elements that have proved significant in other ITV research will result in modified programs that are improved to a statistically significant degree.
CHAPTER III

PROCEDURE

This chapter concerns the procedure used in the experiment. The purpose of the experiment was to appraise the application of empirical program development on the content of creative problem solving in order to determine if empirical procedure can increase the effectiveness of student performance to a statistically degree after viewing ITV programs.

During the 1968-1969 school year four 20-minute ITV lecture programs on the subject of creative problem solving were prepared for television. Two of these programs use the empirical program development technique.

Empirical Program Development

Empirical Program Development necessitates the identification of the exact behavior desired from the students after being exposed to the ITV program, an analysis of the students' performance on the task related to the behavioral objective, and the revision of the television lesson until success is attained on the creative determining criteria. The following were the steps involved
in developing the programs for this study: 1) define the program audience; 2) define the program objectives; 3) develop tests; 4) select content and presentation methods; 5) test and analyze results; 6) revise program until objectives are obtained.

The experimental programs were a combination of the conventional programs, empirical program development, and the elements listed in the second chapter. The empirical procedure listed here was a combination of the procedure suggested by Greenhill, Komoski, Wade, Smucker, and Swartz. These are described in Chapter I and Chapter II.

Define Program Audience

The first step pin-pointed the program audience. It can state such characteristics as age, socio-economic characteristics, previous subject area experience, grade level, ability range, and any other information which will help understand the needs and wants of the intended audience.

The teacher builds on what the student already knows. Thurstone said in 1924:

That teacher is more fortunate who realizes that the starting point for educative process is the child's own mind, and that the tools of education are merely the means whereby we attempt to induce the child to experience its own self in a direction that may be ultimately advantageous. 

It therefore seems reasonable to define the audience the

program is intended to reach so that you can understand their abilities and needs and then build on these.

The intended audience for this study were freshman, sophomore, junior, and senior students at Iowa State University. The ages of these students ranged from 19 to 25 years. They were from many different areas of study, and were taking the basic speech course required by most departments in the university. Their ability was, therefore, college level. Because creative problem solving was a relatively new area, they were expected to have had no experience with this subject. Several pre-test questions were developed to test this assumption.

Define Program Objectives

The individual program and the program series objectives were defined in precise behavioral terms. Terminal behavioral objectives defined what the student was to be able to do to demonstrate that he has learned from viewing program series. These objectives were also stated in measurable terms indicating what the viewer was to do when he demonstrated that he had achieved the program stated objectives.

The primary objective of the two programs was to increase idea fluency. In a full series of ITV programs idea flexibility and originality would also be behavioral
goals. However, because the study is limited to two 20-minute programs the emphasis was to achieve the primary objective to prove the value of the empirical procedure.

Idea fluency was considered the most important criterion measure on the test. Amran points out that there is a high correlation between fluency and flexibility and between fluency and originality. He suggests that the flexibility and originality scores can be predicted from the fluency scores. Wallace points out that since fluency and originality were found to be related and apparently valid predictors he suggests that their scorings be combined as a single predicting score.

Statement of Terminal Objectives for Programs 1 and 2

Given a problem requiring a number of alternative ideas as a solution and a time limit of five minutes, the student will increase to a significant level (.05) the number of ideas listed as compared with a similar problem given before viewing the programs as measured by sections of the Torrance Test of Creative Thinking.

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Statement of Terminal Objectives for Program Series

Given a problem requiring a number of alternative ideas as a solution and a time limit of five minutes the student will increase to a significant level (.05) the number of ideas, the flexibility of the ideas, and the originality of the ideas listed as compared with a similar problem given before viewing the program series as measured by sections of the Torrance Test of Creative Thinking.

Test Development

The measure of student performance was adapted, tested, and refined. The criterion measure evaluated the effectiveness of the program in producing a desired student behavioral change.

A number of measures of creative ability are available. Work has been done for the past 10 to 15 years on the reliability and validity of many of these tests designed to assess creative ability. The Summer 1968 issue of the Journal of Creative Behavior devoted itself to a discussion of many of the measures.4

The following creative tests were considered in making a selection of criterion measure.

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The Guilford Tests

In his book *The Nature of Human Intelligence* J. P. Guilford considers completed research and appropriate situations for his creative tests. Some of the tests deal with verbal fluency, flexibility, originality, and elaboration while other tests deal with fluency, flexibility and elaboration with figural content.\(^5\)

Remote-Association Tests

Sarnoff A. Mednick and Martha F. Mednick define the creative process as the formation of associated elements into new combinations which either meet specified requirements or in some way are useful. They feel the more mutually remote the newly combined elements the more creative the process or solution. The test gives a list of words and asks for another word which will serve a specific associative link between the disparate words. The more remote association made the higher the score.\(^6\)

Alpha Biographical Inventory

The Institute for Behavioral Research in Creativity has developed a 300 multiple-choice instrument in which the

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\(^5\)Letter from R. S. Burke, Executive Director, Sheridan Psychological Services, Inc., P. O. Box 837, Beverly Hills, California, 90213, September 26, 1968.

individual describes himself and his background. It is based on the theory that past behavior, experiences and self descriptions can indicate future performance. The Alpha Biographical Inventory has a wide variety of questions concerning experiences, childhood activities, sources of derived satisfaction and dissatisfaction, attitudes, interests, and self-description evaluations.  

Preconscious-Activity Scale

John L. Holland and Leonard L. Baird have developed a 38-item true or false instrument which seems to reflect an individual's flexibility, willingness to consider the novel, unique, strange, and accept the irrationality of oneself. Based on the theory that ideas and concepts are freed from their usual associations in the preconscious, the original person can make effective use of his preconscious process. Apparently, creative people possess a more subjective outlook, are expressive, able to use their inner feelings, and are not overly critical. This contrasts with people whose outlook is objective, critical, rational, and conventional.  


AC Test of Creative Ability

The AC Spark Plug Division of General Motors Corporation has developed a test designed to measure the quantity and uniqueness of ideas an individual can produce in a given situation as indicated by his ability to foresee consequences, to find reasons and explanations, and to see novel uses for common objects. 9

Flanagan's Test of Ingenuity

Part of the Flanagan Industrial Tests (FIT) and the Flanagan Aptitude Classification Tests (FACT) is the Ingenuity Test. It tests the ability to invent or discover a solution which is unusual, clever, or surprising. 10

Symbols Test of Originality

Herbert J. Burgart has developed a visual-verbal measure of general creativity. Part of the test asks for a one-word description of symbol which is pictured. The score is based on the participant's uncommonness of response to pictures of symbols. 11


Test of Creativity and
Individual Test of Creativity

The Test of Creativity and the Individual Test of Creativity was developed by John J. Risser and Newton Metfessel in response to a need by Project Potential for a culture-fair instrument. This was to identify intellectual talent in culturally disadvantaged children such as the Mexican-American populations. It attempts to measure: re-definition ability, sensitivity to problems, fluency, flexibility, originality, and elaboration.12

Some of these tests did not seem appropriate for this study. The Torrance Test of Creative Thinking was selected, tried, and found appropriate because its scores were observable behaviors which could be used in the statement of objectives.

The test used in the study refined from one section of the creative test developed at the University of Minnesota and known as the Minnesota Test of Creative Thinking, and also as the Torrance Test of Creative Thinking Verbal Form, was used to evaluate the three creative behaviors of fluency, the facility with which ideas are generated; flexibility, the number of different principles, strategies, or approaches in response to a test; and originality, the uniqueness of response to the test items.

The Norms-Technical Manual for the Torrance Test of Creative Thinking describes in detail the rationale of test activities, reliability, and validity. The unusual-uses activity was a direct modification of Guilford's Brick Use Test. Torrance believed "tin cans and cardboard boxes" were more available for children in their play activities than bricks.¹³

Concerning reliability Torrance points out that the customary concepts of reliability are relevant, but that because individual educational experiences, and motivation, affect creative function and may contribute to a lowering of test-retest reliability as traditionally estimated, the measuring instrument should not be assumed unreliable or lacking in usefulness. Torrance states:

The very fact that measurement instruments are sensitive to such factors may make them especially useful in certain kinds of situations. Among such situations are studies designed to assess the influence of experimental methods . . . ¹⁴

Torrance discusses a number of studies of test-retest reliability. A 1962 study of college students on

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¹⁴Ibid., p. 18.
the Unusual Uses of Tin Cans obtained a fluency reliability of .75, flexibility reliability of .60, and an originality reliability of .64.\textsuperscript{15}

Other tests were used during the developmental stage. Informational tests were developed to evaluate the informational content of the program to see if the ideas were communicated. These took the form of forced-choice, multiple-choice, and open-ended questions.

Time and expense involved in scoring creative tests, especially for flexibility and originality, is great. A complete test takes at least 30 minutes for each student. During years of using the \textit{Minnesota Test of Creative Thinking} Amran found a high correlation between fluency scores and scores of flexibility and between fluency scores and originality scores. He suggests that if possible to avoid scoring flexibility and originality and thereby decrease the scoring costs greatly.\textsuperscript{16} This procedure was followed during the empirical development stage. However, for the final test of the hypothesis, all tests were scored completely.

\textbf{Program Content}

The content of the four programs produced for ITV concerned the subject of creative problem solving. This is

\textsuperscript{15}Ibid., p. 22.

\textsuperscript{16}Amran, p. 28.
a relatively new field of study. General Electric has offered courses since 1940 for some of their engineers, and full semester courses in creative problem solving have been offered at the State University of New York, Buffalo, since 1949. Other universities which offer courses in this field of study are: University of Chicago, California State College at Long Beach, La Salle College in Philadelphia, Xavier University at Cincinnati, Ohio, University of California at Santa Barbara, McAllister College in St. Paul, Minnesota, Northwestern University, and the University of Boston.

Two of the programs were conventional and the other two were empirically developed.

The conventional programs were based on material written by others. This reduced any tendency to create "poor" conventional programs and compare them with "good" empirically developed programs. Using previously created material is similar to the procedure employed in most ITV conventional situations. The instructor adapts lectures used in the classroom to television. In many cases there may be little or no attempt to add any visualization to the lesson. The producer-director then may suggest changes that will improve the program when it's carried over television.

The content of the program had been used a number of times from 1965 to 1969 by the researcher in both full
courses on creative problem solving and singular lectures on the subject. And his opinion was that this was the best information available on this subject. It was specially created and offered to lecturers by the Creative Education Foundation in an effort to disseminate information on creativity.

The first conventional program was based on a speech, and slide presentation written by Alex F. Osborn, titled: The Golden Key to Problem Solving.\(^{17}\) It served as an introduction to creative problem solving and emphasizes a number of techniques that can be used to increase creative behavior. The other program was based on lectures for cultivating creative behavior by Sidney J. Parnes and published in the Creative Behavior Guidebook.\(^{18}\) This program emphasized the importance of problem sensitivity and problem statement proper form for creative attack. Both scripts are included in the appendix: I-A and II-A.

The content of empirically developed programs should be selected based on the audience need, program objectives, and test results. This involves the steps of outlining the program content, preparing a preliminary content sequence, selecting presentation methods and strategy that seem to

---


best achieve the results desired, and finally writing a first draft of each program script. The empirically developed program followed the procedure. Therefore, content and presentation methods for each program were altered. Not only did the content and procedure change based on test results, but changes were made based on those procedures outlined in Chapter II which seemed appropriate to the presentation.

Selected parts of the content and presentation were exposed to small groups in the live lecture situation in order to determine student response to it. When students in these groups made errors or failed to achieve significant improvement on the criterion measure, it was considered a failure on the part of the program to communicate the idea presented, and not a failure on the students' part.

Presenting content to small groups proved to be satisfactory and a good deal less expensive than using ITV to try out all procedures. During these classroom presentations a number of audio-visual aids were used, such as audio tape, 35mm slides, pictures, and other graphics.

These programs were revised using empirical development until the subject reached a significant level of improvement on the criterion tests. The objective of the empirical programs were the same as the conventional programs, and the information basically the same, but these programs
were different. They were the result of the application of the empirical procedure.

Tests and Analysis of Results

Before each of the live lectures the students were given a brief pre-test. They were given a problem such as: "List all the ideas you can for improving a bed." When the time was over they were asked to count up the number of ideas they had listed, and this was recorded for each of the students. After these lectures the same procedure was followed for a post-test. They would be asked to list ideas on another problem, such as: "List all the ideas you can think of for improving the library." These scores were compared with t-test, Kolmogorov-Smirnov two-sample test, or analysis of variance to determine if the lecture produced a significant improvement in idea fluency.

Revision of the Program

When test results were not significant in the live lecture the program was revised, trying one of the elements listed in Chapter II, which seemed appropriate to meet the particular program need. For example, one change which was tried and proved successful was the use of active student response. In this case the testing procedure was repeated during the program. Students would be asked to immediately apply a creative technique suggested to a problem. They would total the ideas and in most cases see that the use
of the technique helped them to increase their idea fluency. Students would call out their scores to the instructor, which permitted them to hear how other students were doing in relation to themselves. One response was tried, then in another live lecture having the students respond twice was tried, and so on. Each time higher scores were noted. This procedure continued until significant differences between the pre- and post-tests were noted.

This, then is the six-step empirical program development procedure used to create two programs on creative problem solving. Next the experimental design used to test the results of the empirical procedure will be discussed.

Experimental Design

The experimental design provides a logical structure which is the basis for valid reference. The study used simple, random design, and each treatment was independently administered to a different sample of subjects. All subjects were drawn independently at random from the parent population. Table 1 shows the experimental design using the three fundamentals of speech classes randomly assigned to one of three groups.
TABLE 1.—Experimental design using three fundamentals of speech classes randomly assigned to one of three groups of 17 students in each of the three groups

<table>
<thead>
<tr>
<th></th>
<th>Pre-test</th>
<th>Post-test</th>
<th>1A</th>
<th>2A</th>
<th>1X</th>
<th>2X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conventional ITV</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Empirically</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developed ITV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Subjects

The subjects were college students enrolled in various speech courses at Iowa State University, and during the empirical development of the program listened to lectures or viewed programs in their regularly scheduled classes. The population in the experimental stages used to test the hypothesis were students from four sections of Fundamentals of Speech and were randomly assigned to one of three groups: 1) conventional ITV; 2) empirical program development ITV; or 3) control. Table 2 shows the distribution of subject in groups for the four programs: two conventional ITV and two empirically developed ITV.

The instructor for all programs was the same. He had three years of experience teaching creative problem solving directly to classes.
TABLE 2.—Distribution of subjects in groups for the four programs: two conventional ITV, two empirically developed ITV

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th>Group X</th>
<th>Group C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program 1A, First</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conventional ITV</td>
<td>17</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Program 2A, Second</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conventional ITV</td>
<td>17</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Program 1X, First</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Empirically Developed</td>
<td>0</td>
<td>17</td>
<td>0</td>
</tr>
<tr>
<td>Program 2X, Second</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Empirically Developed</td>
<td>0</td>
<td>17</td>
<td>0</td>
</tr>
</tbody>
</table>

Instrumentation

The instrumentation employed in the study involved
the Telecommunicative Arts studies at Iowa State University
in Ames, Iowa. The equipment employed was the following:

2 RCA Vidicon Cameras, TK-15
1 Film Chain, RCA TK-21C
1 Video Switcher, RCA TS-5A
1 Studio, 55 x 70
Ampex 660 Video-Tape Recorders

The video-tape recorders are located at the studios
of WOI-TV on the Iowa State University Campus. This
commercial television station is the ABC affiliate for Des
Moines. The station is owned and operated by Iowa State
University and is connected by cable to the Telecommunicative
Arts studios.
The classrooms in which the students viewed the programs were located in Pearson Hall on the Iowa State University Campus. These classrooms are equipped with television monitors and are connected to the WOI studios by underground cable. Each of these rooms has lighting fixtures which will adjust for TV viewing.

**Information Questionnaire**

An information questionnaire was given to all groups so that an analysis of student background would be possible. Six questions concerning background and experience in creative thinking were asked. The students responded to the questions on IBM answer sheets. The questionnaire was used to verify the assumption that most students viewing the programs have little background in the area of creative study.

In addition, twelve questions concerning student reaction to the programs were given to the two groups that viewed the programs. A copy of the questionnaire is in the appendix, and the results of the questionnaire are reported in Chapter IV.

**Tests**

Two tests were used: 1) pre-test given before the viewing of the programs; 2) post-test given immediately after the program.
The pre-test, administered immediately before viewing of the first program, determined fluency, flexibility, and originality scores. These scores were compared statistically to determine if differences between the groups were significant.

Post-tests were given immediately after viewing the second program, and these scores were compared statistically to determine if differences between pre- and post-scores for each group were significant.

The following instructions were given to the students before taking the pre- and post-tests:

(Before handing out tests) Don't turn the page until we start. Fill out the information on the cover, and include your sex after the date.

(After handing out tests, and after the students have filled out information on the cover) The activity in this Creative Thinking Exercise will give you a chance to use your imagination in thinking up ideas, putting them into words. There are no "right" or "wrong" answers like there are in most things that we do. We want you to see how many ideas you can think of and we think you will find this fun. Try to think of interesting, unusual, and clever ideas—something that no one else will think of.

You will be timed, so make good use of your time. Work as fast as you can without rushing. If you run out of ideas before time is called wait until instructions are given. Sometimes if you will just sit and think more ideas will come to you and you can add these.

Any questions?

Now turn the page over and read with me.

(Copies of the tests are included in the appendix.)
Hypotheses

The following null hypotheses were tested from programs 1 and 2.

1. There is no significant difference in student idea fluency as measured by one section of the Torrance Test of Creative Thinking between gains made by students viewing conventional ITV programs and students viewing empirically developed programs on creative problem solving.

The following null hypotheses would apply to the program series but were also tested for these programs.

2. There is no significant difference in student idea flexibility as measured by one section of Torrance Test of Creative Thinking between gains made by students viewing conventional ITV programs and students viewing empirically developed programs on creative problem solving.

3. There is no significant difference in idea originality as measured by one section of the Torrance Test of Creative Thinking between gains made by students viewing conventional ITV programs, and students viewing empirically developed programs on creative problem solving.

Statistical Analysis

The statistical test used to determine whether differences between groups were significant or due to chance was analysis of variance. Analysis of variance statistical tests requires a random sample and homogeniety
of variance. Each student was assigned a number, and these numbers were randomly drawn and assigned to one of the three sections. A statistic was applied to check the homogeniety of variance.

An IBM 360 computer was used to calculate the analysis of variance. For the purpose of calculation the data was divided into 18 sets of data: pre-test, post-test, fluency score, flexibility score, originality score, conventional group, experimental group, and control group. Data print-out included each treatment group's size, standard deviation, and mean. For the analysis of variance comparison the computer printed: the grand mean, sum of squares between groups, sum of squares within groups, total sum of squares, degree of freedom for both sum of squares, mean square for both sum of squares, and F ratio.

This, then, is the procedure followed to both develop the programs by the empirical procedure and to experimentally test the procedure to determine if it can successfully increase idea fluency to a significant level. The next chapter will present and discuss the results of this procedure.
CHAPTER IV

RESULTS OF THE STUDY

This chapter presents the results of a study appraising empirical program development procedure on the content of creative problem solving. The goal of the study was to determine if the procedure increased the effectiveness of ITV programs to a significant degree.

Empirical Program Development Procedure

Eighteen different live lecture programs were presented to over 400 students in 18 different regularly scheduled Speech classes during the empirical program development stage of this experiment. Ten revisions were made of the first program, and eight revisions were made of the second program, to make the 18-program total.

Both conventional programs were written during the summer of 1968. These were tested and failed to produce a significant increase on the criterion measure of idea fluency, and so the empirical procedure was begun.

The first program revision was made and tested during the summer of 1968 while the other revisions were given and tested during the fall quarter of 1968.
Significant improvement showed by the fourth program revisions, but further revisions were made to test out procedures which might improve the program even more. This process took from the end of September to mid-October, only about two weeks. Each time the lectures were given to a new group of students who received both a pre-test and a post-test. It wasn't until the tenth revision that the researcher was satisfied that the program had reached a significant level of improvement.

The second program in the series followed much the same procedure. It was first written during the summer of 1968, but was not tested until mid-October of that year. Because of the experience gained in the first program it was necessary to revise the program only eight times. This procedure took place over a period of two weeks. Once again the lectures were given to a new group of students each time the programs were revised. These students took both a pre- and post-test.

Notes of each of the revisions is included in the appendix starting on page 183.

Test Time During Empirical Procedure

During the development stage, because of the limited amount of time with each of the 18 lecture sections, a series of statistical correlation comparisons were executed to determine if the time necessary to respond on the
criterion test could be reduced without adversely affecting the predictive value of the criterion measure, idea fluency. Torrance has recommended that for the portion of the test used students be permitted ten minutes to complete their answers.

The following procedure was used to determine if a 2- or 5-minute test time score could be used. As students worked on developing ideas they were told to place a line on their list of ideas at the end of two minutes, and again at the end of five minutes. The total number of ideas developed in five minutes was compared with the number of ideas developed in two minutes. This was done during both the pre- and post-test.

The correlation results were: \( r = 0.788 \) on the pre-test and \( r = 0.7685 \) on the post-test. The two-minute fluency score was used during further development in the empirical stage.

The Final Program Comparison

Four sections of Speech 211, Fundamentals of Speech, were selected out of the 40 sections which were offered in the Spring of 1969 to form the population for the experiment. The students in these sections were randomly assigned to one of three groups: conventional ITV, empirically developed ITV, or a control group. Each group contained 17 students.
Four ITV programs were produced with the conventional and empirical group viewing two programs each. They were given a pre-test immediately before the first program and a post-test immediately after the second program. They viewed one program each week for two weeks. Therefore, one week passed between the viewing of the first and second programs. The control groups were given the pre-test one week and the post-test another week and viewed none of the programs.

Pre-test Results

Immediately before viewing the first program all students were given a pre-test to measure their ability in creative thinking, and to serve as a basis of comparison to demonstrate improvement when compared with the post-test. Table 3 shows the mean scores and the results of the analysis of variance. No significance between the groups was manifest in the analysis of variance on the three measures of creative thinking: idea fluency, flexibility, and originality.

Post-test Results

Immediately after viewing the second program the students were given another section of the Torrance Test of Creative Thinking as a post-test. Table 4 summarizes the mean scores and the analysis of variance results of the
### TABLE 3.—Pre-test mean score, grand mean, and analysis of variance results for three groups on three measures

<table>
<thead>
<tr>
<th></th>
<th>Fluency</th>
<th>Flexibility</th>
<th>Originality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>13.06</td>
<td>8.35</td>
<td>8.88</td>
</tr>
<tr>
<td>Group X</td>
<td>14.82</td>
<td>10.00</td>
<td>9.94</td>
</tr>
<tr>
<td>Group C</td>
<td>12.00</td>
<td>8.00</td>
<td>7.24</td>
</tr>
<tr>
<td>Grand Mean</td>
<td>13.29</td>
<td>8.78</td>
<td>8.69</td>
</tr>
<tr>
<td>F Ratio</td>
<td>1.61&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.56&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.49&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup>All F ratio non-significant at .05 level.

### TABLE 4.—Post-test mean score, grand mean, and analysis of variance results for three groups on three measures

<table>
<thead>
<tr>
<th></th>
<th>Fluency</th>
<th>Flexibility</th>
<th>Originality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>15.76</td>
<td>10.24</td>
<td>6.76</td>
</tr>
<tr>
<td>Group X</td>
<td>18.41</td>
<td>10.00</td>
<td>7.53</td>
</tr>
<tr>
<td>Group C</td>
<td>9.71</td>
<td>6.57</td>
<td>3.47</td>
</tr>
<tr>
<td>Grand Mean</td>
<td>14.62</td>
<td>8.94</td>
<td>5.92</td>
</tr>
<tr>
<td>F Ratio</td>
<td>12.77&lt;sup&gt;a&lt;/sup&gt;</td>
<td>13.87&lt;sup&gt;a&lt;/sup&gt;</td>
<td>6.76&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup>Significant at .01 level.
post-tests. All analysis of variance post-test scores were significant at the .01 level which would indicate differences between the three groups not merely caused by chance. Inspection of the means would suggest these differences were caused by the groups which viewed the programs and the control group. However, a glance at the control group pre-test means and post-test means on the three measures indicated a drop in scores on all three measures, which may contribute to the difference at the significant level. The control group did not have the motivation that the other groups had and this might be the reason for the drop.

Comparison of post-test fluency means of group A and X resulted in a non-significant F ratio of 1.56 with at least 4.15 needed for significance at the five per cent level.

Pre-Post-test Fluency Comparison

The most important comparison is the pre-post-test comparison of fluency because this is the measure which programs are trying to increase. This is shown in Table 5. Both the conventional and the experimental groups did increase. The conventional group increase was not significant. The experimental group increase was significant at the .05 level.
TABLE 5.—Pre-test post-test mean fluency scores and comparison

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>F</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional</td>
<td>13.06</td>
<td>15.76</td>
<td>1.61</td>
<td>N.S.D.</td>
</tr>
<tr>
<td>Experimental</td>
<td>14.82</td>
<td>18.41</td>
<td>4.26</td>
<td>.05</td>
</tr>
<tr>
<td>Control</td>
<td>12.00</td>
<td>9.71</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Rejection of Null Hypothesis

The following null hypothesis was tested for with programs one and two:

There is no significant difference in student idea fluency as measured by sections of the Torrance Test of Creative Thinking between gains made by students viewing conventional ITV programs and students viewing empirically developed programs on creative problem solving.

This hypothesis can now be rejected. The experimental programs developed by the empirical program procedure did significantly increase idea fluency while the conventional programs did not.

It is interesting to note the program effect on the other two measures of creative thinking: flexibility and originality.
Flexibility and Originality Pre-Post-test

A program series on the subject of creative problem solving would attempt to increase all four measures of creative thinking as indicated by Torrance: fluency, flexibility, originality, and elaboration. Although only fluency was considered important in the first two programs used to appraise the empirical procedure, measures were made of flexibility and originality.

Table 6 shows the pre- and post-test flexibility and originality means for conventional and the experimental groups. No significant changes were evident. It is interesting to note that the originality means for both dropped the same. This might tend to support a conclusion of the Schwartz study which found that while one concept in the revised version was emphasized and strengthened other concepts not strengthened tended to be

<table>
<thead>
<tr>
<th>Group</th>
<th>Flexibility Pre</th>
<th>Flexibility Post</th>
<th>Originality Pre</th>
<th>Originality Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>8.35</td>
<td>10.24</td>
<td>8.88</td>
<td>6.76</td>
</tr>
<tr>
<td>X</td>
<td>10.00</td>
<td>10.00</td>
<td>9.94</td>
<td>7.52</td>
</tr>
</tbody>
</table>
de-emphasized or omitted. This resulted in a loss of achievement on related test items.\textsuperscript{1} During an entire program series such deficiencies would no doubt be overcome.

Test of Statistical Assumptions

Stickell states that in most ITV studies no test is made of the assumptions of the applied statistical test. This is a legitimate complaint. Therefore, a test was made for homogeneity of variance:

\[ F = \frac{s^2}{s^2} \]

\[ F = \frac{6.175^2}{3.644^2} \]

\[ F = \frac{38.1306}{13.2787} \]

\[ F = 2.871 \]

An F of 4.15 or greater would indicate there was not homogeneity of variance. The F value is 2.871, less than 4.15 and therefore, there was a homogeneity of variance in the data, and the statistical assumption has been met.

A second statistical assumption of the analysis of variance is that the sample is drawn at random. All subjects were selected for their groups on a random basis. Each

\textsuperscript{1}Schwartz and Smucker, 21.
student was given a number, the numbers were put in a hat, and then drawn at random.

**Analysis of Student Background**

All three groups, a total of 51 students, responded to six questions concerning their background and experience in creative thinking. One of the assumptions of this study is that the students would have little background in this area of study. The student response generally supported this assumption, and were also generally distributed among three groups. A chi square analysis of each question resulted in no significant difference between the three groups at the .05 level.

Most of the students had little or no experience with creative thinking. Those who had heard about it or indicated they use it all the time were in all three groups. One quarter of the students had read articles on the subject, but only three, one in each group, had read a book on the subject.

It was encouraging to see that seven students had heard speakers or seen demonstrations on the subject. Seven students also had taken a course in creative writing, but all were not the same seven because the numbers of students in each group differed. Only seven students indicated that they sometimes engage in the creative activity of writing stories outside of assignments.
There are 17 students in each of the three groups of the 51 student total. The three groups are the conventional (A) who viewed the first programs; the experimental (X) who viewed the programs after they had been revised by the empirical procedure; and the control (C) who viewed no programs. The following are their responses to statements about their background.

1. What experience have you had in creative thinking?

<table>
<thead>
<tr>
<th>Experience</th>
<th>A</th>
<th>X</th>
<th>C</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>3</td>
<td>6</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>A little</td>
<td>7</td>
<td>7</td>
<td>5</td>
<td>19</td>
</tr>
<tr>
<td>Heard about it</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Studied it</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Use it all the time</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

2. Have you read articles on creative thinking?

<table>
<thead>
<tr>
<th>Read Articles</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>41</td>
</tr>
</tbody>
</table>

3. Have you read books on creative thinking?

<table>
<thead>
<tr>
<th>Read Books</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>48</td>
</tr>
</tbody>
</table>

4. Have you heard speakers or seen demonstrations of creative thinking before?

<table>
<thead>
<tr>
<th>Heard Speakers</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>44</td>
</tr>
</tbody>
</table>

5. Have you taken a course in creative writing?

<table>
<thead>
<tr>
<th>Taken Course</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>44</td>
</tr>
</tbody>
</table>
6. Other than school assignments, do you ever write stories?

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>X</th>
<th>C</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>9</td>
<td>7</td>
<td>10</td>
<td>26</td>
</tr>
<tr>
<td>Seldom</td>
<td>6</td>
<td>5</td>
<td>7</td>
<td>18</td>
</tr>
<tr>
<td>Sometimes</td>
<td>2</td>
<td>5</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Often</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Very often</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Student Reaction to ITV Programs

Immediately after viewing the last program the students were given a post-test. After finishing this test they were given a questionnaire with statements concerning their reaction to the ITV program. A chi square analysis of each question showed no significant difference between the two groups at the .05 level.

Most of the students felt they would be able to somewhat apply what they learned in the programs, and were somewhat better able to think up effective ideas.

They were candid in reaction to the programs. More felt the programs should be what they were or expanded than eliminated or reduced. The programs were viewed during class time and the students moved from their regular classroom to a room equipped with TV for one-half an hour of their one-and-a-half-hour class. Only five students replied that they would definitely prefer not to have viewed the programs had they been given a choice, and only seven said they enjoyed the programs compared with college in general.
Most said they would like to take a full course in creative thinking and that they thought the subject would best be given in junior or senior high school. They suggested that it be recommended to some or most, but not all students.

During the one week between the programs most students indicated that they discussed the programs with friends and that found the programs enjoyable or at least "so so." Five students found the programs enjoyable.

It was surprising to note that most experimental students indicated the programs were only moderately repetitive since more repetition, in the form of responses, was demanded of them. On the whole, both groups found the programs moderately repetitive.

Following are the twelve statements and the response of the conventional group A and the experimental group X. Represented are the number of students replying to each of the statements.

7. I think I will be able to apply what I learned in these programs in my future life.

<table>
<thead>
<tr>
<th>Statement</th>
<th>A</th>
<th>X</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Very little</td>
<td>5</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Somewhat</td>
<td>8</td>
<td>11</td>
<td>19</td>
</tr>
<tr>
<td>Good deal</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Great deal</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
8. I find I am better able to think up effective ideas.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>X</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Very little</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Somewhat</td>
<td>10</td>
<td>8</td>
<td>18</td>
</tr>
<tr>
<td>Good deal</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Great deal</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

9. I think these programs should have been:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>X</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eliminated as of</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>no value</td>
<td>5</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Reduced in length</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>About what they were</td>
<td>4</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Expanded to a few more programs</td>
<td>3</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Expanded to a full quarter</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

10. I would have preferred to not view the programs if I had been given the chance.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>X</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definitely</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>At many points</td>
<td>5</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Sometimes</td>
<td>4</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Rarely felt that way</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Never wanted to</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

11. Compared with college in general I found the programs:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>X</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not enjoyable</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Not very enjoyable</td>
<td>5</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>So so</td>
<td>6</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>Enjoyable</td>
<td>4</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Very enjoyable</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

12. I would like to take a full course in creative thinking:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>X</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>I doubt it</td>
<td>2</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Maybe</td>
<td>4</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Probably</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Yes</td>
<td>5</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>
13. If my best friend asked me if he should see these programs I would say:

<table>
<thead>
<tr>
<th>Response</th>
<th>A</th>
<th>X</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definitely no</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>No</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Maybe</td>
<td>6</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>Yes</td>
<td>5</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>By all means</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

14. I feel this training would best be given in:

<table>
<thead>
<tr>
<th>Location</th>
<th>A</th>
<th>X</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade school</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Junior High</td>
<td>8</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>High School</td>
<td>6</td>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td>College</td>
<td>1</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Graduate School</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

15. I would recommend a course like this to:

<table>
<thead>
<tr>
<th>Group</th>
<th>A</th>
<th>X</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No student</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Some students</td>
<td>9</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td>Most students</td>
<td>7</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>All students</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

16. I have discussed these programs with friends.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>A</th>
<th>X</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>3</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Seldom</td>
<td>8</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>Sometimes</td>
<td>6</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>Often</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Very often</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

17. I found the programs:

<table>
<thead>
<tr>
<th>Enjoyability</th>
<th>A</th>
<th>X</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not enjoyable</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Not very enjoyable</td>
<td>5</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>So so</td>
<td>6</td>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td>Enjoyable</td>
<td>6</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Very enjoyable</td>
<td>5</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

18. I found the programs:

<table>
<thead>
<tr>
<th>Repetitiveness</th>
<th>A</th>
<th>X</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Much too repetitive</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Too repetitive</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Moderately repetitive</td>
<td>12</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>Not at all repetitive</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
Summary

This chapter has considered the results of a study appraising empirical program development procedure on the content of creative problem solving. The result of the empirical procedure was first discussed in which over 400 students took part in eighteen different regularly scheduled classes for the eighteen program revisions. When the desired level of achievement was reached four programs were produced: two conventional and two empirical procedures. From a population of four Speech classes a random group of students were selected and assigned to one of three groups: those who viewed the conventional programs, those who viewed the empirically developed programs, and the control group which viewed no programs. Analysis was made of student background. Students were given one section of the Torrance Test of Creative Thinking as a pre-test immediately before viewing the first program and another section of the tests after viewing the second program one week later. Pre-post test scores were compared and analysis of variance indicated a rejection of the null hypothesis. The experimental group increased significantly; the conventional group did not.

The next chapter will consider a summary of the study and conclusions to be drawn from the study.
CHAPTER V

SUMMARY AND CONCLUSIONS

This chapter will summarize and draw conclusions from a study which appraised empirical program development procedure on a program about creative problem solving to determine if this procedure could increase the effectiveness of the ITV programs to a significant degree.

Summary

Most ITV studies have been concerned with the effectiveness of ITV compared with classroom lectures and have found no significant difference. A more important problem now is to raise the quality of ITV based on what has been learned from research. A study was needed which would appraise a method designed to improve ITV significantly. The empirical procedure was such a method.

Empirical Procedure

The empirical procedure is based on a careful statement of objectives in behavioral terms, an analysis of student performance on tasks related to the behavioral objectives, and the revision of the programs until success is obtained or the limitations of time and money are
expended. This study followed the following procedural steps:

1. Define program audience.
2. Define program objectives in behavioral terms.
3. Develop tests of the behaviors.
4. Select appropriate content and presentation methods.
5. Test the content and analyze the results.
6. Revise the program until objectives are reached.

Suggestion of such a procedure was made by Greenhill and Wade. It was used in various forms by Komoski, Smucker, Schwartz, and Prutsman. Probably the most important part of the procedure is the second step, defining program objectives in behavioral terms. This focuses the program on exact goals.

Stating Behavioral Objectives

Stating the objectives of an educational lesson in behavioral terms was suggested in the 1920's by Babbitt, developed into a seven-step program in the 1940's by Tyler, and became an integral part of the writing procedure for programmed instructions in the 1950's. Woodruff, in the 1960's, pointed out that the definite objective forms the nucleus of teaching and that objectives should consist of one clearly stated concept. Woodruff identifies nine
mediating variables which can be found in most behaviors sought in education. These authors were talking of terminal behaviors desired in classroom teaching, but it applies to ITV.

Krathwohl suggests that all goals may not lend themselves to statement in behavioral terms because objectives can be divided first into the general goals of education, then into the goals of the instructional unit, and finally into specific behavioral objectives. Canfield proposes that the rationale or justification for performance objectives be included with the statements to help overcome resistance and objections when no explanation is given as to why the learner should achieve the objectives.

Empirical Studies

Two important studies have used an empirical procedure. The first, by Smuckex, developed behavioral objectives, a criterion test of the objectives, and finally one ITV program designed to meet the objectives. In an experiment Smucker compared students who viewed the program with students who did not view the program and found that three of the sixteen behavioral tests showed differences at the .05 level.

The second study by Schwartz and Smucker used the Smucker study as a pilot. Schwartz and Smucker investigated a method of developing televised art instruction by the
empirical procedure. After stating objectives a program
was created, video taped, revised, based on the criterion
test results, and then video taped again. They found that
they could strengthen selected concepts, but that this
necessitated restructuring of other concepts in the revised
version.

**Significant Research Elements**

A review of over 450 experimental research studies
made in ITV and film resulted in a list of thirty-six
elements that have contributed to significant results.
Some of these elements served as alternatives in the
modification of the original conventional program in this
research study. The following is a list of these elements:

- animation
- attitude of students
- black and white vs. color
- dramatic presentation
- empirical procedure
- enthusiasm of the classroom teacher
- error presentation
- experienced TV instructor
- film with laboratory instruction
- film strip vs. motion picture
- focus of attention
- generalization
- home viewing
- motivation
- note taking
- observation
- optical effects
- pre- and post-tests
- pacing
- planned visual continuity
- programed ITV
- preview remarks
Procedure

The procedure followed in this study was a combination of the conventional program, some of the elements listed above, and the empirical program development procedure.

The study used a simple random design with each treatment independently administered to a different sample of subjects. The subjects were college students enrolled in various speech courses at Iowa State University. During the development stage over 400 students participated in the live lectures. During the experiment stage students were divided into three groups: students that viewed the conventional ITV programs, students who viewed the empirically developed ITV programs, and a control group which did not view any program. In all, four programs were produced: two conventional and two experimental. The programs were produced in the Telecommunications Arts
studios at Iowa State University. In addition to pre- and post-tests, an information questionnaire was given to all students involved in the experiment.

Results

The experimental group pre-post-test scores increased significantly while the conventional pre-post-test scores did not. Both groups did increase significantly compared with the control group showing that both groups did learn from the lesson. Comparison between conventional and experimental were not significant.

The empirical procedure required eighteen different live lecture revisions with the first program requiring ten revisions and the second program requiring only eight.

The elements that seemed to produce the greatest gains during the empirical stage were: active student response, pre- and post-testing, using visuals to stimulate reaction, and adding more creative techniques.

One person did carry out the empirical procedure up to the point of ITV production. The use of live lectures to try out the different revisions was satisfactory and inexpensive.

Conclusion

There is an indication that an empirical procedure can improve ITV. It can be developed by one person up to
the time of ITV production. It must be remembered that it is vital to select the behaviors to be improved realizing that concepts not emphasized or strengthened in revisions of the programs will most likely decrease in effectiveness. The development of a list of alternative elements was most helpful when the frustration of failure occurred because programs did not reach desired levels on the criterion measure. It was rather easy to look over the list of alternative ways of presenting the information, select one that seemed appropriate, and try it out in the live lecture.

This study makes several contributions. First, a list of production procedures which have produced significant results is presented. Second, it demonstrates the potential of the empirical procedure for improving the quality of ITV programs. Finally, it demonstrates that such a procedure can be carried out by a single person with limited resources.

**Limitations of the Study**

This study is limited to the subject of creative problem solving. The population for the experiment was only four sections of a fundamentals speech course. Comparison between conventional and experimental groups on the post-test were not significant. Other studies have been concerned with art instruction in their use of the empirical procedure.
The size of the groups used in the experiment were small. While results were significant certainly the small group size limits the generalization from the population to the universe of students interested in study in the area of creative problem solving.

Only two programs were revised using the empirical procedure. Ideally an entire program series would have been better, but would not be necessary to prove the hypothesis that the empirical program development procedure can improve ITV programs significantly.

Recommendations for Further Research

A next step in the use of this procedure would be to try it out on an entire ITV program series. This would involve extensive planning and development of behavioral objectives, but could be executed by one person with the available subjects necessary for the tryout of content revisions.

Further research is needed continuing the synthesis and analysis begun in the second chapter which lists the thirty-six significant elements. A matrix of experimental ITV and film research is needed which would categorize all studies into a meaningful context. Knowing what has been done will help point to needed research for the future.

Every ITV series needs to be carefully examined in the light of this study to see if it is as good as possible.
Little can be done about the poor teacher speaking to twenty or thirty students, but something must be done about the poor ITV program that reaches hundreds, thousands, or even millions of students. The programs must be the best available. It makes one shudder to hear students complain about an ITV series that was poor when it was taped five years ago, and continues to be used today. Such programs need to be examined and questioned. Only the best television teacher communicating the best information in a program that reaches or surpasses its objectives should be carried to the many students that will view it on television. The use of the empirical program development procedure can help reach this goal.
APPENDIX I

CONVENTIONAL PROGRAM SCRIPT 1A
Go ahead, be original. Join Professor Charles Connolly in Creative Thinking.

This talk is based on these premises:
1. The foremost function of the mind is to solve problems.
2. Imagination is the golden key to problem-solving.
3. Imaginative ability can be deliberately developed.

This last premise was clouded with doubt until just recently.

But, thanks to scientific research, we now know for a fact that
creative ability can be deliberately developed, and to a marked degree. The establishment of this fact came through the scientific evaluation of semester courses in creative problem-solving—the kind of course which over 100,000 people have taken within the last few years. More about this research later.

For the sake of clarification, let's over-simplify our mental functions as shown here:

1. **Absorption**—the ability to take in knowledge.
2. **Retention**—the ability to retain and recall knowledge.
3. **Judgment**—compare one element with another you see the symbol of the scales.
4. **Imagination**—the ability to think creatively.

Through those first two functions, we LEARN.
Through the latter two, we THINK.

There can be no question about the importance of knowledge.

When it comes to judgment, electronic brains can now "think" superbly in terms of analysis, logic, and other phases of reasoning.

On the other hand, it is practically certain that no machine can ever perform the functions of creative imagination.

Although imagination serves as the golden key in problem-solving, its function is mainly to unlock the vault of memory and supply possible clues in the form of tentative ideas.

Inability to solve problems is more likely to be due to lack of imaginative effort than to lack of knowledge or judgment. The sad fact is that most of us tend to grow less and less creative as
we mature. This fact is stressed in Sheldon's book entitled *Psychology and the Promethean Will*. He points out that nearly all of us are highly creative in our childhood, but that we become less creative from adolescence on. Sheldon calls this "the dying-back of the brain." And he adds that since this tragedy happens to almost everybody, it is generally thought to be unavoidable.

One explanation is the fact that the disciplines of learning and the pressures of living tend to sharpen our critical ability at the expense of our imaginative ability. Consequently, we are almost certain to become less and less creative unless we deliberately do something to
conserve and develop the imaginative talent with which we were born.

Our softening environment likewise tends to cripple our imaginations.

This fact was stressed by President A. Whitney Griswold of Yale when he sounded a national alarm in these words: "Amidst the easy artificiality of our life... our creative powers have atrophied." We lose what we don't use. In this push-button age only a few of us can count on our daily chores to keep us creatively on our toes.

In contrast, America's early environment forced our forefathers to exercise their imaginative muscles almost every hour and with all their might.

With the onrush of automation, fewer and fewer jobs call for
ingenuity. This is likely to lead to a new type of aristocracy—a creative class composed of the relatively few whose daily tasks do demand the kind of creative exercise which insures against creative atrophy.

Unfortunately our creative energy often depends upon others. For one thing, most parents tend to discourage creativity in their young. A typical example is shown in this cartoon where the mother is screaming: "Sonny, if you want to come into the house, go around and use the door—the way any sane person would do."

Some people are far more productive of ideas than others. More often than not, this disparity is due to a difference in driving-force, rather than in native talent.

In our youth we are spurred by
desires for wealth, for fame, for self-realization. In later life our associates too often tend to dull these spurs. For example, as shown in this cartoon, the climate of most conferences is so anti-creative that it tends to wither the man with an idea.

It's even worse when the conference is dominated by an egomaniac, as in this cartoon where the Big Boss is saying: "Those opposed will signify by clearing out their desks, putting on their hats and saying: 'I RESIGN'."

This kind of attitude can't help but nip imagination in the bud. For several years Uncle Sam has financed research in creativity at the University of Southern California under the direction of Dr. J. P. Guilford. In a summary
of findings, Dr. Guilford concluded that creativity can be deliberately developed. And then he added these words: "The least we can do is to remove the blocks that often stand in the way."

Three of the main blocks are:

1. Unawareness of the fact that each of us is gifted with creative potential.
2. Failure to realize that all of us can do much to make ourselves more creative.
3. Unwillingness to try, and to keep trying, to think up new and better ideas.

Emotional blocks include the tendency of so many of us to undermine our own creativity by self-discouragement. To combat this, we should remember that even the Pasteurs fumbled and stumbled, and that most of the world's truly great ideas were
laughed at when first suggested. The fear of "looking foolish"
has stood in the way of many. To help remove this block, Dr. 
James Conant, while President of
Harvard University, kept this
drawing on his office wall . . . 
"Behold the turtle. He makes 
progress only when his neck is 
out."

So much for self-defeating
attitudes. Now for some devices
by which we can step up our
creative power. You can use
them on your next speech, perhaps
to develop a better introduction.
One simple aid is to make notes. 
This helps furnish fuel for
imagination, and tends to empower
association. 
But note-taking is almost a
rarity. That's why this secre-
tary is saying: "And don't
Another way to spur idea fluency is to set a deadline—even to the point of issuing a promise to come up with some new ideas at an appointed time. By thus putting ourselves on the spot, we intensify our emotional power to put our imaginations to work. A corollary device is to set a quota—to commit ourselves to think up a minimum number of ideas. If you thought of five topics for speeches a day you'd have 25 in one week. If you kept up for a full quarter, you'd have 250 possible speech topics.

We can likewise make dates with ourselves for creative concentration.

Since the days of Thoreau, a favorite way to hunt ideas has
been to take a hike.
And it often pays to lie down--
not to go to sleep, but to
think up.
We can train ourselves to turn
on our ideative power while we
shave. Or we can deliberately
take a shower, and ideate our
problem while soaking.
Check-lists can help empower our
idea production.
Let's take a look at some
questions . . .
Maybe you have never heard of
this "other use" for rolling-
pins. But, under the heading of
"other uses," there are many
questions with which we can prime
our imaginations--questions such as:
"New way to use as is?"
"Other ways if modified?"
"What could be made from this?"
Under the heading of borrowing or adapting, we can prime our imaginations with questions like these:

"What else is like this?" (Like the studies of birds made by the air-craft pioneers.)

"What parallels does past provide?" (Like what modern dress designers do in devising new creations from ancient art.)

"Could other processes be copied?" (Like the Japs copying Nature by sticking grains of sand into oysters so as to produce genuine pearls.)

"What other ideas might be adaptable?" (Like Diesel who got his engine ideas from a cigar-lighter.)
SLIDE #21:  GIVE A NEW TWIST?

"What other shape?"  (Like the buggy-maker who tapered the roller-bearing which Leonardo da Vinci had invented 400 years before.)

"What other form?"  (Like detergent powders instead of bars of soap--like liquid soap instead of either.)

"How to create new look?"  (Like mini skirt.)

"What could color do?"  (Like what the automobile industry did to make 1955 the biggest new car year in history, telephones today in color.

"How about motion?"  (Like Christmas tree lights that bubble.)

"Sound?"  (Like the clothes dryer which shuts off, singing "How Dry I Am.")

SLIDE #22:  MORE SO?

This four-handed musician illustrates how Walt Disney uses the
"more-so" technique. Along the same lines of "magnification" here are some idea-starting questions:

"Longer Time?"  (Like the baker who featured slow-baked bread.)

"Greater frequency?"  (Like the doctor who originated the idea of lighter but more frequent meals for ulcer victims.)

"Increase strength?"  (Like reinforced heels and toes in hosiery. Metal taped shoes for factory workers.)

"Height?"  (Like circus clowns on invisible stilts.)

"Greater Width?"  (Like the center strip on the new interstate highways.)

"Include plus ingredient?"  (Like fluoristan in toothpaste.)

Less so?

"What if lower?"  (Like the recent trend in motor-cars.)
"Narrower?" (Like brims on new style of men's hats.)

"Lighter?"

"Streamline?" (Like tank-type vacuum cleaners.)

"Condense?"

"Eliminate?" (Like tires without tubes.)

SLIDE #24: SUBSTITUTE?

What could we substitute?

"Other parts?" (Like fluid drive instead of gears on cars.)

"Materials?" (Like argon instead of vacuum in electric light bulbs.)

"Other process?" (Like stamping instead of casting.)

"Other power?" (Like using air to run windshield wipers. Or now electric.)

"Other way?" (Like the airlift that saved Berlin.)

SLIDE #25: RE-ARRANGE

Here are a few questions we might ask ourselves under the heading of re-arrangement:
"Change pattern?" (Like one-way streets.)
"Revise layout?"
"Alter sequence?" (Like flashbacks in movies.)
"Transpose cause and effect?"
"Re-package?"
"Re-group?"

Newspaper men call this the "man-bites-dog" technique. Hollywood calls it "switcheroo."
Here are some idea-spurring questions along this line:
"Transpose?" (Like putting engine in rear of cars.)
"Down instead of up?"
"Switch roles?" (Like films about female executives with male secretaries.)
"Up instead of down?" (Like dining-room light which throws beam upward from the floor to reflector on ceiling.)
"Do the opposite?" (Like Howe who perfected his sewing machine by designing a needle with the hole at the bottom instead of at the top.)

Most ideas are combinations of other ideas. Here are a few brain dusters along this line:

"How about alloys?" (Like the newest mixtures of synthetic fibers.)

"What old ideas could be merged?" (Like window-washers which combine a brush with a built-in hose.)

"Ensembles?" (Like shirts, with neckties and handkerchiefs to match.)

"Hook appeals together?" (Like drugstores selling blades to those who ask for shaving cream.)

"Combine purposes?" (Like Benjamin Franklin did when, to avoid changing from one pair of
specs to another, he cut the lenses in two, and stuck them together, with the reading halves below. Thus he invented bifocals.)

So much for idea-spurring devices. Now for a basic principle which has been proven by scientific research—a principle which, when properly applied, can almost double idea-output.

This calls for keeping judgment from jamming imagination. Simply put, it means this: That when driving for ideas, you can go further faster if you keep your foot off the brake.

The basis of this principle is deliberate alternation of thought processes. In other words, we should turn on our judicial mind at one time, and our creative mind at another time—instead of
trying to think both critically and imaginatively at one and the same time.

By adhering to this principle, we can make the most of the talent which psychologists call "association of ideas."

Aristotle put his finger on this gift of ours 2300 years ago—and he then laid down its three laws: similarity, nearness, and contrast.

Scientific research has found that an individual or a group can think up considerably more good ideas by deferring judgment during the idea-finding effort.

This deferment-of-judgment principle is far more productive of constructive suggestions than the usual type of conference.

That research finding confirmed the hunch of many a genius of the past. For example, the poet
dramatist Friedrich von Schiller pin-pointed the essence of the deferment-of-judgment principle in a letter to a friend 170 years ago. The friend had asked him how he could increase his idea output. Here's what Schiller wrote: "It hinders the creative work of the mind if the intellect examines too closely the ideas as they pour in."

Thus did Schiller proclaim the principle of deferred judgment.

The creative problem-solving process usually includes, some, or all, of these procedures:
1. **Definition**: Picking out and pointing up the problem.
2. **Preparation**: Gathering and analyzing the pertinent data.
3. **Idea-production**: Thinking up tentative ideas as possible leads.
4. **Selection**: Choosing the likeliest ideas.
5. Development: Re-processing these ideas and adding others by means of modification, combination, etc.


7. Adoption: Deciding on and implementing the final solution.

As a rule, no such one-two-three sequence is feasible. We may start our guessing even while preparing. And, at any step, we may let up in order to allow incubation to invite illumination.

Of all the steps in creative problem-solving, the two most subject to neglect are these: Problem definition and idea-production.

Above all, we need to think up plenty of tentative leads. That is why copious variation is the
basic principle of scientific experimentation.
For example, Thomas Edison thought up countless ideas in his search for a filament for his lamp. He even tried over 1,000 varieties of bamboo fiber.

Scientific research has confirmed the fact that quantity breeds quality in idea-production.

Almost every step in problem-solving calls for an alternation between creative thinking and judicial thinking—on a sort of stop-and-go basis.

All of that nets down to this:
When it comes to problem-solving, we should try to act as if we were two people—at one time, a thinker-upper; at another time, a judge.

How can you use these suggestions? The next time you are confronted
with a problem, like thinking up an idea for a speech, withdraw your judgment. Make a list of 10, 20, or 30 different ideas. Look them over, select the best, and use it. This way you will be using the wonderful gift of creative imagination.
APPENDIX II

EXPERIMENTAL PROGRAM SCRIPT IX
Go ahead, be original. Join Professor Charles Connolly in Creative Thinking.

Today we're going to talk about Creative Thinking and being creative, and the application of your imagination to problems that you face in the speech class. To do this we will explore some of the inner space to give you a better understanding of the operation of your mind. This should give you a better idea of what you can do with your mental powers. To simplify the matter
let us say that you have four mental processes. The first of these is absorption. Absorption is the ability to take in information, to soak it up like a sponge. The second mental ability that you have is the ability that we check on at test time. The third mental process is judgment. This is the ability to weigh different information to see which is better based on a certain criteria. You can compare one element with another. The fourth mental ability is your creative ability, the ability which helps you to use your imagination. By the first two abilities we learn, and by the second two abilities, judgment and creative thinking, we think. We often seem to be in a state of conflict, because of habits that we have formed over the
years. We are all creatures of habits, habits that have been formed over the years. In order to use your imagination you may want to break some of these old habits. Just to show you how much impact these habits have upon your life and how strong they can be, fold your hands in front of you. Got them folded like this. Now take a look and see which thumb is on top, the right or the left? If it's the right thumb, hold your hand up. Now how many people had their left thumb on top, would you hold up your hands. Okay. I usually find that about half the class will have their right thumb. Now whichever thumb it was, place your hands so they are intertwined the opposite way. If it was the right thumb, make sure the left thumb is on top now.
(Pause) How does it feel? Is it awkward? (Pause) It should be, because you're not in the habit of folding your hands that way.

Let's try another experiment. Fold your arms in front of you. Now, try to fold them the other way. How does it feel, awkward? If so, it is because you are not in the habit of folding your arms that way.

Today I'm going to suggest that you might want to break some of your old habits and as you do this you're going to find it awkward.

My first suggestion is that you defer judgment, so that when you're using the mental ability of imagination you do not use the mental ability of judgment. You put it aside, or defer it until later.
Let me give you an example of this deferred judgment works.
The management of a company was faced with a problem. It seems the men in the packing room liked to read the newspaper they used to wrap the product. They had been asked not to read the papers, but if there was an exciting headline or a pretty girl, the workers, being human, would stop and look at these and perhaps read the story.
The managers met to see what they could do about the problem. They decided they were open for ideas, but that in looking for these ideas they would defer judgment. They would make no comment on any ideas until all were suggested. We'll just sit back and let the ideas flow.
After a few ideas someone suggested: "Why don't we get
foreign language newspapers."
No one snickered. No one said they couldn't get the papers or that they would be too expensive. Another person said: "How about hiring illiterate workers."
Someone else said: "How about blindfolding the workers."
This led another person to suggest "Turn the lights out," and then to "How about employing blind workers." It was this last idea that they finally adapted, and it not only helped solve their problem, but it also helped the problem of hiring the handicapped. Can you see the train of thought and how it was some of the ridiculous ideas which ultimately lead to the good ideas? This, then, is an example of what can happen when we defer judgment on a subject.
To give you another example of what can happen when we are slaves to the force of habit, let's consider a truck driver on his way to an address in New York City. As he was on his way he noticed as he approached the street that he wanted to enter that it was a one-way street and he would have had to enter it the wrong way. Therefore, he went around the block so he could enter the street the right way. You know, it wasn't until he was almost to the door that he realized that he wasn't driving his truck but was walking. Can you see the force of habit? What I'd like you to do when you're trying to think of ideas is to defer judgment, to let ridiculous, wild ideas come in. I'm going to give you a problem now, so you'll need paper and
pencil. I'd like you to think of all the ideas you can on the problem I'm going to give you. You will have two minutes to do this exercise, and try to defer judgment as you think of ideas. I'd like all the ideas you can think of to improve the library. Are you ready? Go!

(Two minutes)

Okay, time's up. How did you do? I'd like you to count up the number of ideas that you were able to develop in the two minutes. Let's start at the back of the room all the way to my left, to your right, and that person and across that back row, I'd like you to call off the number of ideas that you've got so that everyone will be able to see how his total compares with everyone else's totals. Okay, go ahead.
We've been talking about the technique of deferring judgment. This is a technique that you can use when you're trying to be creative. I'd like to give you another technique that you can use when you're trying to be creative, and this is the technique of forced relationships. With this technique you relate things which do not normally relate. Things that normally relate could be moon and June, boy and girl, bread and butter, coffee with sugar in it. Now if I were to ask you to relate the problem of creating a speech with light, you might say that they don't seem to relate. Therefore, I'd like you to force a relationship between light and a speech. To do this, first of all you defer judgment.
You look at a light, and you might speak of the physics of light, the color that is in the light. Perhaps you could tell us about the invention of light, the difference between incandescent light and fluorescent light, talk about the different types of light, lighting effects, different types of light bulbs available, proper lights for study. Can you see how we force relationships to create topics for a speech? It is possible to force relationship between almost anything in your environment. You're at your desk, and you're trying to think of a topic for a speech and you look up and see books. Ask yourself: How can I force a relationship between books and my speech. You might talk about the best book you ever read, or a book you read last
week and would like to persuade the audience to buy. In this way you create the topic of your speech. You can force a relationship between elements in your environment and your problem. I'd like you to try this technique right now. I'll give you two minutes again to generate all the ideas that you can think of on a particular problem. I'd like you to look around the room and force a relationship between that item and the topic that I'm going to ask you to create ideas on. I'd like all the ideas that you can think of to improve a bed. Force relationships and defer judgment as you attempt to get a large number of ideas.

Are you ready? Go!

(CU CLOCK) (Two minutes)
Okay, time's up. How did you do? I'd like you to count up the number of ideas that you got and compare it with your old mark to see if you're able to beat your old mark by applying both the techniques of deferred judgment and forced relationship.

(Pause)

Now let's consider what creativity is. My definition goes along the line of the "recombining of elements which already exist" to take things that are in your environment and to recombine them into a new form. Look around you. Every single thing you see in this room has existed on this earth for millions of years. It took somebody with imagination to recombine these into the forms that you see them here. So, creativity is the recombination
of elements which already exist towards some useful goal. We could compare creativity to a kaleidoscope. If you look into a kaleidoscope you'll see a number of pieces of glass and as you rotate the glass you get all kinds of different beautiful pictures. Let me make the analogy that the knowledge that you have is similar to the pieces of glass in the kaleidoscope. The more knowledge you have the greater the variety of pattern that you can create in kaleidoscope. The more knowledge you have, the greater the number of ideas that you can think of. When you take this knowledge that you have and rotate it or recombine it, you are using your imagination just as when we rotate the glass in the kaleidoscope we create new, beautiful
patterns. When we rotate the knowledge that we have, we create new ideas. So that when you recombine the knowledge that you have you're being creative. When you force relationships between light and the problem of finding a topic for a speech you're being creative. And that's all creativity is—the recombination of elements which already exist towards some useful goal.

All right, I have another exercise for you. I'd like you to use the technique of deferred judgment, and use the technique of forced relationships. I'd like you to recombine the elements in your environment in your imagination to solve this problem. I would like as many ideas as you can think of in two minutes, all the ideas you can
think of to improve a bathtub!
Try to beat your old mark.
Are you ready? Go!

(Two minutes)

How did you do? Count up the number of ideas you created. Did you beat your old mark? I hope you did. Remember this: we lose what we don't use. If you don't use a muscle for a while because you're sick in bed, it is very hard to use it when you do get up. You feel awkward. I just started riding my bicycle to campus again, and I said to someone that it feels rusty. It isn't rusty, I am! I haven't been using those muscles. If it feels awkward or difficult when you're trying to create new ideas, remember the awkwardness of folding your hands in a new way. You are
breaking an old habit when you are deferring judgment. You will develop a large number of ideas. They will not all be good, but remember that the more ideas you have the greater the chances are that you will have a winning idea. So I'd like you to use your imagination in your speech class to select good subjects in your speech class. Next try to use your imagination as far as the introduction of the speech goes. Ask yourself the question: In what ways could I make this a really attention-getting speech and an attention-getting introduction? You can also use this technique to reinforce certain main ideas in your speech. You might look at a particular part or point that you're making in your speech, and say that that's
kind of weak now. Ask yourself in what ways can you reinforce this idea. What visual aids could you use? Until next time keep using your imagination to think up better speeches.

Creative Thinking with Professor Charles Connolly was produced by the Division of Telecommunicative Arts, Iowa State University. The producer was Sue Underwood. The director was Wayne Anderson.
Go ahead, be original. Join Professor Charles Connolly in Creative Thinking.

When you're given or assigned a speech you have a problem. A problem is a perplexing situation. It's only because someone sees conflict in a situation that it's labeled a problem. But everyone may not see a situation in the same way. A situation may perplex one person or group and not perplex another person or group.
Problem-solving may be considered the process of human adaptation to cultural life. This means adapting ourselves to our environment (we wear coats in winter) as well as adapting our environment to suit us (we air condition buildings). Creating deliberate means of treating perplexing situations is therefore an opportunity—a challenge. Therefore, we might call a problem a challenge. The means or workable ways of meeting a challenge or problem are only temporary measures that change as our needs change. Thus each of these means of treating a perplexing situation becomes in itself another challenge.

Sometimes our long-established attitudes prevent us from seeing an opportunity or challenge in a situation. If we see all the
elements, we are less likely to see the situation as discouraging and more likely to see it as a challenge.

Sometimes it's hard to realize all the challenges we face because we're used to thinking of challenges as conflicts and we tend to blind ourselves to some of our problems in order to feel more comfortable. If we were to reverse the process, and think of problems as "challengers" or "opportunities," we might be less inclined to ignore so many of them.

George Bernard Shaw said, "No question is so difficult to answer as that to which the answer is obvious."

As pointed out by Lt. Col. Bert J. Decker, an Air Force Officer active in creative problem-solving, "Problems are like
weeds; the more you ignore them, the faster they grow!"

Right now we've been talking about sensing problems, recogniz­
ing problems, and not solving them. Of course, the first task is to state the challenge before we can begin to think about solving it. This is being sensitive to problems.

An instructor in an Eastern college used creative approaches to challenging problems in teaching students to become junior administrators. One of his students lost his job after having completed the course. He went to the instructor, who asked him what had happened. The student replied, "After taking your course in how to meet challenges, I was well prepared. If they had only given me a problem to tackle, I could have
licked it with no trouble at all. Instead they gave me nothing but one big mess."

When we first become aware of challenging problems, we do not see them clearly identified but more as a "mess." But as John Dewey long ago stressed, a problem is half solved if it is properly stated.

Let's look at an example. A chemical company was faced with the challenge of determining weights of barrels of gun powder in order to calculate freight charges. The barrels were so heavy that three men were needed to lift them onto the scale.

Management considered numerous means such as lowering the scale, building a ramp, using pulleys, and so forth. Finally it was decided to start at the beginning and look for the actual
problem. Originally, the challenge had been stated as, "In what ways might we get the barrels onto the scale?"

If we look for other ways of stating the challenge it might be stated "In what ways might we determine the weights of the barrels?"; or "How might we make the barrels easier to handle?"

If we had asked, "Why do we want to get the barrels onto the scale?" we probably would have answered, "To find out the weight." This might lead us to state the challenge as "How to determine the weight."

Another "why" question—why do we want to determine the weight—might lead us to the realization that what we actually wanted to determine was the shipping cost. Thus, we could have stated the challenge as, "In what ways might
we determine the freight charges?"
We may have found still other
ways to define the problem.
Management finally did state the
problem as, "In what ways might
we determine the freight charges?"
With this restatement, they
realized that they could estab­
lish standard weights for filling
barrels of various sizes.
Therefore the barrels did not
even need to be weighed. Chang­
ing the problem statement solved
the problem.
"Why?" or "What is my basic
objective,—what am I really
trying to accomplish?" is the
key question in attempting to
reach an adequate recognition
of a challenge or problem. We
will eventually come to the
basic definition of a problem
if we simply ask the question
"Why?"
In an assembly line the job of taping the end of metal rods (like taping the end of a baseball bat) was faced by management. They looked for an easier and faster way to do the job. After considerable progress had been made in cutting down the length of time and effort required for the job, someone innocently asked why any tape had to be placed on the rod—why the answer was sought to the problem of taping it more quickly and easily. The foreman didn't know. So he asked the engineering department. The engineering department didn't know, but became curious enough to look back at some of the specifications. It was discovered that, sometime before, a new material for the rod had been developed which made the taping...
entirely unnecessary. No word about this had been passed to the department which did the taping. Therefore, the job of taping the ends of the rod had been continued and improved until finally someone asked the question, "why?"

This is analogous to a company working diligently on the problem of making better and better buggywhips without ever asking what the real problem is. The company might find itself out of business because the problem is no longer to get the horse started but to get the car started;--or better still, to get the traveler to his destination on time.

Let's try to broaden our thinking about challenges and the actual goals that are implicit in them. On the next few
examples we will ask you to ask why we are trying to find the answer to the problem. After asking "why," we will restate each problem as a new question that implies a more basic goal. Suppose our original challenge is "In what ways might we make a better mousetrap?" One answer that might be useful by asking "why?" is "to catch mice more effectively."

Thus a possible broader statement of the challenge is "In what ways might we catch mice more effectively?" An answer we might get by asking, "why?" of the restatement is "to get rid of mice," or "to keep our home free from mice."

Thus a still broader restatement of the challenge might be "In what ways might we get rid of mice," or "In what ways might
we keep the house free from mice?" Suppose our original statement of the challenge is "What ways to decorate the house effectively for Christmas." We could possibly restate this as "Ways to create the real spirit of Christmas at home," "Ways to make visitors feel in the spirit of Christmas." "Ways to beautify the house or make it cheery for Christmas."

Suppose our original statement of the challenge is "How to get the lid off the jar." If we try to broaden this by asking "why?" we might say, "How to get the jar opened," or "How to get the contents out of the jar."

Another means of reaching helpful new definitions of challenges is to change the verb in a given statement.
For example, "How to toast bread" may become "How to brown and dehydrate bread." The latter statement has enabled several companies to develop new toaster designs by spelling out the real problem of "toasting" the bread. Changing the verb in the statement of a challenge can help change our "set" or outlook regarding the challenge.

How to park cars may become how to store cars. The latter statement has been helpful in freeing the mind from conventional methods of driving cars into ground-level lots. This less typical way of thinking about the problem would be more likely to lead to new pigeon-hole or bee-hive parking which utilizes the fork-lift arrangement for storing heavy crates in warehouses. John E. Arnold, late
professor of Creative Engineering, put the matter of broadening the statement of a problem in this way: "Knowing what you are looking for helps you to recognize it when you see it. But in the case of innovation, how do you know what you are looking for? You don't unless you state your problem so broadly, so basically, so all inclusively and generically, that you do not preclude even the remotest possibilities--so that you do not pre-condition your mind to a narrow range of acceptable answers." Arnold thus emphasizes the need to state the definition of the problem in the broadest possible way in the early stages. Albert Einstein said, "The mere formulation of a problem is far more essential than its solution,
which may merely be a matter of mathematical or experimental skill. To raise new questions, new possibilities, to regard old problems from a new angle requires creative imagination and marks real advances in science."

Let's look at another challenge:

"A small church congregation of limited financial means faced the problem of repainting its historic old frame church in time for its centennial celebration. To keep down costs, the men volunteered to do the painting during their spare time. Many weeks later, with the anniversary date fast approaching, little or nothing had been done. It became evident to the harassed Repair Chairman that he would have to act fast."
We should try to state this in the "how to" or "ways to" form by asking the question "why" and trying to get at more basic aspects of the problem. If we ask "why" we say "Ways to get the men started." If we ask "why" we might arrive at "Ways to get the men to fulfill their pledges." If we ask "why" and we get a new, broader question it might become, "Ways to get the church painted in time." If we asked "why" again we might even get the broader statement "Ways to make the church attractive for the centennial celebration." If we ask "why" we might get "Ways to strengthen the impact of the church on the community." And so forth. The kind of ideas which might be created in dealing with the problem would hinge upon which
way the question is stated. The Repair Chairman may still decide the problem to approach is the relatively narrow version, "How to get the men started." However, he will have enriched his understanding of this goal by having considered the possible broader definitions of the challenge. Therefore, his thinking won't be inhibited by too narrow a viewpoint regarding the realities of the situation.

Let's consider another aspect of broadening the definition of a challenge—wording it in a way that is conducive to idea-finding. The foreman of a plant found that one of his workers was proving unsatisfactory. He, therefore, considered the dilemma, "Should I or shouldn't I fire the worker?" This might seem to be the problem he faced.
Probably neither of these two alternatives was completely satisfactory to him; otherwise there would have been no question in his mind. As John F. Kennedy once said: "We intend to have a wider choice than humiliation or all-out nuclear war." Neither of the alternatives is acceptable. To have a wider choice than "fire" or don't fire," the foreman must restate the challenge in such a way as to permit him to consider more possibilities. Notice that the foreman's question "Should I fire the worker?" is worded for decision-finding, not for idea-finding. If we ask "why" should we fire the worker, we might answer, "he's not producing well; he is inefficient;" etc. Now let's ask the question "why" and see
what new statements can be made. We ask "why" and we get "How might I overcome his indifference, get him interested?"; "How might I encourage him to do better?"—these are just a few of the ways that the statement might be restated.

To broaden the challenge we further might ask, "In what ways can we get this worker's job done efficiently and cooperatively?" This question would serve to broaden the definition still further and thus allow for a greater range of idea-finding. This broader definition would call for thinking up possibilities other than just dealing with the worker himself. Many areas of exploration (other than the initial question of whether or not to fire the worker) are suggested by each of the broader
statements of the challenge. The final wording of a problem for creative attack might still have to do with the original question of whether or not to fire the worker. But even this possible definition of the problem could be adapted into a question that allows more than just two alternatives. "Should I fire the worker?" allows only two possibilities: Yes or No. The more creative approach might be: "In what ways might I fire the worker with the fewest possible repercussions?" This approach does not call for "either-or" answer; it calls for a multitude of ideas as leads to a solution. Thus, besides the technique of broadening a problem-statement, the second aspect to consider in analyzing the statement is this: Can it
be worded more effectively for idea-finding?
Asking the question "why" helps you broaden your view of the problem and gives you a wide panoramic view of the entire area of the problem. This can apply to problem of creative speech. For example, you might state your problem as ways to create a really persuasive speech. This would be as opposed to stating a problem such as: Should I talk on Vietnam or donating blood? Because you might not like either one of those. The more creative your approach the better your chances of developing a highly persuasive speech.
Suppose you're a young man and you're faced with the problem and you ask the question "Should I enlist?" This can create a
number of anxieties in any young man. But you might look beyond your service period and state the challenge in the following way: In what ways might I get the most out of my time in the service? In what ways might I learn advantages and disadvantages of the different services? In what ways might I serve both myself and the country? To state a problem in this way is as though you're on top of a mountain and able to look over all the valley below of the problem. You can see, then, a number of possible solutions as opposed to sitting or walking in a gully where you can just see a narrow straight or crooked way before you. You can go to Europe by sailboat, steamboat, or jet plane. You may even be able to soon go by rocket or
By listing all the different ways to go to Europe you can see and choose the way you like best. You may decide you want to climb into a small single-man sailing ship like Tinkerbell and sail across the ocean. That’s up to you. Sometimes people do nothing merely because they have not uncovered a variety of alternatives. You must recognize that to do nothing when something might be done is also a decision. This, then, is the way of broadening the statement in order to find the true problem. Quite often words are helpful in finding solutions to problems. Certain words stimulate our imagination to develop ideas. They help generate ideas when we observe and manipulate with any problem. A check-list is often helpful. Let me give
you three words that will help you when you're trying to develop ideas. The three words are "magnify," "minify," and "rearrange." Let's first consider "magnify." When we magnify we sometimes make things larger or add a longer time. How can we add greater frequency? How can we increase the strength or the height or add a new feature? How can we add a plus ingredient? This is the first word you can use when you're trying to spur ideas to a problem. The second word is "minify." How can we add more? How can we make it narrower? How can we streamline it? How can we condense? How can we split it up. These first two words "magnify" and "minify." The third word is "rearrange." How can we change the pattern? How can we reverse
the sequence or layout? How can we transpose? Quite often in movies they do this and they start with a flashback. How can we repackage our idea? The three words are again: magnify, minify, and rearrange. They're quite handy when you're searching for ideas. In speech class you should look at your speeches as an opportunity to discover something new and exciting. To investigate new and exciting areas. So next time ask why and state your problem as broadly as possible. Use words like magnify, minify, and rearrange. You can make your speeches more exciting, more interesting, and more creative. Finally, use creative thinking.
Charles Connolly was produced by the Division of Telecommunications, Iowa State University. The producer was Sue Underwood. The director was Stan Jewell.

MUSIC UP

FADE TO BLACK

FADE MUSIC
APPENDIX IV

EXPERIMENTAL PROGRAM SCRIPT 2X
Go ahead, be original. Join Professor Charles Connolly in Creative Thinking.

How sensitive to problems are you? You may have been hearing about or reading about a new field called sensitivity, which can be considered a part of creative thinking. This is the ability to be sensitive to your environment. To begin with let's make a probe to see how sensitive to problems you are. You'll need a piece of paper and a pencil and
I would like you to list all the problems you now face, that is, all the problems you can think of in two minutes. Are you ready? Go!

(Two minutes)

Okay, time's up. How did you do? I'd like you to count up and see how many you listed. How did you do? Once again I'd like you to tell me how many ideas you developed. We'll start, as before, in the back of the room all the way to the left and just call off the number of ideas so you'll all know how you did compared with each other. Okay. Go ahead. (Pause) All right, that's fine. Quite often our attitude affects our sensitivity to problems. You see we often look at problems as threats to ourselves. Threats to our environment. So we
continue to ignore problems. Lt. Colonel Bert Decker of the Air Force states that problems are like weeds. The more you ignore them the more they keep popping up. Now, what we're going to try to do today is to get you to be more sensitive, more aware of problems that you face, and particularly problems that you face when you try to create a speech. We would like you to develop a positive attitude towards problems so that you look at problems as challenges, as opportunities. When you have a problem you really have an opportunity. When you're assigned a speech you have an opportunity to obtain for yourself a good grade. You also have an opportunity to investigate an area that you're interested in. So if you look
at a problem as an opportunity, as a challenge, you'll tend to be more aware of it and more willing to accept it. Quite often other techniques that can help you when you attempt to discover problems is a check-list. A simple check-list can help you recognize problems when they come up. I'm going to show you a check-list in just a minute, and on the check-list are groups of terms on the right-hand side and on the left side. First look at the top word on the left side, and then look at all the words on the right side. So the first word on the left is "friends." As far as they go what kind of improvements, or what kind of complications exist? How about the attitudes of your friends? How about safety of your friends? How
about economy and your friends?
Next, on the left side of the list is the word "family."
What improvements can be made?
What complications exist, and so forth down the list. You'll have two minutes again, and this time I'd like you to use the time to see how many problems you can discover. See if you can't list more problems this time than you did last time. Are you ready? Go!

(Two minutes)

Okay, time's up. How did you do? Count them up. Did you beat your own mark? I hope so. I hope that you are becoming more sensitive to problems. Another technique that can be used to increase your problem sensitivity is proper problem statement. The way you state the problem often affects your
attitude toward the problem. For example, should I take English 105 or Botany 101? This statement leaves you two alternatives, and maybe you don't like either course. You can open up a wide choice of courses to yourself simply by stating the problem differently. In order to state the problem broadly start the statement with words like "how to." For example, how to pick the best courses here at the university. How to solve my money problems. You can also start the statement with "ways to." For example, ways to get my family to attend church. Now I'd like you to try and restate some of the problems that you listed before simply by beginning a statement with "how to" or "ways to." You'll have
two minutes to do this, and we'll start it right now.

(Two minutes)

Okay, time's up. How did you do? Were you able to restate those problems into questions? Did you put them in the "how to" or "ways to" formula? This should open up a wide group of choices for you in the problem solution. Now let's look at another technique that will help you to be more sensitive. More sensitive in your attempt to ask questions. This technique is particularly useful for you in a speech course or in any situation where you're required to think up questions. Have you ever been in a situation where the speaker said, "Any questions?" You might have had an inkling of a question, but you just couldn't put it into words.
This technique will help you. The technique also works when you're faced with a problem by helping identify a number of questions that might need answers during your attempts to gather facts about the problem. This is similar to the check-list technique because it is a check-list of words which help cue questions. The words are "who," "what," "where," "when," "why," and "how." People studying journalism often use these words when they are trying to develop a good story. They might say "Who was involved in the incident? What did he do? Where did it happen? When did it happen? Why did it happen? How could it possibly happen?" By using these words and proper problem statements you can develop a wide variety of
questions to be answered. To
give you some experience in
using these words to create
questions I have a picture that
I'd like you to look at and
create questions concerning.
Looking at this picture I'd
like you to develop as many
questions as you can about the
picture. Use these words to
help cue questions to yourself
as you look at the picture. Ask
yourself who, what, where, when,
why, and how. Ready? Go!

(Two minutes)

Okay, time's up. How did you do?
Count up the number of questions
you were able to ask about the
picture. (Pause) How many
questions were you able to ask
about that picture? Did you ask
such questions as; What is
going on here? Who is driving
the vehicle? Who decided they
should drive? Why are they
driving? Where are they going?
How did they prepare for the
trip? When did they expect to
get there, and so forth? You
could ask almost an infinite
number of who, what, why, where,
when, how questions. Did you
defer judgment? Even when you
are creating questions you can
use the defer-judgment technique
to help you develop a large
number. If you try to judge
your questions as you create
them you often block the possi-
bility of good questions. You
might say to yourself, "That's
not a good question," or "That's
not an important question," and
this freezes the creative problem
of asking questions.
We're going to show you another
picture, and this time I'd like
you to defer judgment as you
attempt to ask questions about this picture. Defer judgment and use the check-list of words that will cue questions. Apply both techniques this time. Okay, here's the picture, go ahead. You'll have two minutes. (Two minutes) How did you do? Count up the number of questions you asked about the picture. Did you beat your old mark? I hope so. Remember that you lose what you don't use. You have to use the gold mines you have between your ears to help you think creatively. I'd like you to use the techniques that we've talked about on your speeches, to create good ideas for your speeches, to develop better topics, to build a better speech by giving better examples. First it has to begin with the use of creative
imagination. Be careful that you recognize the problems you face. Be sure that you state the problem in proper form for creative attack by using the terms "how to" and "ways to."

Finally, be sure you ask as many questions as you can concerning the problem, so you will be able to free your mind, and think more creatively as you develop better and better speeches. I wish you all the best of luck.

Creative Thinking with Professor Charles Connolly was produced by the Division of Telecommunicative Arts, Iowa State University. The producer was Sue Underwood. The director was Allison Cambre.

FADE MUSIC
APPENDIX V

EMPIRICAL PROCEDURE NOTES
SUMMARY OF EMPIRICAL PROGRAM DEVELOPMENT

The two programs are numbered 1 and 2. The first program was numbered la with the revision lb, lc, and so on until the development was complete. The last revision of each program was designated X for experimental.

The following lists the development number, date, name of the instructor whose class was used, the procedure followed, and the results of each program.

la 7/24/68 Connolly 7:30 class
Procedure: Students heard full program the complete text of which is included in this appendix. Pre and post tests.
Results: No significant difference (n.s.d.).

lb 7/24/68 Connolly 11:00 class
Procedure: Program revised with more emphasis on the importance of deferred judgment.
Results: n.s.d.

lc 9/27/68 Vallier
Procedure: Emphasis motivation and the importance of creativity to the student. Indicated the tests would not affect course grades. Give greater
understanding of creative ability. Student respond to questions on how many believe their creative ability can be improved, and how many would like to improve their creative ability. Demonstrate the impact of habit with hands and arms. Results: n.s.d., of the 19 students 11 thought their creative ability could be improved and 12 indicated they would like to improve their creative ability.

10/3/68 Barnett

Procedure: Emphasize habit with hand and arm demonstration; student respond to questions; try adding another creative technique: forced relationship.

Results: Significant.

10/4/68 Demree

Procedure: Emphasize habit, deferred judgment, students make two responses to tasks similar to the pre and post tests; students call out fluency score so they can see how they are doing in relation to other students in the class; include forced relation technique.

Results: Significant.
10/7/68 Demree
Procedure: Continue as before, try three responses; try repetition of ideas; try adding another creative technique, the catalog technique.
Results: Significant.

10/10/68 Demree
Procedure: Try longer pre and post tests, 20 minutes; continue as before but eliminate catalog technique.
Results: Significant; run out of time, therefore, only time for two responses during the program.

10/11/68 Langford
Procedure: Use no response and select content from program 1a, but include forced relation technique.
Results: n.s.d.

10/11/68 Langford
Procedure: Use three responses during the program; emphasize: habit, forced relation, definition of creativity, creative books; use the long pre and post test, 10 minutes; use short response, two minute during program.
Results: Significant.
1j 12/10/68 Telecommunicative Arts Seminar
Procedure: Integrate slide portion of 1a into the developed presentation; include three responses during the program.
Results: Ran out of time, so therefore only two responses possible; test results were significant.

Second Program Empirically Developed

2a 10/16/68 Hoopes
Procedure: Use complete conventional program; the complete script of this is included in the appendix; use pre and post tests.
Results: n.s.d.

2b 10/17/68 Hoopes
Procedure: Add visuals to stimulate responses on pre and post tests; emphasize check-list technique and problem sensitivity.
Results: n.s.d., but higher than before.

2c 10/22/68 Justisen
Procedure: Emphasize student questions on subject of creativity, one response.
Results: n.s.d., but higher than before.

2d 10/24/68 Drexler
Procedure: Emphasize importance of problem
sensitivity, importance of attitude, problem statement in broad terms.
Results: n.s.d.

2e 10/25/68 Kaufmann
Procedure: Emphasis on check-list as stimulator to active student response; check time of test by asking students to make mark at the end of two minutes and at the end of five minutes.
Results: Significant.

2f 10/28/68 Barnett
Procedure: Emphasize restatement of problem into creative form, use visual cue for tests, use no response during program.
Results: n.s.d.

2g 10/30/68 Goslin
Procedure: Use photographs to stimulate response; positive reinforcement for responses; check-list, observation and manipulation, have students make marks at the end of two minutes and five minutes.
Results: Significant.

2h 10/31/68 Barnett
Procedure: Continue as before; use three visuals and three responses during the program.
Results: Significant.
APPENDIX VI

ANALYSIS OF VARIOUS DATA
Additional Data Presentation

For the purpose of the analysis of variance program the data was broken into 18 sets of data. Below is the results of the analysis.

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>Description</th>
<th>Sample Size</th>
<th>Standard Deviation</th>
<th>Mean</th>
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<tr>
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Treatment Group Description

1. Conventional fluency pre-test
2. Conventional flexibility pre-test
3. Conventional originality pre-test
4. Conventional fluency post-test
5. Conventional flexibility post-test
6. Conventional originality post-test
7. Experimental fluency pre-test
8. Experimental flexibility pre-test
9. Experimental originality pre-test
10. Experimental fluency post-test
11. Experimental flexibility post-test
12. Experimental originality post-test
13. Control fluency pre-test
14. Control flexibility pre-test
15. Control originality pre-test
16. Control fluency post-test
17. Control flexibility post-test
18. Control originality post-test
## APPENDIX TABLE 1.—Analysis of variance

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<th>Treatment Group</th>
<th>Between Group</th>
<th>Within Group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sum of Squares</td>
<td>Mean Squares</td>
<td>F</td>
</tr>
<tr>
<td>Sum of Squares</td>
<td>Sum of Squares</td>
<td>Mean Squares</td>
<td></td>
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<tr>
<td>Grand Mean</td>
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<td></td>
<td></td>
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<tr>
<td>11</td>
<td>10.04</td>
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<td>3,9,15</td>
<td>8.69</td>
<td>63.23</td>
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<tr>
<td>4,10,16</td>
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### APPENDIX TABLE 2.—Additional data analysis with t-test

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\textsuperscript{a}Significant at .05 level.

\textsuperscript{b}Significant at .01 level.
APPENDIX TABLE 3.—Chi square analysis of student background and reaction to programs

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<tr>
<th>Question</th>
<th>Degree of Freedom</th>
<th>Chi Square</th>
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<td>15.51</td>
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<sup>a</sup>Significant at .20 level.

<sup>b</sup>Significant at .10 level.
APPENDIX VII

CREATIVE THINKING BACKING AND EVOLUTION
CREATIVE THINKING

Background and Evaluation

INSTRUCTIONS: Mark all answers on the IBM Answer Sheet. Note that the numbers on the answer sheet go across the page, then down.

The first questions refer to you before you viewed the television programs.

1. What experience have you had in creative thinking?
   1. None;  2. A little;  3. Heard about it;  4. Studied it before;  5. Use it all the time

2. Have you read articles on creative thinking?
   1. Yes;  2. No

3. Have you read books on creative thinking?
   1. Yes;  2. No

4. Have you heard speakers or seen demonstrations of creative thinking before?
   1. Yes;  2. No

5. Have you taken a course in creative writing?
   1. Yes;  2. No

6. Other than school assignments, do you ever write stories?

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These next questions assume that you have viewed the television programs:

7. I think I will be able to apply what I learned in these programs in my future life:
   1. Not at all;  2. Very little;  3. Somewhat;  4. Good deal;  5. Great deal

8. I find I am better able to think up effective ideas:
   1. Not at all;  2. Very little;  3. Somewhat;  4. Good deal;  5. Great deal

9. I think these programs should have been:
   1. Eliminated as of no value
   2. Reduced in length
   3. About what they were
   4. Expanded to a few more programs
   5. Expanded to a full quarter

10. I would have preferred to not view the programs if I had been given the chance.
    1. Definitely;  2. At many points;  3. Sometimes;  4. Rarely felt that way;  5. Never wanted to

11. Compared with college in general I found the programs:

12. I would like to take a full course in creative thinking.
    1. No;  2. I doubt it;  3. Maybe;  4. Probably;  5. Yes

13. If my best friend asked me if he should see these programs I would say:
    1. Definitely no;  2. No;  3. Maybe;  4. Yes;  5. By all means
14. I feel this training would best be given in:
   1. Grade School; 2. Junior High;
   3. High School; 4. College; 5. Graduate School

15. I would recommend a course like this to:
   1. No student; 2. Some students; 3. Most students; 4. All students

16. I have discussed these programs with friends:

17. I found the programs:

18. I found the programs:
   1. Much too repetitive; 2. Too repetitive; 3. Moderately repetitive; 5. Not at all repetitive
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BIBLIOGRAPHY

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