INSTRUCTIONAL DEVICES IN ADULT EDUCATION

by

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Date 12 April 1966
This study is dedicated to my wife, Frances Ann McGown, and our children.
ABSTRACT

This study discusses the nature of instructional devices in the adult education setting and presents a typology or classification scheme in which all such devices can be organized, classified, integrated or considered.

It was important to carry out a fairly wide and deep review of all research that might possibly be pertinent, or even partially pertinent, to the effectiveness of instructional devices, for they were regarded not just as audio-visual aids but rather as a means that could be used purposely to strengthen or enhance the effectiveness of the learning process, whether a method or technique, and which could supplement either of these in the realization of the educational objective.

This rather broad approach to instructional devices involved the author with some aspects of teaching supplements that are not usually found in a discussion of audio-visual aids, yet it was considered that such an item, for example, as "color" or "group size" should be regarded as a device that a teacher must consider, choose and try to use for the best instructional results.

In summary it can be said that in this review of the research pertaining to the use of instructional devices in adult education it was found that their proper use can improve the effectiveness of most teaching situations.
However, it will be seen that there is a large and important conclusion generally accepted by researchers in the field of instructional devices. This is stated in a number of ways, but the following two will illustrate the point.

(1) Adult education can be conducted successfully using any instructional device or combination of devices, and the question of effectiveness must take into consideration the habits and abilities of the learners with regard to the device.

(2) The effect of the use of a device, within certain limits, depends more upon the characteristics of the learners than upon the elemental variables within the device itself.

Assuming this is true it would seem then that it would be the conclusion of the researcher, student or teacher that a premium is placed on the judicious use of any or all instructional devices in order to minimize the noted wide differences in adult learners.
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CHAPTER I

INTRODUCTION

The Adult Education Setting

Adult Education today is considered to be that organized educational activity that a person pursues while his main activity or livelihood is in some other field. Verner (432) defines adult education much more exactly when he says:

Adult education is the action of an external educational agent in purposefully ordering behavior into planned systematic experiences that can result in learning for those for whom such activity is supplemental to their primary role in society, and which involves some continuity in an exchange relationship between the agent and the learner so that the educational process is under constant supervision and direction.

Adult education is becoming increasingly more important as adults seek to fit themselves for a rapidly changing society.

... adults must continue to learn .... The current generation of mature adults represents the first generation faced with managing a culture different in kind than the one originally transmitted to them. The consequence of this new fact of life is such that the well-educated youth of today is an obsolete man tomorrow. (3)

To give some idea of the extent and depth of adult education in the United States, Read and Marble (341) listed 400 separate and different organizations which conducted adult education programs. In every instance, these organizations are involved in planning and conducting educational programs for
adults. Such programs require the use of a variety of instructional processes in order to provide suitable learning opportunities for the adult participants. Heretofore, educational programs designed for adults have tended to duplicate the learning experiences and activities used with children, but in recent years it has become obvious that adults require special consideration.

As the discipline of adult education has developed, increasingly more careful thought is given to the specialized needs of adults in the design and management of learning activities. In so doing, greater precision is developing in identifying the fundamental concepts which constitute the instructional process in adult education. Among these elements in the instructional processes can be found a complex assortment of instruments, materials, and conditions which, for convenience, Verner has identified as devices (433). The role which these play in the instructional situation has not been clearly identified due to the mass of data about them and the confusion created by the variety of research related to the use of devices in different instructional situations.

In order that devices might be used more effectively, it is necessary that extant research be systematized and integrated both to provide a functional guide to the use of devices as well as indicating gaps or deficiencies in extant knowledge about them.
The purpose of this thesis is to review the research pertaining to instructional aids and devices in adult education; to analyse this research and to construct a classification scheme for such devices which will organize, classify and integrate what is known so that the knowledge will be functionally available to adult educators.
The Sources of Information

There have been few reviews of research pertaining exclusively to the use of instructional devices in adult education. Sheats and Svenson (364) published a review in 1950 dealing with the use of audio-visual aids in adult education, Brunner (60) provided a good survey of certain devices in 1959. Goulette's (168) thesis is an excellent review of research carried out in the U.S. Armed Services with some reference to devices used in adult education, and Verner (434) gives a succinct survey of research pertaining to devices used in the adult field in 1959.

Although reviews related to adult education specifically are sparse there have been many reviews of research on the effectiveness of teaching devices generally that are not with particular reference to adult education. These have been published quite regularly since Hoban's (200) comprehensive work in 1937, which was followed by Dale and Hoban (107) in 1941, and by Dale and others (109), (108) in 1949 and 1950. Allen (14), (15) in 1956, McClusky (279) in 1949 and Stenius (385) in 1945 published general reviews of research. Bibliographies of research studies were compiled by the staff of the Instructional Film Research Program (70), Larson and Runden (258), and Moldstad (300). As stated by the Encyclopedia of Educational Research (1960) (187), however, the most comprehensive analysis up to 1960 was the report prepared in
1950 for the Instructional Film Research Program by Hoban and VanOrmer (204). The *Encyclopedia of Educational Research* brings the survey of research up to date and provides an excellent review of the most important research on teaching devices up to 1960.

The information sources for this thesis were many and varied. The biggest contributor of research information was the United States Armed Forces, followed by the Cooperative Extension Service of the United States Department of Agriculture. The Agricultural Experimental Stations and the Extension Services of several State Universities, and the United States National Project in Agricultural Communications have published many valuable research reports which were helpful. Several university degree and non-degree student research papers were particularly useful.

The problems associated with analyzing such research material are legion but tend to arise from one circumstance:—when research was being carried out on the effectiveness of a device, usually its use was generalized and not examined for a particular type of teaching-learning situation, thus some valid conclusions regarding the use of a device in one teaching situation may not hold true in another. This can be illustrated by referring to the use of a rifle, the actual article, as a teaching device. It should be used to illustrate what a rifle is, obviously it is much better than pictures, or film, or any
other device, however it is not an effective device for illustrating how the chamber gases are expelled or how a new round is forced into the breech. It is excellent as an illustrative visual, three dimensional device in one instance but is inferior to a cutaway or a two dimensional non projected device such as a picture series in the next instance.

Again, from the basis of reinforcing learning or teaching a student to achieve a certain standard of speed and excellence, the actual equipment can be used but, as Gagné (150) pointed out, the problem of effective teaching here is not one of making the task similar but rather of arranging the conditions of practice in such a way that essential skills are most easily learned.

It can be seen then that research material regarding the effectiveness of a device, will have to relate to how the device is used and for what purpose.
Definitions of Terms

There are several common terms that have a special meaning as used in this thesis.

Adult education was defined earlier, in the introduction, (see p. 1).

Verner's definitions are used as being the most authoritative and definitive:

Method may be defined as the relationship established by the institution with a potential body of participants for the purpose of systematically diffusing knowledge among a prescribed but not necessarily fully identified public. (432, p. 9)

Technique may be defined as the relationship established by the institutional agent (adult educator) to facilitate learning among a particular and precisely defined body of participants in a specific situation. (432, p. 9)

An Instructional device may be defined as any means which is used to strengthen or enhance the learning process but which does not alone provide the direct learner-instructor relationship necessary to be considered an educational technique or method. Such devices will supplement or strengthen a method or technique in the realization of the educational objective. (432, p. 10 and Verner's Adult Education lecturers at UBC 1961)

In general, devices may be classed as:

1. ideas
2. practices
3. instruments
4. combinations of the preceding three

Some additional quotes may be in order here to point up the fundamental differences between method and technique.
Method is institutionally centered and, therefore, an administrative function; while technique is participant centered and, thus, a function of the learning situation.

Techniques are, for the most part, independent of methods. Just as an institution may use one or more methods for the diffusion of knowledge so may its agent use a variety of techniques within the limits imposed by the method. In some instances, certain techniques which come into being within the concept of a single method are more appropriate to that method than to others; however, in general, most techniques are applicable under more than one method. (432, p. 9)
CHAPTER II

THE NATURE OF DEVICES

Virtually any learning situation is enhanced by the use of instructional devices. Ideally, the purpose of a device is to facilitate the more effective performance of one or more of the following phases in the learning situation by appealing to a maximum number of senses in an optimum environment:

1. Promote group participation and socialization
2. Introduce new material
3. Clarify details
4. Stimulate interest
5. Summarize
6. Review

Being a supplementary measure, the introduction of a device will not overcome by its own merits, a deficiency of interest which the subject matter holds for a given group. Also it is not a substitute for teacher preparation: for maximum effectiveness an instructor should have complete familiarization with the potential of a device, and its operational or mechanical aspects. The proper selection of a device is necessary for maximum effect, and sufficient variation of devices is essential to prevent boredom. Among the earliest work related to devices was that done by Hoban in 1937, which
was concerned primarily with audio-visual aids. Hoban (203, pp. 22-5) stated four general principles regarding the use of teaching devices in the teaching-learning situation which should be kept in mind when comparing and evaluating devices. These are as follows:

A. The value of visual aids is a function of their degree of reality.

B. The value of visual aids is a function of the nature and extent of the pupils' previous experience. If varied experience has already developed wide and manifold differentiation and integration from the concrete through the intermediate levels of experience to the meaningful use of words (verbalization), further visual aids are unnecessary for the development of progressive abstraction. The relative effectiveness of the various visual aids is in direct ratio to the pupil's stage of learning and development. This principle is illustrated in the following diagram: (shown on page 11) . . .

C. The value of visual aids is a function of the objectives of instruction in the particular classroom situation. It is apparent that the degree of reality and the previous experience of the learner are highly related and cannot be isolated from each other.

Mere concrete experience, in itself, is no guarantee of generalization; it merely supplies the situation by which this generalization becomes possible and meaningful. The actual generalization is and must be taught on the verbal level.

If teachers will first determine the objectives of instruction, they can then determine whether visual aids will contribute toward the attainment of this objective and which particular visual aid lends itself best toward this end.

D. The value of visual aids is a function of the intellectual maturity of the learner. It has been previously stated that flexibility of mind determines in part the ability to see relationships and to form generalizations. . . . It follows, then, that the amount and concreteness of the visual aid necessary to the development of any given level of abstraction is greater where the intellectual maturity of the learner is lower, and vice versa. . . . Provisions for individual differences are generally quantitative, whereas they must also be qualitative. . . .
FIGURE 1

words

diagrams

maps

flat pictures

slides

stereographs

films

models

objects

total situation

the concrete

the abstract
About twenty years after Hoban devised the scale (Figure 1) which illustrates the learning effectiveness of various audio-visual aids in the instructional situation, Dale (106) revised this into his noted "Cone of Experience" (Figure 2, p. 13) to explain "the inter-relationships of the various types of audio-visual materials, as well as their individual positions in the learning process". (106) The bands shown are not rigid, inflexible divisions, e.g.,

... a motion picture can be silent or can combine sight and sound. You can view a dramatization as a spectator or you may participate in it as an actor. ... The cone device, then, is a visual metaphor of learning experiences, in which the various types of audio-visual materials are arranged in the order of increasing abstractions as one proceeds from direct experiences. (106, p. 42)

It should be noted that increasing abstractness does not mean increasing difficulty. Exhibits are nearer than field trips to the pinnacle of the cone, not because they are more difficult but only because they provide a more abstract experience. (106, pp 42-3)

Dale's "Cone of Experience" provides a clue to the classification of devices with respect to the functions which they perform in the learning situation. Different functions, therefore, call for different kinds of devices and some devices may perform more than one function. In general, the chief functions required in a learning situation involve illustration, re-enforcement, and the environment, which identify the three principal classifications into which devices can be conveniently catalogued.
FIGURE 2

verbal symbols
visual symbols
recordings, radio
still pictures
motion pictures
television
exhibits
field trips
demonstrations
dramatized experiences
contrived experiences
direct, purposeful experiences
The most common function for which devices are used is that of illustration. In this case the device facilitates learning by involving sense perception in acquiring the material to be learned.

The Illustrative Devices have a natural subdivision into Audio devices and Visual devices and further, the Audio sub-group itself can be readily divided into Live, and Mechanical devices. The Visual subgroup of devices have a further consequential subdivision into Three Dimensional devices, Two Dimensional Non-Projected devices, and Two Dimensional Projected devices.

Re-enforcement is an essential aspect of learning and to achieve re-enforcement there are a variety of devices available. The devices used in the re-enforcing type of teaching can themselves be subdivided into three distinct teaching activity groups, - Practice, Drill, and Performance.

The least used type of device involves certain environmental aspects of the learning situation. The environment itself is not generally forgotten or ignored but it is not usually considered as a controllable device. Here these devices are reviewed under two subdivisions, - Physical and Organizational. The Physical, of course, is all the controllable physical facilities in the meeting place whereas the Organizational is subdivided and considered under the two headings of Group Size, and Arrangement of Learners.
Although the functional classification of devices falls into the three main categories indicated, there is a further classification imposed by the nature of the devices themselves. Some devices are useful in the instructional situation directly while other commonly used devices are less closely related to the actual instructional process but are primarily useful for the general diffusion of information. This classification of Diffusion Devices is divided into the two subdivisions of Distributed Devices which includes such as Circular Letters, Bulletins, etc., and Extension Devices which considers Open Circuit TV, radio, and Motion pictures.

As we have seen, the initial division in the classification system is by the number of participants involved in any employment of a device.

1. **Instructional Devices**
   All the devices used in skill training, illustration, re-enforcement and maximizing the effectiveness of the instructor, method, technique and environment to facilitate the accomplishment of the educational objective of the agency where some degree of personal contact is possible between the agent and the learner.

2. **Diffusion Devices**
   These are devices which present information to the public with no more pre-selection of learners than the accessibility of the media. Fitzgerald (41) lists the
following as characteristics which typify diffusion devices:

- a. broad coverage of a heterogeneous group
- b. low unit cost for producer and consumer
- c. speed
- d. mass interest, with some entertainment value; ability to communicate easily and simply to the average intellect. This group includes only devices which serve to disseminate information and influence changes in attitude. (41)

An examination of these two categories will show that an instrument or practice will become a device only by application, not by virtue of some inherent property.
Typology of Devices

The following is a detailed, if not complete listing of devices by (1) function, (2) sense appealed to, and (3) a listing of representative devices in each category.

I. Instructional Devices

A. Illustrative

1. Audio
   a. **Live**, - verbalization - by instructor or learner participant, recitation.
   b. **Mechanical**: -
      (1) Monaural and Stereo records
      (2) tapes
      (3) radio

2. Visual
   a. **Three dimensional**; -
      (1) mock ups
      (2) demonstrations
      (3) animated panels (pantorium)
      (4) diorama
      (5) cutaways
      (6) museum materials - display of actual items
      (7) field trips
      (8) role-playing
      (9) exhibits
b. **Two dimensional, Non projected.**
   (1) blackboards
   (2) magnetic and felt boards
   (3) books
   (4) handouts
   (5) correspondence courses
   (6) study guides
   (7) teacher guides
   (8) posters
   (9) bulletin boards
   (10) before and after pictures
   (11) stereoscopes
   (12) graphics - charts
        graphs
        flip charts
   (13) comic strips
   (14) cartoons
   (15) technamation displays

   c. **Two dimensional projected**
   (1) opaque and transparent projections
   (2) film
   (3) filmstrip and slide projections
   (4) micro film projections
   (5) Educational TV (closed circuit)

B. **Re-Enforcing**

1. **Practice:** - actual article or simulator or operative mock up
2. **Drill**: - a. **reading machines** (tachistoscope, pacer, reading film)  
   b. **language and other repetitive type recordings**  
   c. **flash cards**  

3. **Performance**: a. **Teaching machines and programmed instruction**  
   b. **Skill tests**  

C. **Environmental**  

1. **Physical**: - all controllable physical facilities in the meeting place.  
   a. **Colour**  
   b. **Lighting**  
   c. **Temperature**  

2. **Organizational**: -  
   a. **Group size**  
   b. **Arrangement of learners**: -  
      (1) reaction team  
      (2) observation team  
      (3) listening team  
      (4) "thread man"  

II. **Diffusion devices**  

A. **Distributed**  
   1. Circular letters  
   2. Bulletins  
   3. News Stories  

B. **Extension**  
   1. Open circuit TV  
   2. Radio  
   3. Motion Pictures
CHAPTER III

ANALYSIS OF RESEARCH PERTAINING TO THE EFFECTIVENESS OF INSTRUCTIONAL DEVICES

In reviewing and analyzing the research material related to devices, the material will be organized and presented in the arrangement indicated by the Typology of Devices presented in the preceding chapter.

I. Instructional Devices
   A. Illustrative
      1. Audio
         (a) Live

To open this discussion of the use of live, audio teaching devices and their effectiveness in Adult Education it may be suitable to mention Dale's (106) "cone of experience" to which he refers when he states that words must be seen on rising levels of abstraction. The closer a word is to some possible concrete presentation, - to showing the object to which it refers - the easier it is to teach and to learn. Conversely, the greater the number of concrete experiences required before a word can be understood, the more difficult it is to teach and to learn.

As Corey (93) pointed out, the lecture method of teaching developed and thrived during the early university period,
largely because of the scarcity of books and manuscripts available for student use. The university faculties then knew many things not generally available and the only feasible method for them to disseminate their learning was by telling or lecturing. With modern advances in printing and multigraphing, the historical argument for the lecture method of teaching has been weakened. Adult students are not so dependent on teachers for intellectual nourishment as they are for stimulation and guidance.

Day and Beach (112) reviewed the research up to 1950 in comparing the visual and auditory presentation of information and found that it was divided 50/50 as to which technique was more easily understood.

In 1953 Lull (271) reported that a comparison of oral and written communications to a group of professional and industrial workers showed that oral communication was more effective.

Webb and Wallon (448) concluded from a research project in 1956 on comprehension by reading versus hearing that since reading is more rapid for a one time acquaintance with material, reading is the preferred method. But if equal time is available for reading as for auditory presentation, significantly more material may be obtained by reading.

Rankin (338) has shown us that listening is the most frequently used language art and Worcester (463) pointed out that the auditory method of presentation is intrinsically superior to the visual method for retention of communicated
subject matter. He also showed us that one who learns easily by one method of presentation also learns easily by the other method, and generally neither the visual nor auditory method has any distinct advantage over the other in terms of the number of repetitions needed for learning. On the other hand, Krawiec (250) substantiates that the visual method of presentation is usually superior to oral presentation for the learning and retention of material, and although neither method is consistently superior for retention, the visual presentation is superior to auditory presentation for the learning of difficult material.

De Wick (117) shows us that the auditory presentation of advertising copy is distinctly superior to visual presentation for recalling products and trade names after a delay of from five days to five months.

Stanton's (382) findings generally support those of De Wick. The auditory method was shown to be superior to the visual method. For recall, the peak superiority for the auditory method came at the seven day interval. After 21 days both auditory and visual results were much lower and the margin between the two had decreased. For recognition the greatest superiority for the auditory method occurred at 21 days.

On the basis of a whole series of experiments, Carver (78) concluded that:

1. The relative effectiveness of visual presentation varies directly with the difficulty of the content, when the difficulty is judged on the basis of graded
curriculum content: the easier the material, the more likely will auditory presentation be superior to visual presentation.

(2) When difficulty of material and educational level of subjects are held constant, recognition, verbalism, recall, and non-criticalness (suggestibility) are more effectively exercised when listening than when reading. On the other hand, comprehension, criticalness, and discrimination are best facilitated by reading.

(3) The effectiveness of auditory presentation seems to be limited to familiar and meaningful material.

(4) The higher the educational level of the subjects, the greater the capacity to benefit from auditory presentation. (78)

All these findings suggest that neither auditory nor visual methods of presentation are consistently effective under all conditions and for all types of information. Television appears to be more effective as it combines visual and auditory methods. For some pure recall, oral methods of presentation are found to be clearly superior to visual. On the other hand, for problem solving or mastering difficult subject matter, visual methods are probably superior to auditory methods.

Kreitlow and Edwards (251) in 1961, made a comparison of the effectiveness of the lecture, the bulletin, 16 mm film and television, in presenting research findings to adult groups and reported that the lecture medium was the most effective.
Also that the bulletin medium scored higher than film or TV, but not significantly so, and, finally that the higher the academic grade level attained, the greater the number of correct answers scored, regardless of the media used.

Hovland (209) concludes that face-to-face communication is almost universally reported to be more effective than is radio.

Michael Polanyi (330) said that words can convey information, but the sender of the message will always have to rely for the comprehension of his message on the intelligence of the person addressed. Only by virtue of this act of comprehension, of this tacit contribution of his own, can the receiving person be said to acquire knowledge when he is presented with a statement.

It may not be out of place here to remind ourselves of the necessity to consider the nationality or language of the people we are involving in the educational process. Time Magazine, for September 20, 1963 (402) reported that General Motors discovered "Body by Fisher" came out "Corpse by Fisher" in Flemish, and "Schweppes Tonic Water" was speedily changed to "Schweppes Tonica" in Italy where "il water" idiomatically indicates a bathroom. Again, native words in one African town are obscenities 50 miles away, and the old advertising catchword "magic" is difficult to use: to Africans the word is linked to a mythical devil named Tokoloshe who gets young girls pregnant.
A. Illustrative

1. Audio

   (b) Mechanical

There have been relatively few basic studies made of the effectiveness of radio and recordings in teaching factual information to adults and in changing adult attitudes and interests.

Tewes (400) reported some findings from research completed on the preparation and evaluation of recordings used as "discussion starters". The results support the following conclusions: the recordings were effective discussion starters and they lessened the need for a trained leader. A variety of problems within a skit helped different individuals to identify themselves with situations portrayed and tended to promote discussion. Individuals resist identification with undesirable situations but indicate an interest in correcting problematic situations. Nelson, Moll and Jaspen (310) showed that significant learning accrued from the presentation of film as a whole and from the presentation of either the audio or video channel alone, and although neither channel was consistently better than the other both channels together were consistently better than either one alone. In general, hearing the sound track in the dark appears to be slightly superior to hearing it in the light.

(3) Radio

Crile's (98) findings from radio research provided a good background for this section. Clinton (82) observed that radio and print, seemingly unlike each other, actually have
certain similarities. Like print, radio does not demonstrate but rather suggests. Its scenes and events are in the imagination of the audience, making radio almost as mobile as print. Also like print, radio does not require a setting: the narrator has freedom for he may speak from a specific time and place or from no time and no place. A narrator is easily accepted.

In 1935 Cantril and Allport (67) proved that education could be successfully conducted by radio. Katz and Eisenberg (236) later found that listeners preferred educational material to be entertaining and were likely to understand the material and retain it better when it was presented in an entertaining manner. Harrell, Brown and Schramm (186) found that audiences prefer broadcasts which do not contain too many individual items even though they may retain more in absolute numbers from the broadcasts which contain the more items. They also showed that human interest, spectacular or nearby events are remembered better than serious subjects, public affairs and events of distant origin. Golden (162) measured the degrees of retention of psychological content presented in radio broadcast by a lecture, a dialogue in interview style, and a dramatization, each of 15 minutes duration. Retention scores immediately following the broadcasts showed no significant differences among the groups. Four weeks later those who had been exposed to the talk showed much higher retention than the other two groups. The dramatization group scored much lower than the dialogue group. The higher the educational level of the subjects, the
higher were the retention scores of those who had heard the lecture. At below high school level, retention was about equal from lecture and dialogue. Wall's (441) study suggested that broadcasts were effective teaching instruments with normal groups and, on the whole, with the better of the backward. For the very backward the evidence suggested that scripts would have to be specially adapted. On behalf of the British Broadcasting Corporation, Vernon (437) made five studies in an evaluation of radio as an educational device. The study on the intelligibility of broadcast talks showed that:

1. Crowding a great many points into the talk had a less harmful effect than anticipated. A large number of teaching points makes for difficulty although high interest talks can contain 10 or more major points. Many subsidiary points or facts may seem confusing but are not found harmful.

2. There was little difference in comprehension and recall between reading and listening to educational matter, but reading was superior at higher levels, and listening was superior in younger and duller and the over 60 learners.

3. Dramatized incidents had greater delayed recall.

4. Good or poor delivery (within reasonable limits) has little effect on intelligibility, although it may influence appreciation; over-speedy delivery is more harmful.
(5) Overlong sentences, difficult vocabulary, many prepositions tend to increase unintelligibility to a slight degree.

(6) Various measures of conversational speech, personal and "human interest" words, also failed to show any relevance.

(7) Both lucidity and liveliness of style are important.

(8) A clear summary helps.

(9) The most successful talks dealt with concrete subjects of a practical kind, which were familiar to listeners in their daily lives or affected them personally. The least successful talks dealt with very abstract topics such as "the nature of clear thinking", or with subjects such as literature which reminded the listener of his schooldays.

(10) Scientific applications are more effective than theories.

(11) The interest aroused by a talk (particularly among dull and average listeners) greatly outweighs in importance any factors of style or language. (437)

Vernon (437) found that about half the population can recall only one third or fewer of the main points of an elementary educational talk and said, "Perhaps we can never hope to reach the bottom 25% of the population, - except by face-to-face instruction.

The B.B.C. report (by Vernon) on the effects of broadcasting a serialized version of a book on the reading of the book were also interesting: -
(1) It spurred library loans and sales of the book.
(2) It led to reading other books by the same author.
(3) The subsequent reading of the broadcast book was due to the interest aroused in the book and not to "filling in" what was missed of the broadcast.

The inquiry into the optimum length of an information broadcast talk showed that:

(1) There was serious diminishing of returns after 15 minutes, and for 30 minutes the total amount of information conveyed did not increase.
(2) After 15 minutes the assimilation of material decreases for the entire broadcast, not only for the part after the first 15 minutes.
(3) Most people who switch off a program do so in the first two minutes, with little switching after five minutes.
(4) A listener hearing a 15 minute broadcast recalls twice as much as one hearing a 30 minute one.
(5) Listeners prefer 30 minute broadcasts.
(6) Of a 15 minute newscast an audience will remember 11 of 20 items, 15 of 30 and 18 of 40 items.

In another program series it was found that:

(1) An artificially contrived setting seemed to distract from the program's effectiveness.
(2) Programs change attitudes as well as supply information.
(3) There was a high positive correlation between respondents having enjoyed the program and a feeling they had learned from it.

(4) A common interest program can appeal to several levels of education with no ill effect.

In 1950 the B.B.C. (51) conducted a study to determine the extent of understanding of a science talk by several audiences of different educational background. The results showed that interest was greatest at the partial understanding level and this indicated the need of three different levels of difficulty for use with the general public.

The Pennsylvania State College Agricultural Extension Department (327) reported that the best length for an agricultural extension radio broadcast is between 15 and 30 minutes.

Wilhilin and Sicer (454) report from their findings that twice weekly broadcasts maintained interest better than weekly broadcasts.

As the result of a study Crile (99) completed in January 1952, she reported that only 4 out of 10 county extension agents who were regularly broadcasting had received any training in broadcasting, and suggested all agents so engaged should be given training and assistance to improve their effectiveness. She also reported that her survey showed that agricultural audiences like their programs between noon and 1 P.M., and as only 1/3 of the total agricultural programs are on at this time an effort should be made to increase this number.
Elliot (133) tells us that where the retention of material is concerned, television is generally superior to radio and radio is superior to film. He also shows us that children shift from auditory to visual dominance at the time they learn to read, and indicates there may be a shift back, particularly among women and the less well educated to auditory dominance in later life. Klapper's (245) studies, which did not include television, showed a superiority for auditory over visual methods. Goldstein (163), and Larsen and Feder (256) all generally agree with Klapper, but show that the advantages of auditory devices diminish with the increasing difficulty of the material.

Cook and Nemzek (88) found no significant differences in the amount of information acquired by radio and non-radio students, and Haugh (189) found that there were no significant differences in the effectiveness of reading or listening to radio drama in acquiring information, and that neither method caused any shift in attitudes.

Brunner (60) states that one of the most successful programs known to have relied upon the use of audio-visual devices was the Canadian Farm Radio Forum, as reported by Nicol, and others (317). The uniqueness of this program, which was active continuously from 1941 to 1965, was that it provided for participants belonging to groups which discussed the programs and relayed suggestions and questions to the central broadcasting office.
Howard (212) reviewed the broadcasting of agricultural extension material on 102 commercial radio stations in Ohio and reported the following:-

(1) The usual frequency of broadcasts is 6 days per week, with 5 days per week next.

(2) The most likely time of broadcast is at noon with nearly 1/3 occurring between 6 and 7 AM.

(3) About 1/3 of the programs are in the charge of the county agricultural agent.

(4) The county agent releases are the chief source of information for programs.

(5) At stations where the agricultural agent is responsible for all or part of the program, 3 are rated excellent, 4 are very good and 17 good.

(6) There were some suggestions that, -
   (a) The agent could put more time on his presentations.
   (b) Too much technical language is used.
   (c) Too much general information is broadcast.

(7) About 1/2 of those who commented felt the agricultural agents could use more training. (212)

According to Putnam (336), the Extension Service contacts more people by radio in the counties of Attala, Coahoma, Oktibbeha and Pearl River, Mississippi, than it does by any other or all other means combined. The newspaper was the next most effective means of reaching rural people. Out of 171 people surveyed, 86 applied at least one practice
recommended by the educational broadcast. The hours preferred for farm and home rural education radio programs are in the following order: first, 12 noon to 1 PM; second, 6 AM; and third, 7 PM. Axinn's (30) findings regarding a listening audience in Delaware agreed with those of Putnam for Mississippi in that more farm operators (in Delaware) can be reached by radio than any other media, and the largest radio audience is available during the noon hour. He also drew some other conclusions, viz - the best time for a farm TV show in Delaware is on Sunday afternoon between 12 and 3 PM, and more farmers take weekly newspapers than dailies.

Silvey (370) points out that the intelligibility of broadcasts depends far more upon the "interestingness" than upon any other factor. He re-emphasizes Katz and Eisenberg's (236) findings which showed that information becomes more meaningful as it is related to objects, conditions, or situations that are familiar to the audience. Silvey here reports that the most interesting talks for the average or below average audiences are those dealing with concrete subjects of a practical kind which are familiar to listeners in their daily lives, or affect them personally. Highlander (195) shows us that interest in the subject matter is more important in gaining audience approval than are the ability of the speaker or other production techniques. Or, as Dietrich (119) states, the content is generally more important than the presentation in increasing favorable reaction to a communication. Highlander
agrees with Cantril, Gaudet and Herzog (68) in that the nonauthority speaker produces educational effects equal to those of the authority speaker, as the mass media tend to confer prestige and authority by the fact that the speaker has been selected by the media or institution to appear before the public. When considering these findings of Highlander and Cantril, it is well to review the Hovland and Weiss (211) research which showed that there was no difference in the amount of factual information learned from trustworthy or untrustworthy sources, nor in the amount remembered after a period of several weeks. Also that a trustworthy source is more effective than an untrustworthy source in inducing opinion change.

Cantril and Allport (67) found that for ordinary educational, factual, or news broadcasts the most suitable length generally seems to be about 15 minutes. The Columbia Broadcasting System Radio Network (85) has noted that people with divided attention, such as a motorist, can hear and remember factual information broadcast on the radio. Klapper (245) points out that radio draws its listeners from all cultural and age levels and thus reaches an audience not as often reached by other mass media. Lucas and Britt's (269) research shows that radio is the most accessible source of information to some individuals; they use it most and believe it as much as they believe print. Elliott (133) proved that those who listen to the radio most are the best listeners and remember better what they hear than what they see. Also, the
less educated and less intelligent listen more and remember better what they hear by radio than do the more educated and more intelligent. As reported earlier, Carver's (78) work proved that face-to-face talk is a better "agent" than the transmitted voice, which in turn is generally better than "print". He further showed that the effectiveness of auditory presentation over reading varies inversely with the difficulty of the material. Goldstein (163) followed up Carver's work by showing that more is remembered for a longer period from what is heard than from what is read if simple material is used.

Dayton's (113) review of thirty radio studies revealed that a high proportion of both men and women of all age and income groups listen to the radio programs of the County Extension agents and those of the State Extension workers in the College station broadcasts. Also that extension radio programs reach as many people as all other extension methods combined. Putnam (336) points out that virtually all who listen to the extension radio programs find them helpful, and Gallup (153) shows us that radio is an effective means of teaching, for a high proportion of people take definite action as the result of these programs in such ways as attending extension meetings, ordering bulletins and changing old practices or adopting new ones. Moe's (299) research reveals that both men and women consider radio an important source of information as it is a timely, regular and easy way to get
information. As a source of farm and home information it always ranks high. Page (325) points out that when local leaders used a radio series of sewing lessons to supplement their project work they said radio reinforced their teaching and gave them community recognition and authority that enabled them to do a better job. Crile's (99) study indicates that it was the opinion of only 3% of all regular extension work broadcasters in the nine central states in 1950 that they could have put their radio time to better advantage in some other extension activity. She points out that although television is widespread, rural owners still tend to listen to farm and county extension programs on the radio; if there is a dominance of television it is more pronounced in the evening.

It is of interest to note that there are, today, over 160 educational radio stations active in the United States, and the first station to broadcast educational programs, WHA, University of Wisconsin, is still in operation.

In this section dealing with audio-mechanical devices, an electronic reading device described in an article in the Vancouver Sun of 19 October, 1964 (423) should be mentioned. It was invented by Dr. M.P. Beddoes of the Electrical Engineering Department of the University of B.C., and is now being tested with the hope that blind persons may, with its use, soon read as fast as 170 words per minute. The machine consists of six photo-electric cells which when passed over a line of standard typewriter print emit a combination of sounds, - beeps, hisses
and a click, amplified by transistors. The results of current tests with two blind persons and the equipment in Vancouver have been quite satisfactory as indicated by Dr. Beddoes who reports that progress has been very encouraging.

Sleep-Learning

As sleep-learning is usually attempted with the use of audio mechanical devices, it will be considered here. McComos (282) made an evaluation of sleep-learning for the U.S. Air Force in 1949, and although he did not, as a result, state any specific generalizations, he did predict its usefulness. In 1954 the U.S. Air Force had another research project conducted by the Rand Corporation. Simon and Emmons (371) issued the resulting report that covered a review of the literature and a discussion of the experiments observed in the Rand Sleep-Learning Laboratory. Once again no fundamentals were revealed or principles obtained. However, they also did not discount the potentialities of sleep-learning. Some definite and positive research was reported by Whitney (452) in an article in the Vancouver newspaper "The Province" of 1 October, 1964. He states that George Washington University experimenters found that a recording of Chinese words played to sleeping students helped in learning that language. The students were divided, one group getting a list of Chinese words and the correct English equivalents, and the others getting the same list with mismatched English equivalents. When awakened, the first group learned the list after five repetitions, whereas the second group required eleven repetitions.
Curtis (105) gives sleep-learning a big boost with his book *Learn While You Sleep* in which he reports over twenty specific instances where sleep-learning has been used as an effective teaching device.

It would seem that sleep-learning has a definite place and function in adult education, particularly in the realm of language learning, and attitude and habit changing.
I. Instructional Devices
   A. Illustrative
      2. Visual
         a. Three Dimensional

(1) Mockup: -

A mockup can be defined as a working replica, made from real or synthetic materials, used when practice or training on the real object would be too costly or impossible — an imitation of the real thing. This thesis will consider the mockup for now in the present category of an illustrative, visual three-dimensional device. Its practice and performance functions will be considered later in the Reinforcing category. Gagne' (150) points out the nice difference between using a mockup as a class training aid to facilitate the presentation and teaching of informational knowledge, and using it as a simulator of operational equipment to achieve either measurement of performance or performance improvement.

Most of the research concerning the effectiveness of three dimensional materials as teaching devices has been done for or by the United States Armed Services. Procedures for device evaluation, requirements for their construction and use were all reviewed in a series of technical papers, — (126), (127), (128) and (148).

Torkelson (408) reported on the comparative effectiveness of a mockup, a cutaway and a series of projected charts
in teaching the nomenclature and function of the 40 mm anti-aircraft weapon and the mark XIII torpedo. With students of superior ability there was no large or significant difference among the compared media. On torpedo instruction the cutaway was favored over manual illustrations and black and white transparencies. With groups of average ability the mockup was favored over manual illustrations and black and white transparencies. The cutaway and mockup were favored in learning results but the differences were small. Any advantages accruing to three dimensional materials were so small in proportion to their high cost as to discourage their use except under special circumstances. Murnin, and others (303) discovered no advantages for the three dimensional mock-up over methods that used naval trainee drawings of schematic electrical systems or teaching methods that used no devices. Vris (440) found that complex motor skills such as threading a motion-picture projector could be taught better by three-dimensional models than by two-dimensional aids, and concluded that 3-D materials should be used where the task to be learned is essentially three-dimensional in nature. This conclusion was substantiated by Vergis' (431) findings with 3-D slides and Cogswell's (83) results from teaching the assembly of the breech block of an anti-aircraft gun by using stereoscopic motion pictures.

Swanson, (393) on behalf of the U.S. Air Force, reported a study that found no appreciable differences in the training effectiveness of mock-ups, cutaways, animated panels, charts,
and symbolic diagrams in teaching skilled Air Force personnel. When teaching inexperienced mechanics, he found a requirement for at least moderately realistic representations of equipment to be provided in teaching recognition of equipment components, that color-coding be used where appropriate, and that more than one type of visual aid be used in order to capitalize on the unique instructional advantages of various training-aid characteristics.

(2) Demonstrations

(a) Method or process demonstrations

This type of demonstration shows an assembled group how to carry out a given practice.

(b) Result demonstration

This type of demonstration shows the result of a recommended practice in comparison with a former practice, under actual existing conditions. The result demonstration has been found to be an effective teaching device in adult education. Gilbertson and Gallup (160) report that result demonstrations stimulate more interest than illustrated pages or talks and increase the confidence of farmers and homemakers in the recommendations of their extension agents and specialists. They also help discover and develop local leaders, provide a record of outstanding results that can be used as a tangible basis for calculating benefits of extension work to farmers and homemakers, and convince persons who have more confidence in the
experiences of their neighbors and in demonstrated results than in reports of research. Although the above advantages are well established there are some significant disadvantages also recorded by Gilbertson and Gallup. These were rated as follows. The demonstrations require much time in planning, establishing and supervising. Also the direct cost per practice changed is high because few people actually see the result demonstrations. Moreover, few people see the field demonstrations or pictures of the stage when the results are most convincing. Again, it is difficult to find people to keep the necessary records for some projects and practices, and it is difficult to develop specific proof of the advantages of some specific practice - e.g. using a better diet. Wilson and Gallup's (459) findings generally agreed with Gilbertson and Gallup's in that they reported 6.4% of new practice adoptions could be credited to result demonstration. Blackmore, Dimit and Baum (39) found that the newer ideas of agriculture could best be brought to the attention of farmers by the way of test-demonstration farms. However, those closest to the demonstration adopted more new practices. The average number of adoptions increased from one to two miles, remained constant from two to five miles, and decreased beyond that distance.

(c) Shop Demonstration

In the shop demonstration the teacher shows how best to do things, the most efficient way so that good habits of execution with tools, materials and machines will be formed along with the right attitude.
Ericson (134) stated that, "From the time that instruction in the manual arts was introduced as a school subject, the demonstration has stood out as the most definite and valuable means of instruction". He added that the shop demonstration as performed by the skillful teacher is unfailing in developing and maintaining interest among students for the following reasons: -

(1) There is an appeal to the sense of vision.
(2) Skillful performance in hand manipulations always attracts attention.
(3) Students see immediate progress as a result of their effort.
(4) A desire is aroused to emulate the work of the teacher.

In the "Handbook for Special Teachers of Food Production: War Training Classes" (183), it is stated that the perfect demonstration involves telling, showing, questioning, illustrating, slowly and clearly; one step at a time, and no more than your students can master. It not only teaches, but sets standards of performance (speed and excellence) for students to attain. In teaching groups where students "learn by doing" the cardinal rule is to instruct or demonstrate at the moment when the students need the particular skills and information involved.

It was reported in "A Study in Adult Homemaking Education in Pennsylvania" (391) that most teachers used a combination of teaching methods in the conduct of the 33 adult
classes. The use of the demonstration accompanied by class discussion was employed by 62.5% of the teachers, while demonstration supplemented by laboratory work was used by 16.2%. The problem method, accompanied by demonstration and discussion was used by 16.2% and the problem method alone by 4.1%.

(6) Museum material:—

"Museum" materials, which includes models, mockups, dioramas and specimens, have all to some extent been successfully used as teaching devices and were reported on as such by Biesel (36) and the U.S. Office of Education (420).

(7) Field Trips:—

Field trips or planned visits to points outside the regular classroom are, understandably, not generally used in adult education although Bigman (37) reported that institutions such as art galleries provide a continuing and effective opportunity for adult education albeit unstructured, and are used to good advantage by many professional people, white collar workers and students. Cass (79) observed that field trips were very effective discussion starters and provided excellent motivation for further study.

(8) Role Playing: —

As Brunner (60) reports, role-playing is a relatively new teaching device in adult education and one for which there is considerable enthusiasm. The most thorough study of the effectiveness of role-playing as a teaching device was conducted by Zander (464) on behalf of the Armed Services, and his
findings based on a leader training program involving 8,000 men places some doubt on the validity of enthusiasm for role-playing. Zander showed that role-playing does not involve rigid persons sufficiently to allow them to participate unless much time is used and more than two experiences are provided. He also reported that role-playing always failed when the nature of the class session tended toward neutrality with respect to the issues under discussion. For a successful learning experience the feelings of the group had to be worked up sufficiently to spark a discussion. On the other hand, Wilson's (457) research in which the role-playing demonstrated the arguments used with respect to the issues discussed stimulated the interest of the participants and increased their sympathy for other viewpoints. Janis and King (226) reported that the factors in role-playing found most significant for opinion change were "amount of improvisation" and "degree of satisfaction with own performance". Janis and King also found that overt verbalization induced by role-playing tended to augment the effectiveness of a persuasive communication. Brunner (60) concludes by remarking that more research is needed to determine what types of people, kinds of topics, purposes and situations lend themselves to its effective use, and to determine more precisely just what are the significant or effective factors in role-playing.
(9) Exhibits:

Perhaps a few words differentiating exhibits and museums would be in order here. By "exhibit" we will mean a careful arrangement of materials, usually three-dimensional, designed to inform the observers about a subject of educational significance. A museum, on the other hand, should consist of objects that are available for the students to touch, feel, lift, and study in order to increase learning and make it more permanent. Derryberry in reporting on the effectiveness of health exhibits at the New York World's Fair (1939) and San Francisco World's Fair (1940) made some significant observations viz. - Panels of statistical data, graphs, and tables usually fail to attract attention or get the message across. Also panels that presented a single statistical fact were most likely to be understood though not remembered. Although statistical facts are often effective motivating influences, common professional words may be misleading to the public; e.g. therapeutic, nephritis. Even expertly designed exhibits may impart misinformation. Tests were discovered to be a good educational device to accompany the exhibits; e.g. 35,000 people at the New York fair and 70,000 people at the San Francisco fair took a short test at the exhibits and demanded the correct answers.

An exhibit of white rats was placed in each school in Winston County, Mississippi and also in a public store window in Louisville. The exhibit was designed to show the advantages,
emphasize the acceptance and use of better nutritional habits for humans. Garland (155) reported this research and noted of 204 persons interviewed, one half the women and almost one half the men had heard of the exhibit. Thirty percent of the women and twenty-five percent of the men knew why the experiment had been conducted. Eighteen percent of the women and nine percent of the men who had heard of the experiment said they had made some changes in food habits as a result. More than twenty-five percent of the mothers with school children reported changes in the children's food habits as a result of the exhibit. The greatest number of changes was reported by persons in the higher educational groups.

Elliott (132) found that the effectiveness of an exhibit was increased about twenty-seven percent when it was reinforced with a visual medium such as advertising, and sixty percent when it was reinforced with auditory advertising such as radio, and a sixty-seven percent increase when the exhibit was reinforced with a combination of visual-auditory media such as poster and radio advertising.

Raudabaugh and Cooke (339) made a study of the effectiveness of an exhibit and reported that of the 228 families interviewed ninety-four percent planned to adopt some of the recommended practices, and of the 80,000 people who attended the exhibit throughout 30 counties of Iowa, eighty percent adopted an average of three new practices per family.
There is little doubt regarding the effectiveness and popularity of exhibits as teaching devices. Schlup (358) makes a review of some of the exhibits that have not been reported for research purposes and notes the following interesting facts. A farm and home labor-saving exhibit in Wisconsin had 60,000 visitors in 1945 and more than 7,000 signed requests for plans and blueprints of the shown devices. A rural progress exhibit toured Michigan in January, February and March of 1946 and 1947 and received 150,000 visitors in the 114 day showings. No bulletins were given away here, but blanks were provided for ordering them, and an average of one bulletin per visitor was ordered. In Indiana an exhibit train made fifty-six stops in fifty-two counties and had 66,415 visitors. In Minnesota 153,000 people visited a farm labor saving and safety exhibit in forty-four county showings, and requests were made for 41,000 bulletins, pamphlets and plans. In Montana 35,594 people visited a labor-saving exhibit in forty-two counties and requested 1,679 blueprints of kitchen plans. During 1947 in South Carolina 73,000 people visited a farm and home labor-saving exhibit in forty-three counties. In Tennessee in 1947, 25,000 people visited a rural progress labor-saving exhibit during twenty-five one day stops. A labor-saving exhibit in Virginia was visited by 29,000 people in thirty-nine counties, and 52,773 people visited a special 4 H Club exhibit train in Mississippi in 1947 when it made fifty-eight stops. In April, 1946, a farm and home devices exhibit train toured New York
State, making about forty stops, and was visited by about 65,000 people.
A. **Illustrative Devices**

2. **Visual**

   b. **Two Dimensional, Non Projected**

Circular letters, bulletins, pamphlets, leaflets and news stories, although visual, two dimensional and non projected, will not be considered here but later, along with "Diffusion, Distributed" devices.

Findings of research based on the effectiveness of direct mail or requested mailing list, printed material have also been included, along with the bulk of the research dealing with printed material, in the treatment of Diffusion devices. It is realized, however, that these are, in effect, very similar to "handouts" and could have been considered under this category.

Clinton (82) observed that although the printed page does not possess the warmth and impact of the human voice, as do radio, films and TV, it does have lack of movement, which he considers its principle asset. The printed pictures and printed words can be studied, discussed, cut out, filed, passed around or read at a more convenient time. It is selective of its audience and demands an active mind.

(5) **Correspondence Courses**

As outlined by the United States Bureau of Education (418) in 1920, the distinguishing characteristic of correspondence courses is the method of study: constant, written efforts by the student and correction by the teacher, and not postal transmission alone.
Bittner (38) points out in "Adult Education in Action" that there is a tendency away from the elaborate syllabic and special textbooks and toward simpler outlines and texts used in universities. Also there is a tendency to adjust instruction more closely to the needs of each student. In general, correspondence instruction has freshness and vitality. Bittner gives some interesting figures regarding correspondence courses that tend to refute the supposition that their mortality rate is high. If you eliminate those who only send in one report and those who only register and all the other really non-starters, the percentage of students who once started go ahead and complete the course averages, among several tabulations, at about 68%.

Hughes' (214) study revealed that there was a strong relationship between course completion and having to meet a deadline: for example -

(1) 75% of those reporting that they had to meet a deadline were successful.

(2) 56.6% of the group who did not have to meet a deadline were successful.

(3) 80% of those who enrolled from one to six months ahead of the deadline were successful, whereas only 64.3% of those who had more than a year to meet their deadline were successful. (214)

Also he found that the purpose for which the student enrolled had a marked effect on his prospects of successful completion.
It has been discovered that this will range all the way from 79.5% successful for Teacher Certification to 55.1% successful for Professional - vocational improvement. Again, Hughes reported that a definite relationship exists between the amount of college work a student has had and the probability of his successful completion: for example - in the group indicating some college credit but no degree, 65.8% were successful, whereas 76.1% of the degree holders were successful. He also reported that 59% of the group with no prior correspondence study was successful, whereas 78% of those with prior experience were successful. In brief, Hughes research indicated that good work and study habits were the most important factors in the successful completion of correspondence courses.

Smith (374), some years earlier had reported much the same information as Hughes, but in a more general way, when he stated that the evidence indicated those adults with higher educational training carry through their courses more frequently than do those with less formal schooling. And, even more broadly, that there is a positive relationship on one hand, to the educational interest and capacity of the student and, on the other, to the purpose which the student has in his study to the completion of the courses taken.

A review of the research completed by Larson (257) and of that reported by Bittner (38) and Hosmer (208) shows that correspondence courses and residence study are fairly equal in effectiveness, as measured in grades obtained. Certainly there
is nothing to indicate any consistent appreciable difference in standards between the two methods. There are some indications of superiority for the correspondence courses but these are probably attributable to the characteristics of the student that enabled him to become a successful correspondence course student.

Between 1942 and 1959 the United States Armed Forces Institute had enrolled 4,506,000 correspondence course students, and 466,000 in 1958 alone.

Bradt (45), working on behalf of the U.S. Armed Forces, studied the reasons for "drop-outs" from these USAFI courses, and his report of August, 1954 showed that there were three main reasons for enrollment: general interest, school-related reasons and career-related reasons. More than half of the enrollees indicated no interest in obtaining credit for the courses. He showed that correspondence and self-teaching courses are made more effective by student counselling and with a more realistic gearing of the student's course program to his needs, abilities, and available time.

Di Vesta (120) reported some interesting research in 1954, in which three styles of presentation of a correspondence course were studied for their relative effectiveness, as measured by an achievement examination. The three styles were not found to be different in their effectiveness, nor did they seem to affect the retention of the achievement level. Also his findings regarding the writing of examinations are
noteworthy, as follows. Students who wrote an "open book" examination had higher final and retention examination (30 days later) scores than did those students who wrote the "closed book" examination. Although the "open book" students took significant losses over the 30 day period, their retention score was still higher than the "closed book" students, who almost maintained their original achievement level.

(6) Study Guides

Tucker (412) made a study to determine how useful the study guides were to the United States Armed Forces Institute (USAFI) correspondence courses, and reported as follows:

(1) 75% of the enrollees believed that study guides were useful and increased their interest in continuing the course.

(2) 14% felt that the style was too terse, too brief.

(3) About 1/3 of the students wanted more explanation and clarification of specific points.

(4) The motivational effect of a study guide was greater for those with less education.

(5) Regarding an "Introduction" that provided general orientation to the course by supplying background information, about 40% rated it very useful, 50% fairly useful, and 6% considered it not useful. There was a definite tendency for students with less education to place a higher value on the Introduction.
(6) About 2/3 of the enrollees rated Study Notes as very useful, and most of the rest rated them as fairly useful. There was some tendency for those with less education to rate the value of Study Notes higher.

(7) There was general agreement that the Study Guide provided helped the students prepare for the end-of-the-course test. About $\frac{1}{2}$ reported that it helped a lot, and 45% that it helped somewhat. (412)

Course Outlines

Bradt's (44) publication regarding the use and effectiveness of USAFI Instructors' Course Outlines stated that those who have used them wish to have them continued. The most frequent criticism concerns the time table, since the actual number of class hours is often much less than that for which the outlines were designed. They are felt to be of primary benefit to inexperienced teachers, and many instructors wish to see more teaching aids and suggestions included in them.

(8) The Poster

The poster is designed to tell its story at a glance, and it may use pictures, cartoons, graphs, diagrams or maps. The U.S. Office of Facts and Figures Graphics Division in 1942 (320) reported that war posters that make a purely emotional appeal are by far the best. No matter how beautiful the artwork, how striking the colours, how clever the idea, unless the war poster appeals to a basic human emotion in both picture and text, it is not likely to make a deep impression. War posters
that are symbolic do not attract a great deal of attention and fail to arouse enthusiasm. Often they are misunderstood. A poster should be a picture - a true and literal representation in photographic detail of people and objects as they are, (though not necessarily a photograph), and as they look to the millions of average people who make up the population of the country. These findings, though based on "war" posters certainly have broader and more general application.

(10) Pictures

There is little research available on the effectiveness of pictorial illustrations or "flat" pictures as a teaching device. However, several reviews of the research have been prepared by Dale and others (108), (109), Ibison (220) (non-adult), Spaulding (378) and the University of Illinois Division of Communications (421).

From a careful review of the research and an experiment with newly literate adults in Latin America, Spaulding (377) stated that an illustration should be presented in terms of the past experience of the intended audience; it should be kept simple, it should be in color, and captions should be used to generalize, modify, relate, and extend the meaning of the illustration.

As part of this section, visual two dimensional non-projected aids, the research pertaining to the legibility of type forms has been reviewed and some of it presented here for guidance with reference to the effectiveness of teaching devices.
Tinker and Paterson (407) in 1946, and earlier, Tinker (404) reported that letters and words in capitals are read at greater distances than those in corresponding lower case. However, Breland and Breland (48) found that under normal reading conditions, printed material in lower case is more legible than material in capitals. Also Tinker and Paterson (405) found that under reading conditions lower case print is read much faster than print in capitals and slightly faster than material in italics. Tinker (404) also noted that the differences in distance for reading words and unrelated letters in lower case are greater than in the case of capitals. Tinker and Paterson (406) in another study reported that readers generally prefer type arrangements with moderate variations in the type forms used.

Photographs and pictures have many uses, as Schlup (358) reports; they can be used to attract attention, arouse interest, motivate, develop attitudes, develop appreciation, introduce new subjects, and explain and illustrate specific steps in doing a job. They can tell a graphic story when used with circulars and bulletins, press articles and reports. They lighten the text, and when well composed form a valuable supplement to the written word.

Buswell (63) studied the nature of eye movements of 200 individuals as they looked at 55 pictures of various types and reported that the directions given prior to looking at a picture have a marked influence upon the character of perception.
Brandt (46) contributed the further information that the initial fixations of the eyes tended to fall to the left and above the center of the picture, indicating that content of an illustration should be organized so as not to oppose eye-movement tendencies, but rather to place the most significant portions of an illustration in the center or upper left of the picture. Gallup (154) noted the following: - people will not take time or trouble to figure out a picture, therefore it should be taken in at a glance. Modern art, symbols or sketches are not as easily understood as actual pictures. Photographs, or art, photographic in detail, will stop twice as many people as an advertisement without photographs or such art. Pictures relevant to the story are more effective than those which are not. Photographs that picture people in a situation, especially in action, are better than people depicted "alone" or "still". Real or actual backgrounds add materially to interest. Pictures that show people expressing some observable emotion such as a woman waving and smiling, are better than "dead pan" pictures. And lastly, identification is important: - if you want to stop the maximum number of women of 35 years of age, use pictures of women of about the same age.

(12) Graphics

Since the early studies on the most effective forms of graphic presentation were completed (102), (103), (104), (130), (429), and (446), very little pertinent research applicable to adult education has been reported.
Speaking generally, Schlup (358) mentions that Extension Service makes wide use of charts and graphs, chiefly to analyse a problem or situation and to clarify and give emphasis to oral presentations. They help to focus the audience’s attention and are a great value in helping a person to present material in an orderly and logical way. He points out that the best charts are sufficiently large to be easily read by everybody in the room and emphasize a single idea. They should be simple in design and contain a limited amount of information. He states that graphs are effective for making comparisons, for contrasts or for presenting complicated facts. A good graph requires little explanation and tells its story quickly.

Washburne’s (446) research showed that:

1. Simple visual patterns with few data tend to produce more specific recall. More general recall results from presenting more data in more complex visual patterns.

2. Bar graphs are best for complex or slightly complex static comparisons.

3. Pictographs are best for simple comparisons.

4. Line graphs are best for dynamic comparisons.

5. Statistical tables are best for specific comparisons.

6. Round numbers, and not too many of them, are best for conveying specific amounts. (446)
About 27 years later Peterson and Schramm (329) concluded some research which indicated that:

(1) Accuracy of estimate drops with an increase in the number of dimensions in the graphic form, i.e., area forms such as bar graphs are read more accurately than volume forms such as the cylinder.

(2) Accuracy of estimate drops with an increase in the number of elements included in a single presentation.

(3) Accuracy in reading graphs is related to age, education and training or experience in the use of graphs.

(4) In estimating parts of a whole, the largest part tends to be underestimated while the middle-sized parts tend to be overestimated.

(5) A circular graph is a superior way of illustrating parts of a whole. Eels (130) made a particular study of the circular graph and his findings agreed with those of Peterson and Schramm (329).

Agrisearch of November 1955 (9) reviews the research pertaining to graphs and summarized the findings as follows:

(1) Accuracy of estimates drops with an increase in the number of dimensions in the graphic form, i.e., area forms such as the bar graph are read more accurately than volume forms such as the cylinder.

(2) Accuracy of estimates drops with an increase in the number of elements included in a single presentation.

(3) Accuracy in reading graphs is related to age, education and training or experience in the use of graphs.
(4) Simple visual patterns with few data tend to produce more specific recall.

(5) A circle graph is a superior way of illustrating parts of a whole.

(6) In estimating parts of a whole, the largest part tends to be underestimated while the middle-sized parts tend to be overestimated. (9)

The article reports that studies show the simpler the visual pattern, the more specific the recall, and more general recall results from a complex visual pattern and numerous data. Both logical and visual factors in the grouping of quantitative material affect recall. Logical factors, - the organization of data, seem to have their greatest effect on the recall of relative amounts; visual factors, - the graphic forms and designs, seem to affect the recall of specific amounts.

A chart is also presented which shows what type of graph is best suited for several different situations or requirements. It is an attempt to bring together the opinion of researchers in graphic representation, and is reproduced here for convenience. (p. 62)
TABLE I

Chart Presentation of Recommended Graph Forms

<table>
<thead>
<tr>
<th>To Show</th>
<th>Single bar</th>
<th>Multiple bar</th>
<th>Circle or Pie</th>
<th>Line Graph</th>
<th>Cosmograph</th>
<th>Pictograph</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole and its parts</td>
<td>✓</td>
<td>X</td>
<td>✓</td>
<td>X</td>
<td>✓</td>
<td>?</td>
</tr>
<tr>
<td>Simple comparisons</td>
<td>?</td>
<td>✓</td>
<td>✓</td>
<td>?</td>
<td>?</td>
<td>✓</td>
</tr>
<tr>
<td>Multiple comparisons</td>
<td>X</td>
<td>✓</td>
<td>X</td>
<td>?</td>
<td>X</td>
<td>?</td>
</tr>
<tr>
<td>Trends</td>
<td>X</td>
<td>✓</td>
<td>X</td>
<td>✓</td>
<td>X</td>
<td>?</td>
</tr>
<tr>
<td>Frequencies</td>
<td>X</td>
<td>✓</td>
<td>X</td>
<td>✓</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Key: ✓ = recommended  ? = possible  X = not recommended
Peterson (328) made a study of the use of graphs as teaching material in the U.S. Air Force, and reported the following:

(1) The title should be made complete and useful, it should tell what, where, by whom, etc.
(2) If the graph cannot be labelled, supply a good key and place it at or near the top of the graph.
(3) Make any labels used easy to read.
(4) Do not run grid lines into labels.
(5) Place a label on the part it names, and if this is not possible, use an arrow.
(6) The type size of a label should never fall below 8 point.
(7) The placement and direction of scales follow directly from mathematics usage. Positive
    Negative \[ \rightarrow \] Positive
    Negative
(8) Begin all scales at zero.
(9) If range of scale is too long, break it.
(10) If some data, say for a month or a year, are missing, leave a space and explain in a footnote.
(11) A graph with only a few bars should be horizontal - if it has many bars, it should be vertical.
(12) If there are only a few bars the space between them should be the size of the bar.
(13) If there are many bars the space between them can be slightly less than the width of a bar.

(14) If bars need not be arranged in a time or other fixed sequence, arrange them in either ascending or descending order.

(15) Be logical, run altitude lines vertically and distance lines horizontally.

(16) Data lines must be heaviest, base lines next heaviest, and grid lines the lightest.

(17) In pictographs the picture must be easily identified.

(18) The pictograph symbol should be capable of enlargement or reduction without distortion.

(19) If different symbols are used, be sure the difference is obvious and clear.

(20) Indicate quantities by numbers, not size of symbol.

(21) Explain the amount a symbol represents.

(22) Avoid fractions with pictographs.

(23) Pictographs should only be used when exact numbers are not important. (328)

It should be noted that Vernon (435) made a comprehensive review of research on graphic presentation in England in 1952, and pointed out four conditions under which graphic and pictorial aids are effective. These he listed as follows: -
(1) Readers require special training to enable them to understand most graphic materials properly.

(2) Diagrams do not always insure better understanding or retention than do tables of figures.

(3) Different sorts of data and relationships may require different kinds of figures.

(4) Pictorial and graphic presentation is usually understood better when supplemented with verbal explanation. These generalizations have been substantiated by the research. (435)

Saul and others (355) on behalf of the U.S. Navy, made an extensive review of the literature pertinent to the design and use of effective graphic training aids. They reviewed 240 references and found that many of the reports were contradictory and inconsistent. There was general agreement on points such as:

(1) Photographs should have a clear-cut center of interest, possess clarity, sharpness and strong contrast and be free from false impressions.

(2) Cross-sectional designs are difficult to read.

(3) Too many colors detract, but colors properly used can feature or emphasize particular objects.

(4) Graphic aids, as most other aids, need an explanatory introduction.
(5) Captions must be properly placed, printed in large enough letters and serve a teaching function.

(6) Pictorial graphs are more easily understood than the conventional line or bar type. Pie graphs are not recommended.

(7) Graphs help intelligent people understand the written text; however, the less intelligent are not helped by them.

(8) Layout is important to graphic aids. Good graphics should possess balance, unity, harmony, emphasis, rhythm, proper lettering and proper color.

There was general agreement also on the fact that the effectiveness of graphic aids depends on the instructor, - the selection should be proper, the group prepared, the use of the aid in the teaching location be tried and the use of the aid be previewed.

(13) Comic Strips

The United States Armed Forces Information and Education Office (20) made two studies to evaluate the effectiveness of comic books as a teaching device and from the first study reported there was no evidence that the men who received instruction in "Military Courtesy" by lecture and comic book learned better than the men who received instruction by lecture and a field manual, or by only a lecture. However the second study of this series a year later in which copies of the comic
book were left in the lounge showed some different findings. Although few men picked up the comic books, there were statistically significant gains in knowledge by both fast and slow learners when they read the book. It was noted that of all those who read the comic book it was only the better educated men who retained more.

(15) Technamation Displays

Technamation displays are devices that use a method of applying transparent plastics to still pictures so that they appear to move when ordinary light, projected through a revolving disc of polarized plastic, is thrown on them. Motion can be controlled so accurately that a technamated cutaway drawing of a jet engine shows the fuel flowing in and burning, the turbines and gears turning and gases rushing out the rear, all in the exact timing of a real engine. The U.S. Government is using a technamation device to teach employees the working of the underground silos and fuel system for the Titan missile. The factors that determine the effectiveness of a technamation device would seem to be its suitability in situations where items such as safety, security and cost have to be considered in relation to whether or not it is the best possible device to either assist the presentation and teaching of informational knowledge, or where performance must be measured and or improved. A review of recent developments in technamation displays was reported by Time Magazine in April 1961 (403).
Electronic Education

A new and very interesting teaching device is described by Trotter (410) in an article entitled "Electronic Education", published in the daily newspaper, the Vancouver Sun, on 17 October, 1964. It is mentioned here as it would appear to have tremendous potential use in adult education. Dr. Trotter, chairman of the board of General Telephone and Electronics Laboratories Ltd., explains that one excellent teacher can now instruct an entire county, state or province through two-way telephone circuits, for as the teacher writes notes and draws diagrams these are transferred to a type of blackboard by telephone; and the circuits are much less costly than closed circuit television systems.
A. Illustrative Devices

2. Visual

c. Two dimensional, - Projected

(1) Opaque and transparent or overhead projections

No research was found that dealt with the effectiveness of opaque and overhead projections as teaching devices in adult education. However it can be seen that the opaque projection is, for the most part, in effect, just an extended use of graphics, posters etc.; and transparent or overhead projections, although more easily used and capable of wider application and greater flexibility, have much the same results as the filmstrip and slide projections, - and these two are examined at some length a little further on in this paper.

This tremendous advantage of wide application and flexibility is illustrated vividly in an article written by Brann (47) that appeared in the National Observer on 23 November, 1964, entitled "Pitt's Amazing Professor Peterson Teaches English With A Projector".

(2) Film

As Clinton (82) pointed out, films started with pictures then added words - whereas the "press" started with words, then added pictures.

Film makes an immediate mass appeal. Plato nicely stated the case when he said, "The imitation of life holds the widest appeal to children and to the attendants of children and to the vulgar mass". Carpenter and Greenhill (73) explain it by
saying the showing of human relationships invites suspension of self and identification with others. This then brings into play submerged impulses which are repressed under tension. The learning situation as represented by the film, can be strengthened with words, but it really does not need them as its appeal antidates speech.

Until fairly recently most of the research carried out in the field of teaching devices was done with reference to educational motion pictures. A thorough research on film was published by Hoban and VanOrmer (204) in 1950. Other reviews of research on the use of film as a teaching device were noted previously as follows, Allen (14), Dale (109), Dale (108), McClusky (279), and Stenius (385).

Most of the early research carried out on the effectiveness of film as a teaching device was based on work with school students, - see Arnspiger (24), Consitt (87), Holaday and Stoddard (181), Knowlton and Titon (249), Merchant (286), Watkins (447), Weber (449), and Wise (461). However this work did show that films can teach factual information effectively over a wide range of subject matter content, ages, abilities and conditions of use. Hovland and others (210) in working with about 2000 soldiers in 1949 proved that films are quite successful in imparting factual information to adults, although not an effective device for influencing motivations or modifying basic attitudes.
VanderMeer (427) completed a study on the relative effectiveness of instruction by (1) films exclusively, (2) films plus study guides and (3) standard lecture method and found that for all practical purposes the three methods were of almost equal effectiveness.

Film has been a particularly effective device for the teaching of perceptual motor skills. Research by McClusky and McClusky (281), Brown and Messersmith (56), Lockhart (264), and Priebe and Burton (334) all proved that the instruction of a motor skill by film was as effective as by conventional methods.

VanderMeer (424) reported on the results of training lathe operators by means of eight U.S. Office of Education films and stated that the use of films cut the working time, resulted in a reduction of the trial-and error learning time, and produced more factual information on machine operation. He concluded that films are probably more effective in teaching the more complex skills than teaching the simple ones. About seven years later VanderMeer and Cogswell (428) reported on the effectiveness of using film to train servicemen in the use and maintenance of the 16 mm sound projector. They stated that the attempt was very successful and that attitudes were influenced in favour of film objectives, and the trainees were favourably disposed toward the film approach to learning. Also it was found that two film showings were better than one.

Hoban (201) reported a study by Beck and Lumsdaine which compared the teaching of the assembly and disassembly of
a portable radar station with a film and with a competent instructor using a scale model. Although the two groups required about the same length of time to perform the operations when tested, the investigators concluded that the film instruction increased teamwork and efficiency. In this same publication Hoban reported on the comparative teaching effectiveness of the slide film and the motion picture and said that the motion picture appeared to be slightly superior in teaching although there was little difference between the two media as measured by the tests.

Roshal (352) investigated the hypothesis that the effectiveness of a training film designed to teach a skill is increased as the film approaches realism and reported that the film will be more effective in teaching a skill if the task (in this case knot tying) is portrayed from the viewing angle of the learner as he will perform the act. Also he proved that a film which shows the motions involved in a perceptual-motor task requiring continuous motion is more effective than a series of static pictures.

Jaspen (227), (228) made two studies of the effects on training men by using experimental film variables. In study one, he used seventeen different versions of a training film and in study two, fourteen different versions. The results can be listed as follows:

(1) Repetition of the demonstration of a task will add to effectiveness of a given film.
(2) It is possible to have too many or too few words in the narration. Medium verbalization, about 100 words per minute, was found most effective.

(3) Showing common errors to be avoided increases the instruction effectiveness of a film.

(4) The use of technical nomenclature does not appear to facilitate the learning of an assembly process.

(5) The inclusion of "How-it-works" sequence did not contribute to learning.

(6) Having the audience perform the task as it is shown on the screen is an effective procedure if the rate of development is slow enough to permit the learner to view the film and perform the task without too much loss of attention to either.

(7) Rapid compact treatment (succinct treatment) is ineffective. The rate of development must be coordinated with the trainees rate of learning.

Ash and Jaspen (27) again proved that second and third repetitions of a film demonstrating a skill was very effective in terms of trainees performance and speed of skill after seeing the film. Harby (184) and Murnin and others (304) used the daylight projection of repetitive film loops in the teaching of athletic skills. They found that a repeated motion-picture demonstration was at least as effective as a live instructor's demonstration but that live instruction was superior when
individual coaching was added. Hirsch's (197) work emphasized these results when he showed that repetitive film loops taught rifle marksmanship skills to Army Trainees as well as did the usual lecture-demonstration-application method. Duvall (124) compared the effectiveness of instructing Servicemen in technical training courses by sound motion pictures and by slides plus tapes and by conventional face-to-face instruction. He reported that there was an insignificant difference between trainee's scores on all three methods. Brody's (53) work in 1960 showed that relatively complex and complete perceptual motor skills can be taught by film without the aid of any other instruction. This would not preclude the necessity of practice on operational equipment e.g. motor car for driving skills, but the practice time on the equipment can be reduced.

Zuckerman (466) studied the effects of commentary variations in instructional films on perceptual-motor tasks. He reported that a medium level of verbalization (89 - 125 words per minute) was best and that the use of the second person pronoun and the imperative mood were most effective. The third person passive e.g., "a loop is formed", was least effective. The most effective phase relationship was where sound led the picture. Cogswell (83) found that a three-dimensional film on the assembly of the breech block of a 40 mm anti-aircraft gun was no more effective in teaching the assembly skill than a two-dimensional film. It can be recommended then that the average factual or motor-skill training film need not be
stereoscopic as the added expense of the technique is not justified by any increment in learning. It would seem that monocular cues for depth perception are sufficient for learning this kind of task effectively. It is possible that three-dimensional films are valuable in training situations where judgement of depth is an essential cue to learning.

Wiese (453) reported that films taught adult illiterates with much less supplementary help than conventional methods required and Pell (326) records the successful use of films in Workers education.

An unfounded criticism of instructional films is that learning from them is "passive" and interferes with thinking and the development of concepts and inferences. There is some evidence to the contrary. Vernon's (436) study of the effectiveness of a sound film and silent filmstrip in teaching British seamen trainees to take soundings showed that the film and filmstrip produced a greater gain in the "comprehension" scores than in the "memory for detail" scores. There is some indication that films are, to some extent, passively viewed as Sillars (368) writes that when used as an adult education medium, motion picture impressions should not be passively received . . . but should be assimilated critically . . . by purposeful and intelligently guided discussion.

Brooker (54) made a survey of 500 businesses and industries on their use of training films and reported the following interesting results.
(1) Films speeded up training without any loss in effectiveness. 
(2) Films made classwork more interesting and resulted in less 
absenteeism. (3) Films made on the university and college level 
were used successfully on lower grade levels. (4) Films are 
not good in and of themselves. They are good only if well made 
and well used. Over-optimism is cautioned against. (5) There 
was evidence that film viewers thought they knew more than they 
did and on the other hand they had learned some things on a 
nonverbal level they could not express. (54) 

Hague (180) reported some equally interesting facts as 
the result of a survey made of 112 Department stores and 15 
Specialty stores plus 44 interviews with training directors of 
these stores. His findings are as follows. Motion pictures 
are of proven value in retail training, -
(1) To arouse emotions, such as feelings of loyalty to the 
store, or pride in a job. (2) To influence employee attitude 
for example, to courteous treatment of customers. (3) To 
provide basic background information, such as the character­ 
istics of merchandise, how it should be used, handled and 
cared for, its construction features and other selling points. 
(4) For job instruction in both selling and non-selling 
categories. (5) Motion pictures are authoritative. They can 
teach people who would not respond to an instructor e.g. 
experienced salespeople resent attempts to give them additional 
training but more readily accept training from a film. 
Business Screen (62) also records an effective use of films
for an industrial in-service training program. Haas (178) writes that the director of retail training for Montgomery Ward & Co. states that when training films are used (1) Employees learn 35% more. (2) Employees remember 35% longer. (3) Films give employees confidence in their ability to work successfully and thus build morale. (4) In any organization everyone must "see alike" and "do alike" in the maintenance of standards and only film can make training uniform. (5) Films make it possible to meet working and training standards in less time thus saving time and money.

Haas also states that B.A. Augenbaugh found that the ratio of retention has been as high as 9 to 1 for the film group over the word group when description, narration, exposition or argumentation are presented as the subject matter. One test employed text book study versus pictures of the same subject and it was found that where it usually required 10 days to cover the work using the text book the same subject could be "covered" by film in 15 minutes and the trainees learned more and retained it longer. Haas adds one principle to those already noted for effective film teaching, - it must be personal- ized. His other points have been brought out, directly or indirectly, in other research findings and surveys but can be stated again: - Film training (1) Must be simple. (2) Must be practical. (3) Must be educational. (4) Must be interesting. (5) Must fit the business operation. (6) must have management support. (7) Must be effective.
Long (265) summarizes eleven studies in reporting that the use of film as compared to the lecture method of instruction shows: - (1) The superiority of film in acquisition and retention, (2) The superiority of the film is further evidenced when as much as 3 to 4 months have elapsed between the initial learning and the final test. (3) In acquisition and retention the color film is as superior to black and white film as black and white film is to the lecture method of instruction.

Vandemeer's (426) findings did not entirely agree with Long's. In comparing the relative effectiveness of black and white film with colour film he showed each version of a film to 250 trainees and tested for results. He reported that there was no difference in the amount of learning but that retention was greater from colour film. Although colour film is liked better the subject matter content was much more important in determining whether or not the film was "liked", than if it was black and white or coloured. He also noted that the teaching effectiveness of a film is positively related to how well it is liked by the viewers but concluded that there was not enough difference in effectiveness to justify the increased cost of color.

The effectiveness of repetitive showings of instructional film has been studied and reported on by several researchers, already noted as follows - VanderMeer and Cogswell (428), Jaspen (228), and Ash and Jaspen (27). McTavish (284) states that the first repetition resulted in substantial increments in learning and three showings failed to add
materially or significantly to the learning effected by two showings. Four showings resulted in an even smaller increment, or in two cases a slight decrement over three showings. Carpenter's (71) findings do not entirely agree with those of McTavish (284). He reported that the second showing increased learning 35% over the first showing and the third showing caused an increase of 7.4% over the second showing. The fourth showing resulted in an increase of 1.1% over the 3rd showing. To add to the considerations, Nelson and VanderMeer (312) found that for an assembly task, increased learning through as many as six repetitions has been observed and that the limit of repetitions as an effective teaching device is not known. Hirsch (196) reports that a second showing of an instructional film will reassure the trainees, as well as aid retention.

Jackson (223) compared the teaching effectiveness of films and kinescopes and reported that when a kinescope or training film is described as a kinescope, learning increases significantly and that superior learning results occur with kinescope in black and white or in colour. About three years later, in 1955, Hurst (217) did much the same research and reported that the kinescope had lost its novel effect and that trainees learned about the same amount from a film whether they were told it was a kinescope or film.

Greenhill and Tyo (173) reviewed the instructional film production, utilization and research in Great Britain, Canada and Australia and report as follows: - (1) The sequence
of pictures in filmstrips should be absolutely logical and human interest should be introduced whenever possible. (2) A silent motion picture with teacher commentary is most effective. (3) Classes taught by filmstrips obtained better scores than those taught by the usual lecture method. (4) Not only the "regular" classes but those who had seen the film strip obtained higher marks if they had seen the motion picture film. (5) Two classes which had no ordinary (lecture) instruction but which saw the film twice in fifty minutes were about as informed, on a paper test, as those classes which had received three full periods of normal instruction from weak instructors. (6) Either film or film strip can be used profitably and both are worthwhile when time allows. Furthermore they can compensate either for weakness in the instructor or for a rather poor level of intelligence in the class.

Ash and Carlton (26) investigated the value of note-taking during film learning and reported that groups seeing a film without taking notes answered a higher percentage of test questions correctly than did groups whose members took notes. The note-taking seemed to actually interfere with learning. There were four groups considered in this study: - "no film", "film & notes", "film, notes and review" and "film only", and the three using the film were all superior to the "no film" group.

Some interesting facts were produced by Ash (25) as a result of a study he made into the relative effectiveness of
massed versus spaced film presentations. He reported that training sessions using film may last as long as an hour and still result in significant learning and that long massed film sessions had not been shown to be significantly less effective than short spaced sessions. The trainees did not seem to find long film sessions less interesting than short spaced sessions and the learning accomplished seems to be relatively independent of expressed interest.

Brenner, Walter and Kurtz (49), and Kurtz, Walter and Brenner (254) completed studies as to the effects of inserted questions and statements on film learning. These studies concluded that the film repeated or the film with inserted questions or the film with persistent statements were all superior to the original film shown only once. Also that showing the original film twice is also about as effective as inserting questions or reinforcing statements.

VanderMeer (425), reported on the effects of practice in film-viewing as a factor in learning from instructional films. The findings were significant and suggest that efforts directed toward the development of skill in learning from films should meet with impressive results.

Vincent, Ash and Greenhill (438) studied the effect on learning of varying the total amount of factual information presented in a film of given length, and the length of time allotted to conveying a fixed amount of information. They
reported that generally a longer film with a light concentration of facts was the most effective for learning.

Zuckerman (467) investigated the contributions that music made to the effectiveness of instructional films and reported that there was no good evidence of the value of music. Also there was no general agreement about the value of music in expressing certain emotional expressions but that it varied with groups. He cites one research which states music can make the three great contributions of unity, atmosphere and enhancement of dramatic values.

Shettel and others (365) investigated the use of special films as possible substitutes for or supplements to expensive and cumbersome mobile training devices and reported that filmed lectures could be used to supplement, and in some cases replace, the training devices. Also it was shown that filmed lectures could be used as periodic reviews.

Working on behalf of the U.S. Naval Special Devices Centre at the Pennsylvania State College, Mercer (293) investigated the relationship between learning factual material from instructional films and the use of optical effects (fades, wipes and dissolves) in such films, and also the film literacy of such optical effects. He reported that: -

1. The noted optical effects did not aid factual learning.

2. Film viewers attached no specific meaning to specific optical effects.
3. Other cues in the picture and sound track were the deciding factors in interpreting optical effects to indicate transitions.

4. Producers of films were found to be inconsistent in their use of optical effects. (293)

It was recommended in the interests of economy that optical effects in instructional films be eliminated or greatly reduced in number. Transitions should be indicated by titles or statements in the commentary.

Lathrop and Norford (261) examined the possible contributions of film introductions and summaries to learning from instructional films and reported that both contributed little and in fact, an introduction in one case had an adverse effect.

Neu (313) inquired into the effect of attention gaining devices on film-mediated learning and found there was no evidence that relevant attention-gaining devices added to the effectiveness of films and there was evidence that non-relevant attention-gaining devices (e.g. bathing beauty) actually detracted from the teaching effectiveness of the films. There was no significant difference found between effectiveness of sound and visual attention-getting devices. The ability to recall the attention-getting devices was practically independent of learning.

Northrup (319) determined how the content of films could be organized and how the organization affects learning. His results showed that adding organizational material to a
loosely organized film aids instruction, and the men benefitting most from this "organization" were those in the lower half of the class. It was also revealed that too much detailed out-lining for an already well organized film may actually decrease its effectiveness. Kimble and Wulff (241) investigated the effectiveness of audience participation to see whether or not built-in-guides which alerted the viewers to important information would assist learning. They found that the guidance procedure was superior for both the intelligent and less intelligent viewers. Such guidance clues could be incorporated into existing film or could be provided in properly spaced review sessions.

Carpenter, Smith and VanOrmer (74) studied the effects of pointing out possible errors, the rate of development and the use of technical nomenclature, in instructional films. They reported that films including an error sequence produced better learning and that slow development was clearly superior to fast development. The omission of nomenclature seemed to be favourable to learning when the nomenclature itself is not an objective of the instruction.

Stein (384) examined the effect of a pre-film test on learning from an educational sound motion picture and showed that a pre-film test which has identical, ordered items, with complete knowledge of results, immediately followed by a film will result in more learning and retention than when a film alone is shown once, or twice in immediate succession.
Miles and Spain (297) reviewed the research in the use of Audio-visual aids in the Armed Services, in World War II, with the view of its application to general education. Their studies supported the contention that films can and do affect emotional attitudes in the direction predetermined to be desirable and that such attitudes tend to persist for a considerable time. They also showed that films definitely increased factual knowledge and such knowledge remained with the trainees for a considerable period of time. They reported that the Service instructors believed that the use of movies and film strips shortened training time, resulted in greater learning, and stimulated interest and motivation. Their review revealed the comparison of learnings derived from (1) a training film (2) studying from a well-illustrated manual and (3) an organized lecture using 19 lantern slides. Both the superior and inferior sections of the movie group did significantly better than the other two groups, both immediately and when tested again after two months. Also, learning increased when the instructor preceded the film with explanation. Miles and Spain, in the same publication, report a survey of Service instructors' opinions of 159 motion pictures and 45 slide films. Although this is not research, the study made by the Training Aids Division of the Bureau of Naval Personnel in 1945 was sufficiently wide in scope and thorough to warrant consideration. There were 3441 individual ratings of films and 457
ratings of slide films. The more important of the Instructor opinions concerning the general effectiveness of appropriate use of films and slide films can be summarized as follows: -

(1) Navy instructors think training films constitute an effective part of the training program.

(2) Motion pictures are considered more valuable in training than slide films.

(3) Films can be successfully used to present highly technical subjects in a clear and understandable manner.

(4) Navy instructors believe that men learn more, remember longer and show more interest in learning when films are used than when traditional methods are employed.

(5) Films tend to standardize training, shorten training time and make instruction more practical. (297)

Although it is generally agreed that films can modify motivations, interests, attitudes and opinions if they are designed to stimulate or reinforce existing beliefs of the audience, it is pointed out by Harris (187) that there is little evidence that films can make changes if they are contrary to the existing beliefs, personality structure, or social environment of the individual in the audience.

Standohar and Smith (381) investigated the contribution of lecture supplements to the effectiveness of an attitude film and reported that the Airmen trainees who heard one of the lectures with the film expressed more favourable opinions concerning military discipline than those who had seen the
movie without a lecture. Supplemental lectures provide a means for making more effective use of films which are already pertinent to a given attitude. French (145) studied the effectiveness of a movie in changing attitudes in a military audience. He reported that a factual test, measuring understanding and memory, showed that the average service man had absorbed more than $\frac{1}{3}$ of the film details and that officer groups absorbed about $\frac{2}{3}$. Also that measurements of attitude change before and after the film indicated that significant change had been achieved. It should be kept in mind that Hovland and others (210) showed that films alone are not an effective instrument for influencing motivations or modifying basic attitudes. Fowlkes (143) in reporting the work of Ahlgren and others, showed that the use of a film with a carefully prepared manual can appreciably change attitudes and, to a lesser degree, actions relating to a community improvement program.

In pursuing the effect of films upon motivations and interests, Lashley and Watson (259) found that although a film on venereal disease had no measurable effect on subsequent sexual behaviour of the audience it did influence viewers who had contracted a venereal disease, to seek immediate treatment.

Ramseyer’s (337) study of social attitudes with documentary films indicated strongly that a motion picture can influence specific attitudes if the attitude to be changed is closely related to the content of the film and if the film conforms to the social norms of the audience. If the film
tries to promote an attitude in conflict with the social norm, it may result in a "boomerang" effect, actually reinforcing the existing attitude instead of changing it. This result was seen in the study by Cooper and Dinerman (90) in which a film intended to have a specific effect on an audience actually had the opposite effect. A study by Wilner (456) found that Southerners viewing the film, "Home of the Brave" were not persuaded to change their attitudes toward the Negro, but actually had their prejudices reinforced. This fact was also demonstrated in a study with political cartoons by Cooper and Jahoda (91).

Kishler (244) studied the effect that audience attitude toward, and audience identification with, the main character of a film had upon learning. Using the film, "Keys of the Kingdom", whose starring role is that of a Roman Catholic priest, Kishler found that the film had more effect upon the tolerance attitude of those who originally held the role of Roman Catholic priest in high regard than those who held it in low regard. Stein (383) reported that mental health films could be used in a program of mental therapy. The least well-adjusted showed the greatest emotional involvement with the films, and those who had problems similar to the problems discussed in the films seemed to react more strongly and remember the films longer. Fearing (139) found that films on venereal disease and malaria discipline were effective in changing the attitudes of Naval Trainees in the direction advocated by the films.
It would seem from the evidence that an audience has a predisposition to accept an attitude or opinion which influences the individual's interpretation of the communication. Ramseyer (337) shows that the reactions of students to films dealing with social subjects was related to the occupation of their parents. Hovland and others (210) found that military trainees who were predisposed to accept certain opinions prior to a film showing tended to hold these same opinions nine weeks after the film, although when tested shortly after the showing, their opinion fell into no discernible pattern. Greenhill and McNiven (172) discovered a relationship between learning from a film and the degree to which the viewer perceives the film to be of use to him, which Kishler's (244) research reemphasizes. Hoban's (198), (199) two studies conclude that audience involvement in an identification with instructional films is determined more by aspiration than present status, although reaction is related to audience status. Some impedance of communication is likely to result with the upper-status level of an audience when the film presented values associated with the lower-status level.

Lange (255) studied the effect of using films along with group discussions, as a means of providing leadership training and reported that the films resulted in a broadening of viewpoint in dealing with leadership problems. The trainees also gained experience in analyzing problems and expressed the feeling of gaining confidence in their judgement. These trainees also showed greater improvement in the quality of
their solutions to leadership problems. They were also better judges of who the top leaders in their class were. Johnson (231) showed that films can effectively be used in training staff members in a community organization for a better understanding of human relations.

Sillars (368) noted that film used as an adult education device "should be followed by purposeful and intelligently guided discussion as a practical means of participation in the formation of attitudes and policies which guide us in dealing with all aspects of our environment". Ress (344) states that since non-theatrical, documentary films are not made to be used as a stimulus for adult education discussion groups, their effectiveness for this purpose is closely related to the skill of the leader in so using them as to give the discussion a focus. Auerbach (29) also warns that where there is a growing use of films as a source of content or means of introducing content in parent education or parent-child relations, the films themselves can increase the tensions and anxiousness of an audience. Gruenberg (176) said much the same thing eighteen years previously when he pointed out that the use of methods (such as film) where the material cannot be adapted to the known resistance of parents, to their needs, or to their initial level of understanding, results in errors and misunderstandings. However it should also be observed that in trying to determine the effect of chronic and situational anxiety on how much a student would learn from instructional films, Allison and Ash
(16) found that students who received anxiety-producing instructions made higher scores than those who received anxiety-relieving instructions. In answer to Auerbach and Gruenberg, Brim (50) points out that there are no counter-arguments to these defects in the use of media (such as film) except the one that there has not been any scientific demonstration that this more than any other method, increases parental anxiety, misinformation and the rigid application of ideas.

It may be stated again that Hovland's (209) comprehensive review of studies of communication media effectiveness indicates that an oral presentation, (radio, lecture or other such type), is more effective in changing opinion than is printed material; and we can add his remarks here that films seem to be about equal to an instructor in bringing about gains in factual knowledge and concepts.

One of the most extensive uses of films in an experimental adult education project was that made by the Ogdens (321), (322), and their conclusions did not contradict any previously mentioned in this paper. They summarized that there was no sure way to select films for adult education except through the eyes of the particular audience with which the picture is to be used.

Studies generally show that adding films to usual teaching methods brings about increased learning. Films communicate the information they contain and their influence is felt more in retention than in immediate recall. They
usually do not teach by implication but by stimulating other learning activities such as discussions, voluntary reading, investigations and art work. As shown previously films are about equal to, and in some cases better than superior instructors not using films, in communicating facts and demonstrating concepts.

Hoban and VanOrmer (204) were mentioned as contributing the most comprehensive analysis of teaching devices up to 1950. The majority of their research references have already been reviewed in this report, however some additional information is noted. After presenting all the many strengths and uses of film, the authors remark that films, of course, cannot replace the instructor in matters of providing motivation, answering questions and providing the personal relationship. In other words the instructor must structure the learning situation for the particular group involved in the learning process.

Job Aid. - Film: - A job aid is a carefully prepared film which a worker can watch while he is performing an assigned task. It can be re-run as often as desired. Hoehn and Lumsdaine (205) investigated the use of the job aid film in training a man to do a job in a mechanical yet satisfactory way, without giving him an adequate technical background and preliminary training. They reported that airmen could perform long and exacting bench-check operations without previous instruction by using a job aid film. It is so called "job aid"
because it is a help on the job rather than during training. Its use reduces training time, facilitates the employment of lower skilled men and increases the reliability of human performance.

Although not characteristics of the teaching device, the factors "seating arrangement" and "amount of light" should be taken into account when considering the effectiveness of films. In 1943 the Society of Motion Picture Engineers recommended that the maximum distance for viewing was six screen widths. Other pertinent research on these factors has been reported by the National Education Association (308), Gibson (159), and Ash and Jaspen (28).

Crile (96) records a publication of the United States Naval Training Device Center, Port Washington, New York. It represents a summary of sixty-five instructional film research reports and, whereas most of these individual reports have already been reviewed here, the summarized publication is reproduced to ensure that nothing has been inadvertently omitted. Much of this research also has direct application to television use and should be reviewed again in that category.

1. Effectiveness - Films are at least as effective as other comparable means of instruction. Films alone can be used to teach factual information.

2. Motor-skills - Motor-skills that are at least as complex as operating a sound motion picture projector or performing gymnastic skills can be taught by means of
film alone. An instructor can increase his effectiveness by using film loops to teach a skill to groups while he devotes his time to coaching individuals. Daylight viewing of films is very effective. Optimum viewing occurs within 12 screen widths and 30 degrees from the center line.

3. **Mental Hygiene** - In addition to being effective for teaching skills and factual information, suitable films can be used to improve personal adjustment.

4. **Specific Films** - Specific content in films is required to meet specific instructional objectives. Films with broad superficial content aimed at a generalized audience are likely to be less effective than films with well specified content aimed at an audience of known characteristics.

5. **Specific Audience** - Films should be prepared for a specific audience.

6. **Purposeful Use** - Use films to teach. Films are likely to be more effective if they are integrated into the curriculum, and if they are related to carefully formulated instructional objectives.

7. **Consistent Use** - People learn to learn from films. When films are used as fill-in, for entertainment, or if the content does not appear to the trainee to be pertinent to the course being studied, there is likely to be less learning than would otherwise be the case.
8. **Evaluation** - Films should be evaluated using a film analysis form.

9. **Dramatic Films** - A straightforward expository or documentary approach in films will be as effective or more effective for teaching information than a film that incorporates dramatized sequences especially if these are elaborately staged.

10. **Perceived usefulness** - Films that are perceived by students to contain useful material will provide the greatest amount of learning.

11. **Attitude Changes** - A carefully prepared film may change an attitude.

12. **Cost of Film** - In most cities films can be prepared locally and relatively inexpensively in a few weeks by non-professional personnel.

13. **Camera Angle** - Show a performance on the screen the way the learner would see it if he were doing the job himself.

14. **Rates of Development** - The rate of development of a film should be slow enough to permit the learners to grasp the material as it is shown.

15. **Succinct Treatment** - Presenting only the bare essentials or rapid coverage of subject matter may be very ineffective.

16. **Show errors** - Learning performance skills from films will be increased if you show common errors and how to avoid them.
17. **Repetition** - Organize a film so that important sequence or concepts are repeated. Repetition of films, or parts within a film, is one of the most effective means for increasing learning to a required level.

18. **Organizational Outline** - Films which treat discrete factual material appear to be improved by the use of an organizational outline in titles and commentary.

19. **Introductions** - Present relevant information in the introduction and tell the viewer what he is expected to learn from the film.

20. **Summary** - Summarize the important points in the film in a clear concise manner. Summaries probably do not significantly improve learning unless they are complete enough to serve as a repetition and review.

21. **Visual Potentialities** - Take advantage of the ability of the motion picture medium to show motion, to speed up and slow down motion, to telescope and otherwise control timing of events and processes, to bridge space, and to organize events and actions. The visuals and commentary in a film should reinforce each other.

22. **Picture-commentary Relationship** - The commentary of a typical informational film appears to teach more than only the pictures of that same film when learning is measured by verbal tests. This does not necessarily mean that the commentary has greater inherent effectiveness than pictures; it may mean that producers are
currently relying more heavily on commentary than on pictures or on the optimum integration of the two. With films designed to teach performance skills, where learning is measured, by non-verbal tests, the picture appears to carry the main teaching burden.

23. **Concentration of Ideas** - Ideas or concepts should be presented at a rate appropriate to the ability of the audience to comprehend them.

24. **Commentary** - The number of words (per minute of film) in the commentary has a definite effect on learning. Care should be taken not to "pack" the sound track. Application of readability formulas to improve a commentary may not do so.

25. **Use of Personal Pronouns** - Use direct forms of address (imperative or second person) in film commentaries. Avoid the passive voice.

26. **Nomenclature** - Introduction of new names or technical terms in a film imposes an additional teaching burden on learners, and may impede the learning of a performance skill.

27. **Comparative Effectiveness of Training Aids** - No differences were found in the training effectiveness of cutaways, mockups, and transparencies used in instructional sequences.

28. **Special Effects** - Special effects used as attention getting devices have no positive influence on learning.
29. **Optical Effects** - A film in which such optical effects as fades, wipes, and dissolves have been replaced by straight cuts, teaches just as effectively as a film which uses these effects.

30. **Stereoscopic Films** - In the one experiment conducted, the addition of stereoscopic vision did not increase the learning of a motor skill performance. For teaching a complex motor skill a three-dimensional model may be better than a two-dimensional aid.

31. **Color** - Experimentation has not yet demonstrated any general overall increased learning as a result of using color in instructional films.

32. **Music** - Preliminary experimentation suggests that music does not add to the instructional effectiveness of an informational film.

33. **Pretesting** - Scripts, workprints, demonstrations, and final prints can be evaluated quickly using the learning profile method of film evaluation which requires a group of trainees to estimate their own learning. A film analysis form should be used for preproduction evaluation on films. Audience reactions to films can be economically obtained using infrared photography.

34. **Film Loops** - Short film loops which can be repeated continuously as many times as desired, appear to be a good way of teaching difficult skills.
35. **Participation** - Learning will increase if the viewer practices a skill while it is presented on the screen, provided the film develops slowly enough, or provided periods of time are allowed which permit the learner to practice without missing new material shown on the screen.

36. **Dramatic Sequences** - Incorporation of dramatic sequences such as comedy, singing commercials, or elaborately staged settings in films to teach factual information will not improve the film.

37. **Filmographs** - Filmographs which incorporate still shots rather than motion may be equally effective for some purposes and be less expensive than motion pictures.

38. **Visual Recordings** - Films may be produced to make a visual recording of a task that may be difficult to describe with words alone.

39. **Research Findings** - Research findings should be applied to training film production.

40. **Inexpensive Films** - Because color, optical effects and dramatic effects have little to do with increasing learning from films it is possible to eliminate them. Films prepared in this manner can be made inexpensively and can be produced quickly.

41. **Protagonist** - In a film intended to change attitudes it is desirable to characterize the protagonist or
commentator clearly. It is even more important that he be a prestige figure close to the audience's reference group.

42. **Let the film do the instruction** - Good films can be used as the sole means for teaching some kinds of factual material and performance skills. Where the instructional situation makes it advisable, take advantage of this possibility.

43. **Instruct students to learn from films** - Tell the viewers firmly, that they are expected to learn from the film.

44. **Increase the amount of learning** - Learning can be increased by repetitive showings, pretesting, post-testing with knowledge of results, and introducing the film and stating the purpose and importance of the showing.

45. **Use of Study Guides** - Ability to learn from films improves with practice in learning from films. Trainees will learn more if printed study guides are used before and after film viewing.

46. **Distractions** - Note-taking should not be encouraged during the average film showing because it interferes with attention and hence learning.

47. **Use film loops in the practice area** - One showing of a film dealing with a complex skill may be insufficient. Show a film in the practice area so that the student can easily refer to the film model as often as necessary.
This can be accomplished by rear projection of film loops on daylight screens in the work area. Students should sit within 12 screen widths and within 30 degrees of the centre line.

48. **Use mental practice** - Men can partially learn to do a skill by watching a film and imagining that they are performing the skill and by going through the skill "mentally", even though they do not have the equipment available. Films can provide a model for guided "mental" practice.

49. **Length of Film Sessions** - Film viewing sessions of informational material can extend to at least 1 hour without reduction in training effectiveness.

50. **Evaluate Film Showings** - Do not assume that learning has occurred as a result of showing a film. Evaluate the effect of a film by giving a test.

51. **Principles** - Explain the principles of operation when it may be necessary for a trainee to generalize his learning to a different but related situation. (96)

In summing up the use of films, Barnouw (31) states that when a film succeeds in channeling inner drives toward new ideas and actions, it is seldom through its own impact alone but through the face-to-face relationship it sets in motion. This was stated even more strongly by DeFleur and Larsen (114) when they noted that in successful communication the audience must be no bystander, but the chief actor. This of course just
echoes what Sillars (368) wrote some ten years previously.

An excellent article concerning the use of motion pictures in adult education was written by Razik (340) and it appears in Adult Education, January, 1965. He discusses some of the research material reviewed in this thesis and suggests that maybe not enough use is being made of film as an important teaching device.

(3) Filmstrip and slide projections

These are usually considered together as they have certain characteristics in common. They are still pictures or projections; the subject matter is often available in both media, and the production procedures are similar. The slide film or filmstrip is nothing more than a logically arranged series of still pictures on a strip of 35 mm film.

Filmstrips and slides are among the most economical of teaching devices; therefore, their effectiveness as compared with the more expensive motion picture has frequently been studied. Early studies by Brown (55), James (225), McClusky (280) and McClusky and McClusky (281), (already referred to), comparing filmstrips and slides with the silent motion picture found that the projected still pictures were about as effective in teaching factual information as silent motion pictures. The section dealing with films made several other references to filmstrips for comparison purposes, and may be referred to.

Carson (77) records a study made by the Scottish Educational Film Association in which long and abbreviated
versions of a filmstrip on American cowboys were compared with a sound film on the same subject. As measured by a 40 item true-false and multiple-choice test, the two film-strip groups were greatly superior to the sound film group in learning information and concepts. Vernon's (436) experiments in teaching British seamen to understand and learn to take soundings with a lead line found the filmstrip and film to be about equal in value, with a great advantage to the method that combined the two devices. Gibson (159), as reported earlier in the Miles and Spain (297) review of research compared a group instructed through films with a lecture group for which the lectures were organized around a series of 19 slides and with a group that read a well-written and well-illustrated booklet on the Air-Training subject of position firing. The film group learned significantly more facts, the lecture and manual groups were about equal. Heidgerken (191) found no differences among filmstrips, motion pictures, and filmstrips combined with motion pictures in teaching certain parts of a course on nursing arts. Hovland and others (210) compared the effectiveness of an Army training film on map reading with an Army filmstrip that presented the same content and reported that testing indicated the trainees learned slightly, but not reliably, more from the filmstrip. Lasser (260) compared the effectiveness of a filmstrip with a film in teaching a simple performance task of repairing a broken sash cord in a window. No significant differences were found except for one sub-operation on which
the film group did much better, presumably because the film had continuity. On several operations neither medium was effective. As recorded earlier, Torkelson (408) in a comparison of the effectiveness of mock-ups, training manual illustrations alone, cutaways, and projected black-and-white and colored transparencies as devices in teaching found that although the three-dimensional mock-ups and cutaways produced superior learning, the differences were so small in proportion to their high cost that their general use appeared to be unjustified. Kale and Grosslight (233) investigated the learning of Russian vocabulary under several different conditions, that included pictures plus titles versus titles only, motion versus still pictures, and sound versus silent pictures. They found that pictures of an object or act were an aid to learning vocabulary, that still pictures were as effective as moving pictures and that the pronunciation of the words by a narrator seemed to inhibit learning to write the words.

Zukerman (468) showed how a pre-production filmstrip of the outline for a training film could be used to predict the learning that would result from the completed film. The UNESCO (415) report entitled "The Healthy Village" concerning a visual education experiment in West China, showed that audio-visual materials are effective in teaching health principles to a partially literate rural population. Filmstrips and slides were considered the most effective means used in reaching large numbers of people and in making the deepest and most lasting
impression. The comparative effectiveness of captions on slides was reviewed by Butts (64) and he reported that declarative and imperative captions were significantly superior to interrogative captions in helping students learn and retain information.

Kerrison (240) tells us that films and filmstrips properly used have made union meetings more interesting and profitable. Browser (58) declares slide films to be the best and most inexpensive aid for group training in selling. Callahan (65) and Edwards (129) both conclude that filmstrips are less expensive and more flexible than motion pictures. Hague (180) in writing on the use of teaching devices in the training of department and specialty store personnel reports that for certain types of training, namely those where an operation is to be taught or where the instructor needs to interpolate, the slidefilm has definite advantages over the motion picture. He states that where attitude training is the objective or where movement and expression are important, the motion picture is by far the best medium. McGuigan and Grubb (283) on behalf of the U.S. Army, investigated several methods of teaching contour interpretation and reported that the most effective device for classroom use was to picturing the terrain features on two-dimensional slides with contour lines as represented on 3-dimensional relief maps. Hovland and others (210) report yet another effective use of slidefilms. It was found that the learning of a phonetic alphabet was facilitated when Army trainees shouted the correct word as a letter was
projected from the filmstrip onto a screen. Miles and Spain (297) in their review of audio-visual aids in the Armed Services reported that instructors and training-aid officers had confidence in slidefilms as a major aid in teaching. Slidefilms are not used to a greater extent because of a lack of experience in their use, and, in some cases, because of their inferior quality. They could be made more effective by containing frames at the beginning that offered suggestions to instructors, and review and quiz frames at the conclusion.

The effectiveness of a teaching device is a valid consideration only if the device is actually used, therefore the factors influencing frequency of use and those associated with amount of use are of interest in this paper. Mikhail (296) made a study of the variations in the current use of slides and filmstrips by vocational agriculture teachers in Wisconsin. He investigated the factors influencing the effective use of these aids, and determined what factors were related to instructor use or non-use of slides and filmstrips. The factors influencing frequency of use were as follows:

1. Convenient location of equipment for instructors.
2. Size of slide and filmstrip library, - a big one was used more.
3. Confidence in their value as a teaching device.
4. Courses taken in audio-visual methods.
5. Local production, - if they could be made locally, their use was high.
(6) Inservice training had a high frequency of use correlation.

(7) Efforts to keep up with new information had a positive correlation with high frequency of use. (296)

The factors associated with the amount of use of slides and filmstrips: -

(1) Age of instructor, - older instructors used a larger number of these aids.

(2) Longer teaching experience was associated with higher total use.

(3) Instructors who had a good sized slide and filmstrip library also had a higher total use.

(4) Instructors with funds to spend on visual aids had a higher total use.

(5) Acceptance of recommended procedures is associated with higher total use. (296)

On the basis of their review of the research on filmstrips and slides, Hoban and VanOrmer (204) concluded that the superiority of the motion picture probably resulted from the greater adaptability of movies for portraying interacting events, whereas the superiority of the filmstrip was probably due to the slower rate of development used in the actual presentation of the filmstrip to the audience.

(5) Television

To introduce this section dealing with Educational TV it is helpful if we now review Verner's (433) remarks on the
subject. He stated that, -

Unstructured and unsupervised, televiewing is obviously not adult education, even though learning may result. Televiewing becomes adult education only when it includes an agent-learner relationship to give the educational process some direction. Such relationship may often be so minimal that adult education needs to design ways of creating and maintaining stronger relationships to enhance the quality of television as an educational method. (433, p. 32)

- or device. One way in which this device has strengthened its use is by combining with correspondence study.

Rock, Duva and Murray (348), (349) appear to have been the first to report any research based on the use of television for teaching adults. Their findings (348), which were based on the results obtained with three groups of men, each about 100 strong, were that:

(1) TV can be used effectively for conveying information to widely separated groups.
(2) 50% of the men learned more and 25% of the men learned as much as groups given traditional classroom instruction.
(3) The Naval Air Reservists used in the study were in favour of TV instructions.
(4) The kinescopes, or TV recordings, are effective when later used as sound moving pictures. For 94% of the officers, kinescope was as effective as TV and for enlisted personnel it was as effective in 73% of the comparisons. Kinescope was better than the local instructor in 3/4 of the comparisons made. (348).
In their second study, (349) that involved eight one-hour lessons telecast at weekly intervals to 3000 Army Field Forces Reservists from the Special Devices Center to 10 stations in the east and north central states, it was found that:

(1) TV instruction is an effective means of training large groups of men in widely separated groups.

(2) The Reservists not only learned but remembered most of what they had learned 4 to 6 weeks later.

(3) TV instruction is highly acceptable as 70% of the officers and 60% of the enlisted personnel stated a preference for it.

(4) The amount of gain on test items is related to the explicitness of treatment of the topic. Sketchily treated material caused poorer scores after instruction as it caused confusion.

(5) The most effective type of TV presentation was:

a. Narration with meaning-conveying film.

b. Drama with some form of narration.

c. Less effective were Narration and Drama. (349)
There has been a distinct increase in the instructional use of TV in the past ten years and particularly since Kumata (253) reported his review of instructional TV in 1956. At that time he stated that as far as informational gain is concerned no significant differences seemed to exist between conventionally taught and TV taught students.

The Iowa State College Agricultural Extension Service (221) telecast a series of 9 thirty-minute shows which demonstrated the construction of a cotton dress and although it was not required, 3,004 enrolled for the series. The shows were programmed at 2:30 P.M. Wednesday and Fridays. More than half the enrollees lived in town and 76% of the town women had not participated previously in Extension work, whereas only 30% of the farm women were "new" to Extension. Thirty-six percent of the women completed their dress. The series was considered very helpful by 58%, helpful by 37% and not helpful by 5%. Of those who made a dress 93% said it fit satisfactorily, and 99% said the general appearance was satisfactory. There was little appreciable difference between the results of four teaching methods tested: television only, television plus home economist assistance, television plus bulletin, or television plus bulletin plus home economist help. Wilson and Moe (460) and Pollock and Meloche (332) also found TV highly effective in teaching sewing practices to women.

Husband (218), Millis at Western Reserve University (298) and Stromberg (390) all found that the adult home TV
Ill audience achieved higher grades in psychology courses than did the regular on-campus students. Millis (298) reported that 10,000 to 30,000 sets were tuned in to the program 9:00 to 9:30 A.M. weekdays and of the 289 who registered for the course 209 completed and 46 withdrew. The median score of the TV students was 67% whereas that of the campus students taking the same course was 54%. The great amount of written material which was required of the tele-students was very well done. Their age range was from 19 to over 50.

As reported by Clinton (82) in 1957-58, there was a total registration of 7,239 for the telecourses given over Channel 11, the Educational TV station in Chicago, - of which 1511 were taking the courses for credit. Of the total number registered for the second semester 71% completed the courses. There was constant supervision by the educational agent for those registered, and for those taking the course for credit, papers had to be completed and exams written.

Another good example of Educational TV is the Continental Classroom. This consisted of physics and chemistry lectures sponsored by several corporations such as the Ford Foundation and carried over the N.B.C. commercial network at 6 A.M. It was the first network educational TV class and was recognized by 350 colleges in 47 States. If an adult wished to participate in the academic work of the Classroom he could register with any one of the 350 colleges that recognizes it for credit purposes and the registrants came under the constant supervision
by the college concerned. The University of Maryland in comparing the work of its regular students to that of its TV students found the TV students to be 60% superior.

It may be of interest to note that in March 1957, thirty-seven colleges and universities were offering college credit courses over TV, with homework being completed and forwarded by mail to the institution for marking and return. In most cases the student was required to go to the campus for the final examination. In 1955 the American Council on Education estimated that 12,000 students paid fees for TV courses.

Shimberg (366) reporting on the effectiveness of television in teaching home nursing stated that the National American Red Cross found television instruction to be as effective as classroom instruction in teaching facts about home nursing and in promoting an understanding of the principles involved in the care of the sick. Those taught by TV did almost as well on the performance test as those taught in the classroom although they had about one half the instructional time. The attitude of those who viewed the television programs regularly was overwhelmingly favourable toward this method of instruction.

Tannenbaum (396) found that closed-circuit TV lecture-demonstration in periodontics to practising dentists in six states was highly effective as compared with a control group and a group that studied only a manual.
As mentioned previously the U.S. Armed Forces has sponsored a great amount of research pertaining to teaching devices and TV has had its share of attention. Important research has been carried out on behalf of the Armed Forces by Desiderato and others (116), Kanner and others (235), (234), and Runyon and his associates (354). Kanner and others (235) examined the comparative effectiveness of TV and the Army's usual type of basic training. Fourteen hours of instruction, representative of the information and skills taught in the first eight weeks of Army basic training, were selected and parallel television instruction was prepared and given. All the usual standardizing precautions, such as matching, were observed; and tests were given to about 12,000 basic trainees used in the research. It was found that TV instruction is at least as effective as regular instruction and more effective for lower-aptitude groups. Television instruction also is remembered at least as well as regular instruction and kinescope (TV recordings) instruction is as effective as regular instruction. A test performance for groups receiving one kinescope review was significantly higher than scores obtained immediately after the initial instruction, and the test scores for low-aptitude trainees receiving one kinescope review approached those of high-aptitude groups following their initial instruction.

Other studies were conducted for the military by Rock and others (346), (347), Boehm (43), Allen (13), Dowell (122)
and Frank (144); and by the U.S. Army Signal Center (417), and in every instance it was found that TV instruction was at least as effective as regular classroom instruction in teaching military-training subjects. Dowell (122) also showed that TV was even more effective in bringing about attitudinal changes and in the dissemination of pure information than in the teaching of a skill.

Fritz and others (146) made a comprehensive survey of television utilization in Army training, reviewing the literature (100 references) and interpreting previous findings in terms of direct application to Army training problems. Their conclusions were as follows:

1. Television can be advantageously integrated into the Army Training Program.

2. Qualified officers using a carefully prepared check list can determine which training lends itself to television.

3. Military training can be achieved with commercially available TV equipment.

4. Training aids designed for demonstrational purposes are universally applicable to TV.

5. The advantages of magnification and close-up views make TV teaching especially valuable.

6. The materials on hand can be used, there is no need for special equipment.
(7) One TV camera is satisfactory but two would make the teaching situation more reliable and flexible.

(8) Kinescope recordings are most useful in training instructors, duplicating lessons and disseminating new developments rapidly.

(9) Qualified instructors can easily be taught to be suitable TV instructors.

(10) TV Teacher Training can be accomplished in a relatively short time if the persons involved have had previous teacher training. (146)

Crile (96) reports a summary of instructional television research reports made by the United States Naval Training Device Center and integrating the findings of various studies made for this body. Many of these items have already been noted but their value is not lost in the repetition.

(1) A TV program can be at least as effective as comparable means of instruction.

(2) TV instruction is well liked. Well prepared programs were highly acceptable after an 8 week period of TV training.

(3) TV is a feasible and effective means for instructing widely separated groups.

(4) Most learned material was retained over a six week period.

(5) All grades of personnel learned from TV programs.
(6) There was a novelty effect noted. In 1950 trainees said that the TV instruction they received was more effective than the average training film. This instruction was carefully prepared, skillfully presented and the trainees tried to learn.

(7) Material that was explicitly covered was well learned. Sketchily treated material was not learned.

(8) Learning occurred when specific information was presented. Little learning occurred from dramatic or situational presentations.

(9) A criteria check list has been developed to determine courses of instruction which are suited for televising.

(10) One TV camera will fulfill most military training needs but for reliability and flexibility, two cameras are more desirable.

(11) Qualified instructors can be trained to teach by television in a relatively short time.

(12) Effective TV teaching has been carried out in a large number of subject areas.

(13) Films are effective on TV.

(14) Film recordings of TV programs (kinescopes) are very satisfactory for military training even though the picture quality may be poor.

(15) Kinescopes were recommended for training instructors, duplicating lessons, disseminating new developments and as a substitute for instructional films.
(16) Unless it is essential to the subject being taught, colour does not increase the effectiveness of television teaching.

(17) Training devices may be televised to a larger group than can normally see them. Thirty-one principles for improving visibility have been noted - see Jackson (224).

(18) TV expense and labour can be more easily justified when the training situation is dangerous or mass training is essential.

(19) Dramatic treatments brought about less learning than other types of treatment.

(20) Polls have shown a definite acceptance of "attitude" type programs dealing with book reviews, social problems, history and the like. (96)

Another interesting research study was made for the United States Navy by Jackson (224) who tested 105 training devices for their visibility on TV and reported 31 principles of visual design that affected their clarity as a TV picture. These are listed as follows:

(1) The figure or principal part to be seen should be organized in a horizontal movement from left to right.

(2) Three horizontal planes of organization give the best visibility.

(3) Radial-type organization is effective. Circular or oval organization should be avoided.
(4) Vertical organization should be avoided.

(5) Simple organization is best.

(6) Moving parts should operate slowly.

(7) A light figure on a dark background is best.

(8) A figure should extend over 2/3 of background.

(9) The device should have a border of about 1/3 of the total area.

(10) Dull light gray tones against dull dark grays give the best contrast.

(11) Where several contrasts are needed it is best to work from dark to light, to dark to light etc.

(12) Avoid either too great or too little contrast in gray shades.

(13) Avoid glazed or reflecting surfaces.

(14) Avoid translucent materials.

(15) Rough surfaced wood and paper give the best visibility.

(16) Transparent glass or plastic gives an illusion of transparency.

(17) Dull or tarnished brass gives an illusion of metal.

(18) Very large or very small devices can be used equally well.

(19) Height to width ratios should be from 3 X 4 to 4 X 4.

(20) Detail must be proportional to total size of device.

(21) Small devices should be designed so that the hand will not hide them.

(22) Height of letters and numbers should be $\frac{\text{Height-of-device}}{15}$
Width of letters and numbers should be \( \frac{\text{Width of device}}{25} \).

Stroke width of letters and numbers should be about \( \frac{\text{width of device}}{100} \).

Letters and numbers should be separated by approximately one stroke width.

Above 4 rules should be applied to other detail wherever possible.

Letters, numbers, etc. should be light against dark background.

Three dimensional objects should be surrounded only by air.

Charts should be substituted for cutaways.

Light yellow against red or dark blue gives good contrast.

Light yellow surrounded by air is excellent for 3-dimensional devices. (224)

Jackson concluded by suggesting that TV contributes three main advantages to mass training:

1. Position, - the TV camera can view an object from many angles uncommon to the human eye. From above, at a distance, etc.

2. Amplification, - The TV camera can enlarge a small object or details of any object. Reverse is true, i.e. large objects can be made small.

3. Organization, - The TV camera can focus attention on objects or details and eliminate extraneous objects which may detract or distract.
Further information is given here of some research mentioned previously, completed by Ash and Jaspen (28), as their report on the optimum physical viewing conditions for a rear projection daylight screen has direct application to effective viewing of television. They found that the optimum area for viewing was within 30 degrees of each side of a center line drawn perpendicular to the plane of the screen and 12 screen widths deep. In this optimum area performance is better under conditions of daylight; outside the optimum area performance is better under conditions of darkness. Increasing the distance from the screen results in sharper loss in performance than increasing the angle of view, and the relative loss is greater under daylight viewing conditions than under darkness.

Warner and Bowers (445) reported some interesting results from the use of open-channel television in post-graduate medical education. Four TV clinics were transmitted by open-channel TV from Salt Lake County General Hospital. Three hundred and forty-two physicians participated with over one half located outside Salt Lake county. There was greater participation by physicians who lived at a distance from the medical school and new facts were obtained by 74% of those viewing one or more of the clinics. Sixty-six percent of those viewing the clinics felt they were the preferable form of post-graduate medical education and the rural seminars and the courses given at the medical center were listed as second choice by 30% of the physicians interviewed.
To show its versatility as a teaching device and in contrast with the previous study, the work completed by Eschler, Dell and Alexander (135) showing the effective use of TV in giving a short course (5 half-hour lessons) in dairy cattle feeding is cited. Two thousand, one hundred and twenty-seven enrolled, before and after quizzes given, personal interviews held and the mean knowledge score on a 28 item quiz improved from 45 to 59%.

Collican (84) studied the effectiveness of teaching by TV compared to teaching by the use of an Extension bulletin and reported that the group viewing the TV program had a greater change in knowledge than did those reading a bulletin.

Fulton and Timken (149), made an evaluation of the opinions of teachers regarding the effectiveness of a televised, modern oriented mathematics in-service course. It was reported that the teachers considered the TV discussion method superior to any other type of presentation. They particularly favoured the small group discussions following each telecast. The school administrators also considered the TV discussions to be very worthwhile and they would encourage their teachers to participate in future offerings.

Evans (137) reported a study she made on education by television in later maturity. She stated that over half of the older people interviewed watched the university education channel and the most preferred fields of interest were welfare 73%, current events 68%, health 66% and music 65%. They felt that
the programs should be entertaining as well as educational and
the types of presentation most desired were panel discussions,
illustrated lectures, informal discussions and demonstrations.

Crile, Reist and Tait (100) reporting on the use and
effectiveness of Extension television in Lancaster and Lebabon
counties Pa., found that more than 2/3 of both men and women
who watched the extension TV programs given by the county
extension agents found the information useful. Of those who
said the programs were useful, 1/5 of the men and 2/5 of the
women had used some of the information presented.

Mathews and Ueland (289) in examining how consumers got
information in Louisville saw that one or more persons in more
than 21,000 households had seen the "Market Basket Show", a
consumer marketing information television program. About 7 in
10 said they received "some" or "very much" benefit from the
show and about 3 out of 4 remembered receiving some helpful
information.

Reporting on TV coverage in Vermont, Williams (455)
found that the Extension service TV Program "Across the Fence"
had been watched by 53% of the farm households, 42% of the
non-farm households and 37% of the urban households, - an
estimated total of between 20,000 to 25,000 families or
50,000 people in the telecast area.

Gordy (165) reported that county extension agents
throughout the United States have steadily increased their use
of TV broadcasts for extension teaching as follows

Just as Crile (99) recommended training in radio broadcasting for the county Extension agents active in this media so Jones in 1962 (232) evaluated Agricultural and Home Economics programming by extension personnel on TV stations serving Ohio. He surveyed data from 25 TV Stations within Ohio and 7 TV stations across the state border but serving large areas of Ohio, and recorded that 11 stations said the agents needed training in TV presentation techniques in general, 10 specifically in public speaking, grammar, diction, pronunciation etc., 20 in using visual aids and 5 in choice of clothing, grooming etc. Three are reported as needing training in news writing for TV, 11 in photography for TV and 15 in selecting subject matter for the audience they are trying to reach.

There have been many studies made of the rapid growth of TV viewing and the related viewing habits of the audience. Some of these studies will be examined here to give a better understanding of the factors to be considered and to contribute information toward the possible more effective use of TV as a teaching device. Crile, Reist and Tait's (100) work was with open-country families; village, town and city families were not included.

(1) TV sets were owned by about 1/4 of those whose occupation was farming and by more than 1/2 of those not farmers and by 41% of all open country residents.
(2) Pattern of viewing was much the same for weekdays, and Sundays except on Sunday the afternoon viewing started earlier. Few men and women watched before late afternoon on weekdays and 1 PM on Sundays.

(3) The pattern is much the same for men and women except more women watch TV at almost every hour. The highest percentage watch between 8 PM and 9 PM.

(4) The time of the day is more important than the day of the week for extension watching. The best time is 6 to 8 PM, and the 2nd choice is 12 noon.

(5) TV had little effect on newspaper reading and attendance at meetings but it did reduce the radio listening time. This comparison is for the total use of these media and not exclusively extension. Extension radio in Lancaster and Lebanon counties lost relatively few listeners to TV as compared with total radio. (100)

The Agrisearch series (7) have made a great deal of TV research material available for easy reference. Agrisearch for July 1955 (11) reports figures that indicate the very rapid growth of TV in the U.S. as follows: - TV owners per 100 families in 1948 was 1.4 whereas in 1954 the number had increased to 76 percent. (11) This report also showed that:

(1) About 9 out of 10 TV sets can be expected to be tuned in for about 4 hours every weekday evening.

(2) Normally 67 to 75% of the members of TV families will view TV for about 2 hours during an average weekday evening.

(3) The average TV fan spends about 12 hours a week watching TV on weekday evenings.
Monday through Friday, husbands and wives spend the most evening time watching TV (13 plus hours); children under 10 the least (7.7 hours); while teen-age children and young adults occupy a middle position with 10 to 12 hours.

TV owners who buy sets some time after TV becomes available are less devoted to TV than the earlier buyers. (11)

Agrisearch for August 1955 (6) summarized research to show that:

1. Members of TV families adjust home routines to allow for television and for other leisure-time activities.
2. Visiting and entertaining friends decreases in TV homes.
3. When a TV set is brought into a home, movie attendance and magazine reading drop at first then increase.
4. Housewives are the most avid daytime and evening TV fans.
5. Except for weekday mornings, radio listening tends to decrease initially in TV homes and then to increase.
6. Factors other than upkeep costs explain why the lower class families own relatively fewer TV sets. (6)

The two preceding reports (6) and (11) were based on the seven initial studies in the Videotown series. Videotown actually is New Brunswick, New Jersey, an urban center with a population of about 40,000, being 30 miles southwest of New York city and used as a laboratory for the study of the growth and impact of television by the Advertising firm Cunningham and Walsh, Inc., Madison Avenue, New York, N.Y.

In December 1956 Agrisearch (10) stated that TV owners per 100 families had risen to 87.7 and added that in a community which is approaching saturation in television growth, and maturity in viewing habits,

1. More than 90% of the homes will have TV sets.
2. About 9 out of 10 TV sets can be expected to be tuned in for about 4 hours on an average weekday evening.
Generally, about 75% of the members of TV families will view TV for a little more than 2 hours during an average weekday evening. The average TV viewer will spend about 11 hours a week watching TV on weekday evenings. Monday through Friday evenings, husbands, wives, and grown-up children will spend about 3.5 hours each evening in TV viewing; children 10 - 18 will view for less than 3 hours; and children under 10 will view for a little more than 2 hours. 

Agrisearch for January 1957 (8) continued its review of the Videotown series and reports what happens to homelife, movie attendance, reading habits and radio listening after nine years with television, - assuming that the community is approaching saturation with TV.

In the average TV home, most of the family will view TV on a weekday evening, a smaller proportion will view during the afternoons, and relatively few will view during weekday mornings.

Housewives in TV homes will account for most of the morning and afternoon viewing, and add their proportional weight to evening viewing.

Radio listening in TV homes will tend to be highly limited during weekday evenings.

Morning radio listening in TV homes will be relatively unaffected by the competition of TV.

On an average weekday morning, more people will listen to radio than view TV; however, more time will be spent in viewing TV.

Visiting and entertaining will tend to increase during the initial stages of TV growth, decrease as TV becomes established, and increase again as TV saturation is approached.

Usually, newspaper reading will not be affected by the competition of TV.

On the average, progressively larger proportions of the higher socio-economic status people will be TV owners.

As a pattern, larger families buy TV sets earlier, the average size families buy them later, while the smaller families will hold. (8)

Bertrand and Bates in December 1958 (35) made a study of TV use in rural Louisiana and reported that,
(1) On weekdays the peak viewing period for rural men is 7 to 10 PM. Between 8 and 9 PM as many as 90% of men interviewed from TV homes were watching their set.

(2) On Saturdays more men use their sets between noon and 6 PM and fewer women view TV on Saturday afternoons than during the week.

(3) More men use TV on Sunday afternoons than on weekdays or Saturday afternoons but fewer watch on Sunday evening than on weekdays or Saturday evening. Women follow much the same pattern but not to the same degree.

(4) Rural men's choice of programs - 1st Sports, 2nd Comedy, Rural women's choice of programs 1st Comedy, 2nd Mystery.

(5) About 3/5 rural adults regularly view agricultural programs.

(6) The favourite times to view agricultural programs: 1st 6 to 8 PM, 2nd noon hour.

(7) TV has drastically reduced the time rural people devoted to radio, movies and reading.

(8) Economic factors are the main reasons for the majority of rural non-TV owners. (35)

Crile (96) reviewed the interesting fact, as reported by Broadcasting, Telecasting, in January 1957, (52) that an August 1956 survey showed a more rapid growth of TV households outside metropolitan areas than inside.

A fairly large amount of research has been completed on the effectiveness of kinescope recordings of live TV
programs. Some of these, already noted, - Hurst (217), Husband (218), Jackson (223), Kanner and others (235), Rock and others (346) and Tannenbaum (396) and some others, - Stover and Tear (389), Ulrich (414) and Dumazedier (123), all found the kinescope recordings of a TV program to be at least as effective as regular instruction, and in some cases superior to such instruction.

From the research results reviewed it appears that live TV, kinescopes, and conventional films are about equivalent from a teaching point of view, and Fritz and others (146), and Rock and others (347), found that adult students were generally favourably inclined toward TV instruction.

Tadros (394) conducted an investigation into the impact of TV upon the maturing process of the adult and reported some rather disappointing results. He reviewed 39 studies of empirical, pertinent research and reported that TV viewing apparently does little or nothing for, or is inimical to,

(1) the promotion of adult growth in knowledge;
participation in creative interests and constructive activities.

(2) growth into socio-centricity.

(3) grasp of reality

(4) growth into responsibility and independence. (394)

It is concluded that TV is capable of helping adult viewers to mature but it does not make a substantial contribution to the maturing process. The majority of adult viewers
will not develop their maturity as long as their main interest is TV entertainment programs, which constitute the bulk of TV fare.

In 1962 the U.S. National Association of Educational Broadcasters published the results of a survey of the needs of education for Television Channel Allocations (307). It reported that since 1952 the Federal Communications Commission had reserved some 275 TV channels of the existing 2200 for the use of educational TV and that only 62 were in operation. It recommended that educational TV service should be expanded:

(1) To provide opportunities for continuing education at every stage of life.
(2) To help overcome the deficit in teachers and extreme shortages in some disciplines.
(3) To make college and university services available to the community at large for continuing and special education programs.
(4) To facilitate the cooperation among state institutions and colleges for the use of certain facilities and instructional resources.
(5) As the limited space in the TV spectrum may be filled before the necessary facilities and technique for TV instruction can be ideally developed. (307)

Mayer writing in The Saturday Evening Post, September 1963, (290) states that there are TV sets today in the great majority of American schools, though only in a small minority
of the classrooms. He reported that almost 80 cities had their own educational television stations with New York State alone expecting to have 27 transmitters operating within a few years. In 1962 U.S. Congress appropriated $32 million for matching grants to States, Cities and educational institutions which were interested in putting up educational TV facilities.

Lyon's Article (274) on 27 October, 1964, in the Vancouver Sun reports that educational television is now available to 100 million Americans through 84 non-commercial channels, and in addition there are 182 closed circuit school systems in operation with some linking as many as 100 schools. In the U.S. in 1963 there were 229,857 classes taught by television.

In 1960 Schramm (360) noted that adult education audiences are very important keys to educational television success. He stated that the education of adults highly motivated to learn presents a unique opportunity for TV and when costs figures are available it may show that adult credit courses such as those offered in Chicago may "carry" the educational TV station.

**Educational TV in Canada**

Development of educational TV in Canada has run up against a host of problems which threaten to block further progress. Creery (95) reviews the situation in two articles written for the Vancouver newspaper, "The Province", on the 18 and 19 June, 1964. Most of the difficulties stem from the fact
that whereas the major producer of educational broadcasts on both TV and radio is the publicly-owned Canadian Broadcasting Corporation, education itself is the most jealously guarded of provincial jurisdictions.

Some of the provinces, particularly Quebec, want a degree of control over educational programs that the CBC is reluctant to grant. The Corporation, while acknowledging the Provinces' rights to control over educational content, insists on retaining control over production standards. Up to now, federal policy has been to refuse licenses to applications from Provincial governments or their agencies and while not in any statute, the policy has been followed since court decisions in the 1930s decreed that broadcasting is in the area of federal jurisdiction.

The C.B.C. is also deeply concerned with the extent to which it is justified in spending money out of the Corporation's budget, - which is more than two-thirds federal tax money, on provincial education programs. The problem is heightened by the fact that some provinces get more than others, depending on how ambitious they have been in launching educational TV.

Dr. Stewart, president of the Canadian Association for Adult Education and a former president of the University of Alberta, foresees the need, not far in the future, for a comprehensive daily schedule of educational programming. It would include courses for elementary and secondary schools, university courses, adult education courses and programs which serve not as
a credit course in themselves, but as an "enriching" element to specific courses or in a general educational way.

There has been some discussion in interested circles of establishing a C.B.C. educational network, but the idea flies immediately into the problem of provincial educational jurisdiction.

The Board of Broadcast Governors has taken some steps to encourage educational TV in that it has reserved an ultra-high frequency channel for the metropolitan educational Television Association of Toronto. Also it has sought to encourage private stations by allowing them to count educational programs as 100% Canadian, to meet the 55% Canadian content rule, even if they come from abroad.

Eventually, the problem of channel restrictions may be overcome by ultra-high frequency (UHF) which will offer many more channels than the present very high frequency (VHF) system. Canada lags behind the U.S. here again because it does not have a regulation of the American type requiring new TV sets produced after 1 January 1965 to be equipped to pick up UHF.

One of the major problems is getting down the unit cost of educational TV, and this can probably be achieved only by inter-provincial agreement to use the same courses. If such agreement is not reached, the likely outcome would be the importation of educational TV from the United States where the economics of scale have already been realized.
The nature of the educational TV problem may soon be radically altered by the perfection of TV tape which can be fed into sets to reduce transmission costs.

The exploitation of the various possibilities would require an immense amount of planning and co-operation which has hardly begun. Even if agreement were reached on content, it would be difficult to get the right program to the right group at the right time, although this should be somewhat easier in the field of adult education than in the like of high school academic courses.

John Arnett, the education reporter for the daily newspaper, The Vancouver Sun, adds to our knowledge of the Canadian Educational TV situation by his two articles on the 9th February, (21) and 11th February, 1965 (22). He gives a good account of how the city of Kamloops, British Columbia is using TV in this 1964-65 school year as a regular means of instruction for its grade 8 and grade 9 pupils. This, of course, is not Adult education, but some of the outcomes are recognized as being valid, of direct value, and readily usable in the adult situation: -

(1) The teachers involved in the TV programming all agree that it has improved their teaching 100 percent. The teachers state they are very critical of one another's teaching, - "as soon as a class is over, we get each other's reaction to it and we are pretty frank in criticizing one another.".
Some teachers felt concern that they were losing the traditional rapport between teacher and student.

Some teachers stated it was difficult to know if you were "registering" with the students.

Some students found it difficult to concentrate when a teacher spoke for long periods without using visual aids.

Students stated that interest was roused by the different points of view presented by the teacher who taught the TV lesson and the teacher who led the smaller discussion group that followed.

The discussion groups that follow the TV presentation have to be small enough to give everybody the opportunity to speak.

It was concluded that TV will never replace the teacher in the classroom. As a teaching device it is excellent but behind it all stands a good teacher. If anything it can only make the good teacher better.

In this section dealing with educational television mention can be made of a study published by Barrow (32) under the title, "Proposed Theory For The Effect Of Educational Television". He proposes this theory and as far as possible tests it against existing experimental studies. It is a good review of communication theory, very interesting and pertinent to our knowledge of educational television.
B. Re-Inforcing Devices

1. Practice

Actual article or simulator or operative mockup.

As Gagne (150) points out there are two kinds of utilization of training devices, - performance improvement and performance measurement. Both uses may be made of a single piece of equipment, or they may be kept separate with different equipment. In this section dealing with practice we will only consider the first use, - performance improvement.

The characteristic of importance in the device used for improving performance is the amount of transfer of learning to an operational task. The degree of simulation is a secondary consideration, although there are many occasions in which the actual equipment rather than a substitute device is used as a training device e.g. the rifle. The problem of effective training is not one of making the task similar, but rather of arranging the conditions of practice in such a way that essential skills are most easily learned.

Skill training devices provide motivation and reinforcement in their instantaneous knowledge of results. Their design can incorporate provisions which increase the probability of occurrence of response if a specific response is essential, or may have greater tolerance if only familiarization with principles is sought.

The simulator usually has a high degree of resemblance to the operational equipment in its display, controls, and the
way one affects the other, - and this is recommended by Newton (316). The most common use of simulators is that of proficiency measurement, - which we will examine a little later. Usually the degree of precision in simulation is increased only by a disproportionate increase in cost. Adams, and others, (2) checked the effectiveness of a cockpit procedure trainer and found that good performance in the trainer does not assure good performance in actual operation.

Teaching the process need not require the response precision of the actual operation; it may prove more effective to sacrifice exact simulations in order to emphasize the critical aspects of a given task.

Games that teach are often used by business, industry and the Armed Services (138), (345). We are all aware of Army manoeuvres and Naval fleet exercises which are war games in effect.

Most of these games are played on a make-believe basis in specially built game rooms in which actual conditions can be simulated. This method was tested (243) for effectiveness by the United States Air Force and the results were favourable. Those who had taken part in an operational game for five hours did consistently better during their training than those who had not taken part in the game. Positive transfer was noted and was credited to the similarity of the game and the actual situation.
Two other studies (142), (324), conducted for the U.S. Air Force showed that a flight simulator used for pilot training was very effective in bringing about performance improvement in flying procedures.

A type of self-tutoring game device was tested by Hatch (188). The aid was to help pilots recall a large body of necessary job information and it proved quite effective. Players improved significantly on the criterion tests whereas non-players did not.
B. **Re-Inforcing Devices**

2. **Drill**

   a. **Reading machines**

   There are three basic types of devices that are generally used for increasing reading efficiency and effectiveness and these are: -

   1. The Tachistoscope, - a machine which combines a slide projector and a camera-type shutter which can flash lines of print on a screen at a controllable rate.

   2. The reading pacer, - a machine that covers and then exposes print directly to a subject at a controllable rate. It is sometimes called a reading rate controller.

   3. Reading film, - print is projected on a screen from a film in a motion picture projector. The print is projected on the screen and then removed at a rate established during the production of the film.

   Each of these devices can be used to increase the speed and comprehension of reading program participants over their previous reading performance level. Smith and Tate (376) found there was a relationship between an increase in reading speed and time spent in a reading course. The improvement as measured by reading tests was not nearly as great as was shown on the reading rate controller, however some proportion of the indicated speed gain did transfer with little loss in comprehension.

   Manolakes (285) studied the effect of not using a tachistoscope in a reading improvement course and spending the
saved instructional time in a broader program of training in vocabulary and comprehension skills. The control group then with tachistoscope, reading rate controller and book study made a gain about one half that of the experimental group that did not use the tachistoscope.

Other apparent contradictions are noted. Thompson (401) reported that a book-centered, 21 hour reading instruction course for adults can result in reading speeds that are significantly higher than the speeds attained by machine-centered instruction. Although he states that subjects in a machine-centered short course devote a considerable proportion of their time (1) getting accustomed to the machine and (2) "weaning" themselves away from the machine at the end of the course, and adds that with a few more hours a machine-centered course might show up considerably better.

Schwartz (362), on the other hand reported quite favourably on the effectiveness of reading training given in the U.S. Naval pre-flight school that made good use of the reading rate controller. Of the twenty-one hours for the complete course, seven were used for actual reading practice, – principally with this device. At the end of the course the average student displayed an 88% increase in speed for reading fictional material and after ten weeks of no further instruction, an average of 90% of this improvement was retained. Also the reading speed for technical material showed an average increase of 104% and once again 90% of this increased speed was retained after ten weeks.
B. Re-Inforcing Devices

3. Performance

a. Teaching machines and programmed instruction.

As the essential characteristic of a teaching machine is the inherent programmed instruction, very often the wider term of programmed instruction is used for all methods of programmed automated teaching, whether or not a machine is involved.

It is evident that without an agent it is really a mass communication source that can be used for self education whereas in the hands of an agent it becomes a teaching device.

Although "teaching machines" have gained prominence only in the last few years Lumsdaine and Glaser (273) report that workable models in various forms have been in existence since 1924 and as early as 1862 a patent was issued for one.

Carr (76) reviewed the literature on "Self-Instructional Devices" in 1959 and reported at that time that the literature in this field was growing so fast it was hard to keep up with it. His findings were that there was three major classes of variables which influence the effectiveness of learning by means of self-instructional devices and these are (1) the characteristics of the device (2) the characteristics of the program (3) the characteristics of the learner. He stated that much attention is given to programming on the arrangement of materials to be learned in proper sequence which maximizes the rate of learning and degree of retention, and of course this is
still true. He points out that the concept of individual differences must still be considered with particular reference to the learner's background and intelligence; and his aptitude and interests with respect to the subject matter will very probably influence the program in the matter of repetition, sequence and stepping. He concluded by stating that more research is needed to determine correlation between I.Q. and achievement for subjects using teaching machines.

Galanter (152) points out that there is evidence that P.I. provides a means superior to conventional teaching for the acquisition of academic skills and pure mastery of content with a retention level at least equal to that of conventional teaching.

In 1960 Bryan and Rigney (61) made a review of "the current trends in automated tutoring" on behalf of the U.S. Navy and reported that the teaching machines as presently developed would only supplement conventional methods and that completely automated training would be unrealistic at that time.

Silverman's (369) review of automated teaching theory and research in 1960 is interesting and important but does not give any information regarding the effectiveness of P.I. He does point out the importance of analysing exactly what is to be learned and then the need for measuring very accurately what has been learned, before attempting to make a comparison between programmed and conventional instruction.
Irion and Briggs (222) reported on the effectiveness of an automatic device used in the U.S. Air Force for teaching subject matter and noted that the most effective modes of presentation were quiz and modified quiz, in that order. The former provided immediate indication of the result and the latter provided immediate feedback only if the trainee chose the correct answer.

The Renner Company (343) devised a device called the Study Card Set Synthetic Simulator. Rather than use a "gimicked" guided missel for training purposes it introduces paper problems for solving, requires step by step testing, provides for immediate reinforcing at time of testing, simulates actual experience, gives immediate feedback of information and self-scoring if desired. The reports from the U.S. Naval Training Device Center indicate that students who used the Trainer-Tester were superior to students who used equipment only in both Basic Electronics and Advanced Radar Training.

Mowry, Webb and Garvin (302) concluded a series of studies in Air Technical training on behalf of the U.S. Navy in 1955 and reported, among other things, on the effectiveness of a type of teaching machine called a classroom communicator. They found that it did facilitate instruction in that it did improve student learning as measured by an examination. It was not determined to what degree the increased learning was due to the novelty of the device. The students approved of
the use of the device and the instructors did not, - perhaps because of faulty equipment and improper preparation for its use.

Tait (395) made a comparison of the effectiveness of programmed instruction versus lecture and discussion as means of training newly hired county extension personnel in the subject of radio broadcasting. Tests given after one day showed significant differences for both groups but the gains for the program instructed group were considerably greater.

In 1960 the U.S. Air Force (291) summarizing its experience on the use of a teaching machine for its SAGE (Semi-Automatic Ground Environment) system stated that the SAGE staff's initial enthusiasm for using a teaching machine for on-the-job training was sustained over a 16 month period despite the observed implementation problems. A year later Benson and Kapstein (34) reporting on some research they completed for the U.S. Air Force stated that the automated teaching of basic electronics, in the first test and with completely untried materials, taught as well as an experienced live instructor and added that a substantial reduction of training time seems well within reach.

Only about one in four or five studies of programmed instruction effectiveness has used adults so as yet there are some assumptions made that are based on research with non adult populations.
Programmed instruction has been tried and has resulted in learning at every level from preschool, Alter, Eigen and King (17), and Glaser, Taber and others (161) to graduate professional school, Ferster (140), and Green (171). It has been used successfully with slow learners, Smith and Quackenbush (373), and Stolurow (388), and on mature, superior students, Jensen (230). It has been used to teach package and billing clerks, Hickley and Anwyll (193), electronics technicians, Benson and Kopstein (34) and computer operators, Hughes (215). The last three were, of course, adult studies.

Programmed instruction has been used successfully to teach a great variety of subject matter and a great variety of behaviours, - among them, rote learning, Gotkin and Goldstein (167), paired associate learning, Blyth and others (41), the application of formulas, Keislar (238), construction of deductive logical proofs, Evans (136), formation of concepts, Gagne and Brown (151), directed reading course, Reed and Hayman (342), trouble shooting in electronic wiring, Cantor and Brown (66), and reading a radar screen, Arnoult (23). The last two were adult studies.

Programmed instruction has been used to teach all or part of the basic subject matter of a course, or to supplement the main part of a course as in Klaus and Lumsdaine (247) who tested the method as a supplement to Harvey White's physics lectures on the Continental Classroom TV program. It has been used in the classrooms and at home. It has been used casually
and without assignment or supervision and still produced desirable results.

Programmed instruction has been used successfully in the form of teaching machines, flash cards, programmed texts, - both horizontal and vertical, - and both visually and orally. It has been used effectively as programmed films, (see Roshal (353) and his work with 4200 naval recruits). It has been used successfully in many different styles - with and without branching, with different kinds of cues and prompts, with different amounts of repetition, with different size of step, overt and covert responses, constructed or selected responses, and with different kinds and amounts of reinforcement. Classroom lectures and television classes have been "programmed" and increased learning has resulted, Roe and others (350); Gropper and Lumsdaine (174).

Schramm (361) reports that eleven U.S. Naval Reserve officers devoted 70 hours during ten days to full time study of the Russian language, working through a program, then moving to a study of grammar and of a tape recording when they finished the program. On the basis of tests, their instructor estimated that these officers learned about as much in ten days as they would have learned in one and one-half semesters of a college course. And in an English study, Knight and Tilley (248) reported that R.A.F. cadets, taught with a teaching machine, learned to a given criterion about twice as quickly as a conventionally taught class.
Hughes and McNamara (216) making a study for the I.B.M. company reported that a class of computer programmers completed their course work in about half the time, using programmed instruction, as was needed for conventional class methods. Again, Hickey and Laidlaw (194), reporting on the effectiveness of the programmed instruction in a U.S. Navy Supply Officers course, stated that the Supply Corps School students who used the adjunct program saved 56% of usual homework time and 17% of usual overall study time in reaching performance criterion. In addition the instructor's lecture hours were reduced 54% and the attitude was generally favourable.

Holt and Valentine (207) investigated the use of a programmed self-instruction course in basic electricity for the Bell Telephone Laboratories and reported that the time taken to complete the training course was about the same for both the "programmed" group and the conventionally taught group but that the proficiency of the program-taught group was significantly greater as measured by examinations immediately after the course and again six months later.

Smith (375) on behalf of the U.S. Air Force Academy, made a comparison of teaching elementary statistics by the conventional classroom method as compared with the use of programmed instruction and reported that there was no significant difference in performance between the two groups although the programmed group required less time. Also there was no significant difference in interest in the groups.
Teaching Machines, Inc. (398) report the Sandia Corporation's interesting cost figures on teaching by programmed instruction. To teach Russian to their employees in conventional classes cost $57.15 per completion; to teach it by P.I. cost $20.19. Algebra taught conventionally cost $20.50 per completion; the cost to teach it by program was $16.79. The cost of instructor's salaries was approximately the same for either way of teaching but with programs the instructors could handle more students and obtained a higher percentage of completions.

In view of the findings thus far several tentative statements may be made about programmed learning. It certainly can be effective as Krumboltz and Weisman (252) showed that students have learned successfully from it. Holland (206) proved that P.I. can reduce student error and that proper analysis followed by suitable revision of the material can decrease errors even further during the learning process. Lysaught (275) showed that P.I. tends to level the differences in learning capacities among students; while all students exposed to the program may show achievement, the gain seems to be more conspicuous among the lower portion of the class distribution. Eigen (131) pointed out that individual learning time may vary widely with P.I. since students work at their own speeds. Little (263) warns that predictability of individual success may decrease because slow learners and
others may perform better on P.I. than would have been indicated by previous behaviour on other ways of learning. And in addition, Blyth (40) notes that motivation to learn may increase because of the students' immediate knowledge of success; which is not usually forthcoming in other, conventional forms of instruction.
B. **Re-Inforcing Devices**

3. **Performance:**
   
b. **Skill tests.**

The research dealing with the effectiveness of the actual article, or simulator or operational mock-up, as a teaching device was reviewed and evaluated in two previous sections, - (1) Illustrative devices, visual and three dimensional (2) Re-Inforcing devices, practice.

However it should be noted again, here, that Gagné (150) pointed out the most common use of the simulator, or operational equipment in a learning situation, is to measure performance or test skill. The other use, as mentioned previously, is to improve performance.

Again, both uses can be made of the same piece of equipment or device, eg., a rifle; for as Gagné said "what distinguishes a training device is not its appearance or construction but rather how and for what purpose it is used." He also showed that if a device is used for skill tests it must have the important characteristics of (1) reliability and (2) validity.
C. Environmental Devices

1. Physical - all controllable physical facilities in the meeting place.

a. Colour

Colour will be dealt with as a separate entity and in more detail further on in this thesis but for now it will be discussed as a controllable physical facility in the physical environment of the learning situation.

A colour can be pleasing or repelling depending on what other colour(s) it is combined with. McClendon (277) reports that it can contribute to emotional disturbance and fatigue as one quarter of the bodily energy is consumed in retinal activity and where colour schemes are poor, the resulting increased eye strain causes fatigue and emotional strain.

Mason (288) made some important observations and recommendations regarding the use of colour for certain types of learning activities and other studies have been made in the use of colour e.g., as an aid to safety and efficiency in industrial activities (411).

b. Lighting

It is readily seen that an adequate amount of light is usually important for effective learning to take place. This relation between illumination and vision has often been studied and reported. Among these studies are those of Crouch (101),
Hibben (192), Weston (451), Guth and others (177), and Seagers (363). In studies of this nature the modifying factor of age is usually considered.

Hibben (192) points out that indoor tasks are performed under a wide and sometimes constantly changing brightness. The new light sources are not inherently troublesome but call for superior intelligence in usage. He adds that the partnership of light and vision involves the question of age for although at 20 years the pupil diameter is approximately 8 mm, at 60 years plus, the diameter may be reduced to about \( \frac{1}{2} \) mm. Thus artificial lighting should be designed for the average of elderly people and with the increase of contrast brightness, smaller objects can be seen. The background brightness should be one-half that of the task and all glare and bright lights that may be exposed should be eliminated from view.

Weston (451) found a considerable decrement in visual performance (combined speed and accuracy) with age. Older observers attained a greater improvement in performance with increased illumination than did the younger observers. However, even with the highest illumination (500 foot-candles) the older group was unable to achieve the same performance as the younger group did with the lowest illumination (5 foot-candles). It should be noted however that Weston's test involved "quickness of perception", eye-hand coordination and manual dexterity and these last two factors may limit the performance more than visual perception.
Guth, Eastman and McNelis (177) made a thorough study of the lighting requirements for older workers using 100 typical office and laboratory employees aged 17 to 65 years. All those with pathological and uncorrectable optical eye defects were excluded. They reported that the decrease in visibility is gradual up to the age of about 45, after which the change becomes more pronounced and that each age group i.e., the 20s, 30s, 40s etc., has a fairly constant and equal decrease for all foot candle levels. The observation was also made that the lighting requirements increase move markedly from age 45 to 50 and that all except the oldest group (61-65 years) required about the same percentage illumination for a given improvement in visibility. Higher foot candles contribute to better seeing and as age progresses this factor becomes more important.

Seager's (363) publication is a very useful manual for the educator. The chapter headings are: Visual Development in the Growing Child, Anatomy and Physiology of the Eye, Eye Care and Protection, The Physics of Light, Light and Seeing, Environmental Recommendations. There is also a glossary of terms used as well as an annotated bibliography and a ready reference table showing recommended levels of illumination for all probable instructional areas and learning environments.

c. Temperature

Very little research has been reported on the effect of temperature in the learning situation. Mayo (292) did
investigate the influence of summer heat on the achievement of Naval Air trainees performing sedentary tasks. Two matched groups of 404 men each were used; one group studied in an air conditioned building maintained at a mean temperature of 71.3°F and the other group studied in a building with an exhaust fan only and a mean temperature of 82°F. No significant difference was found in the achievement of the two groups although the group working in the higher temperature thought their learning was impaired. The groups had a mean age of "slightly over 20" thus we do not know whether the results would apply to older students.
C. Environmental Devices

2. Organizational

The organization of the educational environment appears to be heading for many changes. Although certainly not research, MacPherson (276), gave an interesting insight when addressing a symposium on school design at the University of British Columbia in January 1965. He spoke of the future school, - not planned around a blackboard, and with learning areas suited to the basic teachings of each discipline. King (242) at the same symposium, said that the formal box-like class room with its row of desks is on its way out. In its place will come lecture theatres, seminar rooms, and possibly individual study areas for students. He added that we can expect to have team teaching in lecture theatres holding well over 100 students which could be followed by more informal lectures in smaller rooms. He stated that windowless rooms are being tried to see if there is any increase in effectiveness due to lack of distraction, and, in elementary schools, there are some classrooms fitted with carpets where children are encouraged to sit on the floor and work, - once again in an effort to find the most effective way for education to take place.

In October 1964 Trotter (410) spoke of other devices and ways of education which would radically change the educational environment. As mentioned previously, he said that one excellent teacher can now instruct an entire county,
state or province through a two way telephone circuit. He reported that it is now possible for an individual to write notes and draw diagrams that are transferred to a "blackboard" by telephone - and these telephone circuits are much less costly than closed circuit television systems.

Trotter continued to say that the present school buildings could be used to educate elementary and secondary students from 8 a.m. to 3 p.m. and the same buildings could be used for junior colleges from 3 p.m. to 8 p.m. This means the colleges and universities would double their capacity because they would only have to teach two undergraduate years and postgraduate courses.

"The most popular and familiar pattern of organization in adult education is the meeting or class", (434) - or group. There are several factors that must be considered in relation to the effectiveness of a group as a teaching device. The effectiveness of a group is certainly modified by its size and the size in turn is determined by "attendance". Marsh and Coleman (287) found that attendance is related to educational level and increases with education. Crile (97) listed other factors affecting attendance in rural areas, viz., - income, size of farm, distance to the place of meeting.

Shoptaw (367) found that rural families will attend educational meetings if they are planned to interest all members of the family, that continuance on a long term basis encourages participation and that distance influences
attendance. He recommended the use of churches, community
buildings and country stores rather than consolidated schools
as this resulted in reduced travelling distance and encouraged
neighbourhood spirit. Crile (97) reported that the effectiveness of the meeting related to prompt starting, regular
attendance, participant interest in the subject, willingness
to take part in discussions, readiness to assume responsibility,
and adequately trained leadership. The popular use of meetings
or groups in adult education seems to be justified by the
findings of Wilson and Gallup (459) and Rohrer (351).

a. Group Size

Brim (50) made quite a thorough study of the effect of
size on the functioning of groups in parent education and his
findings are reviewed. He points out that Cheavens (80)
affirms that group discussion is a superior means for reaching
a solution to any specific child-rearing problem presented by
a member. Eckert (125) narrowed this down by stating that the
evidence is quite conclusive that the best thinking occurs in
small groups; probably a group of five is an ideal size. Brim
adds that there is considerable evidence on group versus
individual problem-solving, as presented by Lorge and others
(268), indicating that this statement and this general point
of view are not necessarily true. Brim observes that the
superiority of group or individual problem-solving depends
on a large number of variables such as the level of skill of
the group members and the type of problem.
There are several other differences noted between educators as to what is the most desirable size of a group. Kawin (237) suggests a group of 25 is ideal. Grossman (175) says 20 to 30 is good. Goller (164) states that the range may be from 8 to 22 with about 15 being the most desirable. Cheavens (80) indicates that between 15 and 25 is usually thought to be ideal. It is difficult to say whether the relatively small differences noted are sufficient to constitute disagreement.

Terrien (399) made a very interesting contribution to this consideration of group size. Basing his work on Bossard's "Law of Family Interaction" he pointed out that with two people there is only one line of communication but that as family (or group) members are added the lines of communication between any two people increase faster than the number of members. The formula for this process is $r = \frac{n(n-1)}{2}$ where $r$ = number of relationships which is to be determined, $n$ = the number of persons in the group, $(n-1)$ stands for all other persons in the group who may be contacted by a given individual, the 2 by which the whole is divided is necessary because each line connects two persons. Using this formula it can be determined that in a group of 100 people there are 4950 potential two person contacts. With 200 people — 19,900 two person contacts and so on. In a 2 person group, 1 person will have 100% participation opportunity,
3 person group, 1 person will have 67% participation opportunity
4 person group, 1 person will have 50% participation opportunity
5 person group, 1 person will have 40% participation opportunity
6 person group, 1 person will have 33% participation opportunity
7 person group, 1 person will have 28.6% participation opportunity

It is sociological axiom that, as the size of the group increases it moves away from intrinsic evaluation of the individuals involved and from government by empathy. Members evaluate each other by an extrinsic basis - judging them by the services they can perform rather than for what they are as humans. Group control is increasingly formalized, - rules are substituted for understanding and communication becomes increasingly difficult as the lesser individual is ever further from the source of power.

Bass and Norton (33) reported their findings on group size and its effect on leaderless discussions. They noted that when leaderless discussion participation was studied in groups of 2, 4, 6, 8 and 12 there was a significant decline in the mean leadership assessment earned by participants as the groups studied became larger in size. Also that maximum stratification in the absolute sense occurred in discussion groups of 6. Relative stratification tended to increase directly with an increase in discussion group size. Observer agreement also reached a maximum with discussion groups of 6 and tended to decline as group size was altered in either direction. They
added that consistency of leadership behaviour was at a minimum in discussion groups of 2. Beyond that point no systematic trends were clearly discernible for behavioral consistency in relation to group size.

The seating behaviour of large groups was studied by Kennedy and Klein (239) and several observations were noted and conclusions made. Interviews with delegates suggested that those individuals who are most intensely committed to small groups as the ideal medium for human problem solving and learning tended to have a set against the "large theory sessions" before experiencing them. Other observations noted that might well indicate the possible effectiveness of the meeting for the group participants are viz., the order of arrival at the lectures - early or late, the degree of post-meeting satisfaction expressed, the amount of participation, and, what seemed to be the most important observation, - the total movement score or variability in choice of seat. This last is a reflection of the shifting participation of an individual over a series of meetings.

Schellenberg's (357) study of group size as a factor in the success of academic discussion groups reported a consistent and significant finding of an inverse relationship between group size and participant satisfaction. A second important discovery was the difference between the perspective of instructors and students. Instructors are more inclined than students to show satisfaction with larger groups. Also there
was limited evidence presented to indicate that smaller groups showed slightly higher academic achievement than did larger groups.

Gibb's (157) work showed that productivity appears to vary inversely with group size and examines the effects of group size and threat reduction upon creativity in a problem solving situation.

Hare (185) examined the effect of group size on consensus, interaction and satisfaction and found these all higher in groups of 5 than in groups of 12. He also noted that as the group becomes larger than 12 the trend toward fractionalism should become more apparent.

Slater's (372) study of contrasting correlates of group size found that groups larger than 4 were never felt to be too small and groups smaller than 6 were never felt to be too large. The size of 5 was seen as the group size which, from the participants' viewpoint, was most effective in dealing with an intellectual task, - that other than a physical or manual operation.

Taylor and Faust (397) found that groups of four are slower on concentrated problems than groups of two, but faster on abstract problems. Whereas, Ziller (465) showed that accuracy in decision making is better in groups of six than in groups of 2 or 3 persons.

In 1961 Davis (111) reported some research based on a study of group loss or drop outs from Great Book discussion
groups, taking into account such factors as size of group and age or seniority of the groups. The group sizes studied were 6-10, 11-15, 16-20, 21-24 and 25 or more; and the seniority of the groups observed were from the first year through fourth or more. This study however showed no consistent pattern. There is a tendency for the larger groups to have higher retention rates in the second and third year but in the most senior groups there is no trend, and one cannot conclude that either large or small groups are more successful. Beginners have higher drop out rates when contrasted with advanced members. It appears that seniority and size are not very important for the survival of Great Book groups, - except as both are related to the individual propensity for newcomers to have a greater loss rate.

Stogdill (387) reported that within the group, performance, interactions, responsibility and authority of superiors exert a direct effect upon the performance and interactions of subordinates. The leadership process may be more smoothly maintained in a stratified organization than in a primary group. In a primary group leadership is subject to the buffets of face-to-face interaction. The behaviour of one member of a group is likely to have an immediate and direct effect upon the behaviour of other members of the group. In a stratified organization interactions are likely to be more highly formalized. Counterbalancing effects are observed in large organizations
as well as in small ones but the large appear to maintain a more stable system of interactions and to be less sensitive to interactional tensions.
b. **Arrangement of learners**

Carp (69) reports how individuals within the group can be arranged or organized by the teacher to bring about certain results or effects. If the group is large these described organizations may be more important and applicable.

1. **Reaction Team:** Sometimes it is advisable, if a presentation is likely to be rather complex, to select a few members to act as audience or group reaction spokesmen. With both the teacher and audience or group agreed in advance, it is the privilege of these spokesmen to interrupt the speaker whenever a point being made needs further clarification or elaboration. This requires careful and discriminating use or it might hinder rather than help the communication process. As a variation, "quizz cards" can be written as the presentation proceeds and these can be handed in for synthesis, combination and answering at the end of the talk.

2. **Observation Team:** This lends itself particularly well to the dramatization of an incident or demonstration of a skill. Other visual or audio presentations, such as films, slides, recordings, etc., are also excellent. The group then, either as individuals or in smaller groups, is asked to report observations. When it is considered desirable to view the incident from various points of view, the separate smaller groups can be so instructed. The coordinated report then for the entire group can be prepared by collating the written observations or having a brief "buzz session".
(3) Listening Teams: - This is a useful device in which the
group is divided into listening teams by the teacher eg., those
on the right side of the room form one team, those in the center
another, and those on the left, a third. Each team listens for
particular points. For example one team might listen for
"points requiring clarification". A second team could listen
for "things we question or disagree with". A third team could
listen for "things we ought to do something about".

(4) Thread Man: - This is another organizational device that
can be used within a group, particularly where the group is to
meet for a number of times. Schmitt and Svenson (359) describe
this activity by pointing out the thread man function is to
bring ideas and experiences into focus. The individual,
co-ordinator, master-of-ceremonies, chairman, - personifies
the over-all unity and purposefulness of the program. He
usually describes the purpose and plan of the program at the
outset and thereafter points up the relationship of experiences
to each other and to the learning objectives; and he may also
summarize.
II Diffusion Devices

A. Distributed

As Clinton (82) pointed out, of all the diffusion devices, viz., the printed page, film, radio and recordings, and television; the printed page is the only one that does not have the human voice. It may be noted again here that although the devices eg., film, radio and TV do possess the warmth and impact of the human voice, the lack of movement is the principal asset of the printed page. The printed pictures and printed words can be studied, discussed, cut out, filed, passed around, or read at a more convenient time. It is selective of its audience and demands an active mind.

Brim (50) states that one of the strongest arguments in favour of the use of diffusion devices is that they have the lowest cost per capita of delivering units of information. Also as they are able to reach into the home and influence adults who do not participate in discussion groups or attend lectures they are more likely to reach those not otherwise contacted.

An aspect of diffusion devices that has received and is still receiving careful attention from adult educators concerns the intellectual level of the communication, assessed in such manner as the "reading ability required to understand the pamphlet". In 1955, the U.S. Dept. of Health, Education and Welfare (419) called to the attention of parent educators that
the mothers of nearly sixteen million children under five years of age included nearly five million with a grammar school education, or less, and nine million, who had completed only one to four years of high school. It follows that users of mass media must make their material readily understandable.

Two studies completed in 1934 show the printed material of that time to have a high intellectual level. Witmer's (462) research showed the material then was probably too difficult for more than half of the parent clientele and Ojemann's (323) work indicated some three quarters of the material sampled required ability beyond high school. This tendency seems to have changed as there are indications of a trend toward simplicity. A Study by Weng (450) in 1952 analyzed some 75 national and state pamphlets and the analysis of the reading level of a subsample of 44 pamphlets showed 80% to be at the 7th or 8th grade level and the remaining 20% at the 9th or 10th grade or above.

This designing of the media for the reading ability of the users, or readability, was first systematically researched by Gray and Leary (170). They found that clarity and smoothness of style made a written work more readable and more enjoyable. They also discovered that interest and strong motivation could overcome such handicaps as long involved sentences, unusual polysyllabic words and a heavy style.

Morriss and Holverson (301) found that if the written material dealt with familiar concepts, subjects or scenes,
the adult students read and enjoyed writing of a more difficult level than they would otherwise finish. Their cultural conditioning influenced their acceptance of the writing. Lorge (267) said much the same thing when he reported that people not only tend to read what they already know about, a reflection of their interests, but because of their interest, the meaning they give the text grows out of their own background of experience and knowledge.

Carpenter (75) reported that the content of publications appears to be the most important factor for rural audiences. He made an elaborate comparison of the acceptance of a 64 page booklet and a 4 page leaflet on the same subject, by 200 Wisconsin farmers and found the booklet preferred by 47.2% and the leaflet by 36%; 16.8% being undecided. There was no relation of choice to economics, tenure, education or age. For example, although those who were high school graduates or better preferred the booklet, so did those with less than high school experience, and those with some high school education favoured the leaflet.

In 1959 the U.S. Air Force (416) investigated the readability of its literature and took action to determine the readability index of some of its publications. A few years previously, Klare, Mabry and Gustafson (246) analyzed the readability of a standard Air Force study guide and found that when readability was increased (as measured by a standard formula) there was an increase in immediate retention and
reading speed. Also the more readable study guides were judged to be more interesting, and the use of personal rather than impersonal words did not increase the interestingness of the guide. Mowry, Webb and Garvin (302), in their study mentioned previously, investigated the readability of some of the naval publications. In one school most of the analyzed material was at the 10 to 12 grade level but much was at the University level whereas the reading level of 26% of the trainees using these materials was below the grade 10 level, 53% was below the grade 11 level, 97% was below the grade 12 level and 99% was below the university level. At another school only 12% of its trainees could read at the analyzed level of the material. In general, they found that 88% to 97% of the assigned reading material was "over the head" of the trainees in three Naval Air Technical Training Schools.

Standlee and Fattu (380) point out that the U.S. Navy should no longer accept fourth grade reading ability as an indication of functional literacy and the capability to read official publications he will encounter in the Navy. They analyzed eight navy publications for readability and, using the Flesh formulas, rated them from 6th grade to college level in degree of difficulty and human interest level.

Twenty-one years after his work, mentioned previously (170), Gray reviewed the research relating to the reading ability of adults (169), and found the average ability about equal to the average ability of pupils in the early part of ninth grade.
Cowing (94) made a study of changes in the readability of state publications between 1943 and 1960. His analysis was based on samples of 111 publications being distributed in 1943 and 112 that were available in 1960. The % scoring at the desired 6th to 9th grade comprehension level advanced from 49 to 71 and the average sentence length dropped from 20 to 16 words with the average syllable count falling from 153 to 146 per 100 words. On the matter of human interest the % in the "interesting" or "highly interesting" category advanced from 5 to 31%. However 40% continued to score in the dull category although this was a decrease from the earlier figure of 69%.

Many studies have been pursued in an attempt to determine the usefulness of distributed diffusion devices as it is a matter of record that printed material is the most used of all adult education devices. Wilson and Gallup (459) found that bulletin's influenced the adoption of 8.6% of the practices studied and Abell, Larson and Dickerson (1) found that farm papers and bulletins were preferred by farmers in Schuyler County, New York, to other sources of information. Childers and others (81) made a survey of 55 of Oklahoma's 77 county agents to obtain their opinions concerning the understandability and usefulness of the Oklahoma Agricultural Experimental Station bulletins. Their study showed that more attention should be given to clarity in tables and to providing plentiful subheads. Also it seemed clear that agents (and perhaps bulletin authors) need to be more fully advised of the purpose
of experimental station publications and their (agents) relation to extension circulars.

Frutchey (147) investigated the recognized needs of the public for information and attempted to determine the use made of popular publications issued by the Vermont Extension Service. He reported that people are apt to read short easy-to-read publications on topics that interest them. If people ask for a publication they are more likely to read it than if it is sent to them unrequested. But if they do receive an unrequested publication they will usually look it over and if it interests them they will read it. Readership can be forecast by knowing the interests of people. Readers questions indicate the needs they are aware of but not their unknown needs. He also stated that the public is interested in gaining a better understanding of problems as well as learning new skills. He concluded that a mail survey is a practical method of "taking a reading" of readership and the use of publications.

In 1927 Wilson (458) tried to obtain suggestions from farmers on how to make extension bulletins more useful however most of the 1035 farmers said they knew so little about the technique they could not make constructive criticisms. Since that time however the trend in publications has been toward the short bulletin or leaflet. Wilson and Gallup (459) noted that since 1930 county extension agents have gradually increased the emphasis placed upon bulletins and circulars.
Brown (57) made an evaluation of agricultural extension specialist newsletters as a means of disseminating information to county extension agents in Texas. He reported that the agents rely heavily on the specialists' newsletters for the latest factual information in the field of agriculture and home economics. Also that specialists' newsletters are important links in getting information to the field through agents' newspaper columns and radio programs. All findings generally were strongly in favour of more and better newsletters.

Goss (166) investigated the use of agricultural news in the Vermont press from 18 January to 13 March 1954 and found that the daily and weekly newspapers want short stories from 100 to 300 words. Extension service material rated a high percentage of use, - 75% of the agricultural news in the weeklies and 43% in the dailies. Economic news was well used as were animal pathology stories. Stories with a local angle got good acceptance, - especially with weeklies. The daily papers use spot news more frequently than they use information stories. He observed that the extension stories printed received wide distribution. Multiplying column inches printed and newspapers circulated, almost 78,000,000 inches of extension material was sent out in dailies and nearly 10,000,000 inches in weeklies, during the eight weeks.

Troldahl and Lewis (409) conducted an evaluation of reader interest in a dairy newsletter that is distributed to
addresses on a requested mailing list. They reported that about half the respondents read the newsletter without fail and over half mentioned they had found ideas in it they could use. Two thirds list it as one of their sources of daily information and a quarter name it as their primary source. Ninety one percent consider it either "almost always or always - reliable".

In Hall and Delany's (182) study of the use made of Cornell University's Extension Bulletin, "Reupholstering Chairs With Foam Rubber", they found that over half the women who sent for the bulletin never used any other. Also their most frequent suggestion for making Cornell Bulletins more useful was to publicize them more. Although twenty-three percent sent for the bulletin for information only, 10% used it for information only. And women with less schooling used the bulletin to the same extent and in the same way as reported by women with more schooling.

Venne (430) explored direct mail announcements as a way to expand the audience for extension work in 67 of Wisconsin's 71 counties: four primarily urban counties not being used. He reported a response of from 10 to 15% can be expected and it can be assumed that some of those who did not respond already had adequate access to publications. Direct mail announcements will perform a service for about 75% of the respondents. Although 9% of the respondents are very active in extension work, nearly 60% are in the "seldom or never active"
or "no record" category. It was shown that the factors that affect the 10 to 15% return are (1) type of publication offered
(2) number of publications offered (3) design of the card
(4) timing of the card. Also noted was that direct mail
announcements should be confined to listing popular type
publications, easy to interpret and use by the average farmer
and homemaker, - rather than technical or research publications.
He found that a good general rule might be to limit the number
of publications listed on one card to 10 with a concise
description of each included. Finally, the winter months are
probably the best months for mailing, but further research is
needed on this subject before a definite conclusion can be
drawn.

It is realized that the findings of research concerning
the effectiveness of direct mail, or requested mailing list,
printed material should probably be reviewed along with
"handouts", in the Visual, Two Dimensional, non-projected
section; however indulgence is requested as it was considered
to facilitate a more compact and comprehensive treatment if
they could be considered along with the bulk of the research
dealing with printed material in this review of Diffusion,
distributed devices.

Who reads general circulation magazines? A study by
Politz (331) gives us some information on the audiences of
such magazines as Reader's Digest, Saturday Evening Post,
Life and Look.
Generally, people with more education get and read more magazines. About \(6/8\) of the college educated population were "exposed" to one or more issues of the set of four, whereas about \(3/8\) of the less than high school graduates were exposed. This study also pointed out that the higher socio-economic groups not only have a greater chance of being exposed, but are more likely to look into issues several times than are lower socio-economic groups. For example, the college educated make up slightly less than one-fifth of the total adult population but make up better than one-fourth of the audience of the four magazines combined, and contribute nearly two-fifths of the "reading days" of the four combined. The less than high school educated make up slightly more than one-half of the total adult population, make up just under two fifths of the audience of four, and contribute just a shade more than one fourth of the "reading days". With educational levels rising it is to be noted that every addition of 1,000,000 persons to the college educated groups would provide an increase of between 300,000 and 400,000 in readers of these four magazines on the basis of present relationships.

On 3 October 1964, a Vancouver daily newspaper, The Province (335) reported a new diffusion device demonstrated the previous day in Japan. In brief it showed that an entire newspaper can be transmitted to a subscriber's home by ultra-high frequency broadcast. The demonstration in Tokyo used a
transmitted signal from the newspaper office that was picked up by a radio receiver 4 miles away, scanned and printed on chemically sensitized paper at 300 words per minute, complete with photographs. This device would seem to have wide potential use in adult education and its development will be watched with interest.
II. **Diffusion Devices**

B. **Extensions:**

Open circuit TV, radio and recording, motion pictures.

Research pertaining to these extension, diffusion devices was reviewed previously when radio was discussed as a mechanical, audio, illustrative device, and motion pictures and closed circuit TV were considered as two dimensional, projected, visual illustrative devices. When these were previously reviewed it was with reference to their effectiveness as instructional devices in adult education in the total sense and all pertinent research was examined and reported from this inclusive point of view. Using TV as an example, the total effectiveness of TV was considered when it was introduced as a two dimensional, projected, visual illustrative device and not just its effectiveness in a closed circuit viewing situation.

The extension, diffusion devices can also be used as supplementary educational devices, as in the case of the Citizen Forum programs on the CBC Television network, where small discussion groups are built around the televised programs. A study completed by Cook (89) may be reviewed here. His report, called "Tel-lecture" was printed in Adult Leadership, May 1963 and described an extended use of TV that could well have wide application to adult education. He shows Tel-lecture as a fairly effective way of presenting speakers situated in one location, by television to audiences assembled in another,
with the opportunity to ask questions of the speaker and to receive an immediate and spontaneous reply. Basing his study on a Tel-lecture attended by 100 people at La Crosse State College he found that all respondents felt the Tel-lecture to be either a "Very Effective" or "Effective" method of teaching and learning. Sixty-six percentage of the respondents felt the Tel-lecture was "As Effective" as a lecture "in person" and 25% felt it to be "Less Effective". Cook recommends that the Tel-lecture should not be used to replace the individual lecturer who can reasonably attend a group; but it should certainly be considered as a means of bringing to a small group or to an isolated community, good skilful, gifted teachers or lecturers who might otherwise never personally reach such groups.

Clinton (82) tells us that live TV introduces something never seen in films: - real time. The effect is to establish a person-to-person relationship. The feeling of reality is conveyed by the close to life size heads on the screen and the natural distance between the audience and the show. It gives an actor the opportunity to create real continuity.

Each of the four diffusion devices, - the printed page, radio and recordings, TV, and motion pictures or film, has a tendency to become involved in the affairs of one or all of the other three.

It should be noted again that radio and TV are devices for adult education only when they are organized for this
purpose. Of the two, TV has made the greatest advancement as an educational device, - perhaps as a result of the experience gained through thirty years of radio programming. TV, the newest of the diffusion devices, has become the meeting ground for the other media.

Radio cannot seize the eye and is therefore the one mass medium or diffusion device that can serve an active audience.

Anderson (19) uncovered some interesting findings regarding diffusion devices when he studied the problems resulting from fringe migration (the migration of city workers to the suburbs or fringe of the city). He found that (1) Farm and part-time farm families concentrate their listening to one radio station, while non-farm families diversify their listening to include several stations. (2) The metropolitan daily which reaches the largest proportion of farm families is far exceeded in circulation by a second metropolitan daily in reaching part-time farmers and non-farmers. (3) Local weekly newspapers are much more effective in reaching farmers and part-time farmers than in reaching non farmers. (4) The more extensive communications, such as mimeographed material, circular letters, and "do-it-yourself" bulletins, are about equally effective in reaching the large proportions of the three (farmers, part-time farmers and non-farmers) open-country population groupings. (5) Announcements given in two types of communications channels,
such as metropolitan dailies and radio stations, or radio and television news programs, reach nearly all of the population. (6) The local weekly newspaper reaches the population around the community in which it is published. (19)

Long, Hughes Jr., and Bowers (266) made a study of how the farmers in a tobacco cooperative in Knoxville, Tennessee, got their agricultural information and reported that out of the 224 members, 63 received their information from newspapers, 51 got their information from neighbours, 41 from the radio, 22 got theirs from office personnel, 16 members got their information from the "auction floor", and lesser numbers elsewhere. They also found that within any given level-of-education group the tobacco growers who used the newspapers as their principal source of information about the tobacco cooperative had a higher score (answered more questions correctly) than did growers who relied principally upon neighbours for information.

Dickerson (118) made a very detailed study of information sources used by 278 men farmers in Schuyler County, New York. One of the valuable reports she published shows the level of adoption of new farm practices from the information source, - as follows:
<table>
<thead>
<tr>
<th>Information Sources</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm Papers</td>
<td>79%</td>
<td>90%</td>
<td>86%</td>
</tr>
<tr>
<td>Radio</td>
<td>72%</td>
<td>79%</td>
<td>69%</td>
</tr>
<tr>
<td>Neighbours, friends, relatives</td>
<td>68%</td>
<td>64%</td>
<td>62%</td>
</tr>
<tr>
<td>Printed Extension, news, circulars</td>
<td>59%</td>
<td>65%</td>
<td>81%</td>
</tr>
<tr>
<td>Farm bureau</td>
<td>43%</td>
<td>46%</td>
<td>38%</td>
</tr>
<tr>
<td>Oral Extension (talk with Country agent, Extension meetings, demonstrations)</td>
<td>34%</td>
<td>44%</td>
<td>59%</td>
</tr>
<tr>
<td>Salesmen and Dealers</td>
<td>29%</td>
<td>27%</td>
<td>41%</td>
</tr>
<tr>
<td>Other agricultural Agencies e.g. Soil Conservation Service</td>
<td>25%</td>
<td>41%</td>
<td>58%</td>
</tr>
</tbody>
</table>

The low, medium and high levels of adoption are determined by the ratio of approved practices followed to the approved practices applicable, eg. 64 farmers or 23% were in the low range of 0 to .3, 70 farmers or 25% were in the medium range of .4 to .6 and 74 farmers or 27% were in the high range of .7 and over. Seventy farmers or 25% were excluded because their operations did not require adoption of the practices in question. An illustration may be in order here: - using first figures in each case; there were 64 farmers in the low level of adoption group and of this group 51 or 79% used farm papers as an information source. Although multiple answers were counted and the trend is not sharp, there are indications that high adopters tended to specify more of the more technical and more professional sources. (118) This is particularly noticeable in
printed and oral extension and for "other agricultural agencies" such as Soil Conservation Service, the Agricultural Adjustment Administration, and the Farm Security Administration.

Abell, Larson and Dickerson (1) reviewed the research pertaining to sources of information used by farmers and found that the Schuyler County study and thirteen others completed between 1947 and 1956 all more or less agreed and indicated the following overall trends: -

(1) Farm papers rank first or nearly first among farmers as preferred (usual) sources of information.
(2) Neighbours, friends, and relatives is most often in second or third place. In the Schuyler study it ranked fourth.
(3) Radio ranks third to sixth in most of the studies but in this (Schuyler) study it was third.
(4) Printed extension (Farm Bureau News, circulars, Cornell bulletins), which ties for first place in the Schuyler study, ranked lower in most of the others.
(5) Oral extension (talks with county agent, extension meetings, demonstrations) ranks below printed extension in most of the studies but was named "helpful" by more than half of the farmers in the Schuyler study.
(6) Salesmen and dealers and other agricultural agencies rank low in nearly all of the studies. (1)

Damon (110) completed a study in 1957 on the effectiveness of various (practices) devices in disseminating information about public school adult education in California. He sent out
two questionnaires, one to 162 Adult School Administrators and the second to 2591 enrollees in 27 Adult schools; 138 or 85.18% administrators completed and returned their forms. A comparison of the processed results is interesting and informative.

PERCENTAGE OF SCHOOLS REPORTING VARIOUS INFORMATIONAL MEDIA USED

<table>
<thead>
<tr>
<th>Media</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Newspaper stories and pictures</td>
<td>93.48%</td>
</tr>
<tr>
<td>2. Schedules and other printed information</td>
<td>92.03%</td>
</tr>
<tr>
<td>3. Dependence on word-of-mouth publicity</td>
<td>70.29%</td>
</tr>
<tr>
<td>4. Letters or postcards in the mail</td>
<td>65.22%</td>
</tr>
<tr>
<td>5. Letters sent home with day school children</td>
<td>39.13%</td>
</tr>
<tr>
<td>6. Announcements at meetings</td>
<td>36.96%</td>
</tr>
<tr>
<td>7. Displays</td>
<td>23.91%</td>
</tr>
<tr>
<td>8. Talks on Adult education</td>
<td>23.91%</td>
</tr>
<tr>
<td>9. Posters</td>
<td>19.56%</td>
</tr>
<tr>
<td>10. Radio</td>
<td>18.11%</td>
</tr>
<tr>
<td>11. Television</td>
<td>3.62%</td>
</tr>
</tbody>
</table>

PERCENTAGE OF ADULT STUDENTS INDICATING VARIOUS SOURCES OF ADULT EDUCATION INFORMATION

<table>
<thead>
<tr>
<th>Source</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Word-of-mouth</td>
<td>35.93%</td>
</tr>
<tr>
<td>2. Adult school schedule or leaflet</td>
<td>25.05%</td>
</tr>
<tr>
<td>3. Newspaper</td>
<td>17.91%</td>
</tr>
<tr>
<td>4. Letter or postcard in the mail</td>
<td>10.65%</td>
</tr>
<tr>
<td>5. Letter brought home by day school child</td>
<td>3.82%</td>
</tr>
<tr>
<td>6. Talk on adult education</td>
<td>2.97%</td>
</tr>
<tr>
<td>7. Display on adult education</td>
<td>2.28%</td>
</tr>
<tr>
<td>8. Announcement at a meeting</td>
<td>1.08%</td>
</tr>
<tr>
<td>9. Radio</td>
<td>.66%</td>
</tr>
<tr>
<td>10. Television</td>
<td>.54%</td>
</tr>
<tr>
<td>11. Poster</td>
<td>.42%</td>
</tr>
</tbody>
</table>
Administrators think newspapers, printed schedules and word-of-mouth publicity work best. Schedules are the most expensive to use costing $1.13 per unit of average daily attendance compared to $0.18 or less for other devices. Newspaper publicity reaches older persons more than younger persons and women more than men. Word-of-mouth publicity tends to reach new students more than those previously enrolled and also younger adults. Schedules appear to work better in reaching adults previously enrolled and persons above age 25.

Some conclusions were made, as follows:

(1) Favourable word-of-mouth publicity from satisfied students and others who recommend the school brings more students to adult classes than does any diffusion device or publicizing medium.

(2) Newspapers, printed schedules and direct mail contacts attract a fairly large proportion of the students.

(3) Announcements, talks, letters carried by day school children, displays, posters, radio and television reach only a small proportion of the students who enroll for adult education classes. (110)

Porter and Wilson (333) made an evaluation study of a consumer marketing program that had been conducted by radio, television and newspapers in the St. Joseph, Missouri area. Of the 246 persons contacted who did most of the food buying for their households, 88% had been exposed to the particular information during the test week.
79% had been exposed via one medium, 18 via two, and 3% all 3
72% were contacted by some arrangement involving newspapers
28% by television
15% by radio

Something might be said about the physical barriers
that exist for diffusion devices, in addition to the ever
present need for "readability" that has already been discussed
quite fully.

The problem of informing the public is not simple. The
physical barriers are reinforced by psychological barriers, -
past experiences, perceptions, expectations, individual
personality and so on. The physical barriers must be appraised
in the light of the psychological barriers. As Hyman and
Sheatsley (219) point out the physical barriers to communication
merely impede the supply of information. In order to increase
public knowledge it is necessary to present more information
and that the mass audience be exposed to it and that it
absorb the information.

Studies by Nafziger, Engstrom and MacLean, Jr., (306)
and Myren (305), and others, point to definite physical
barriers to communication on topics of general interest to
the public. Their findings were as follows: -

(1) Media containing general information for the public are
    not always available, and not always accessible.
(2) There may not be enough repetition of information.
(3) Much general information for the public may not appear in
the more popular media.
(4) The general public may not possess the verbal or other skills needed for following and understanding the particular information presented. (See previous discourse on "readability" in Distributed, Diffusion Devices). In addition it was noted that effective communication of information depends on: -
(1) The time and space devoted to presenting the information.
(2) The biases and distortions inherent in the particular device or medium.
(3) Editorial or communicator interest and objectivity.
Some Additional Learner Characteristics That Affect the Use of Instructional Devices

The characteristics of the learner must be kept in mind when considering the effective use of instructional communications and teaching devices. It is now usually agreed that Carpenter (72) stated an acceptable position regarding instructional devices generally when he said that the effects of film instruction, within certain limits, depends more upon the characteristics of the perceivers, individuals and audiences, than upon the elemental variables within the films themselves.

With further reference to the characteristics of the learner Hovland and others (210) found that likes and dislikes of a film are related to the film's influence on opinions. On the other hand Ash (25), Heidgerken (191), Twyford (413) and VanderMeer (426) found little or no relationship between interest in films and the information gained from them. In the study of liking and learning from educational television programs, Merrill (294) found similar results.

There is evidence from a number of studies (158), (210), (295), and (436) that persons of high intelligence usually learn more from films than those of medium or low intelligence, although in some cases those of lower intelligence appear to make a greater increment in learning but not enough to surpass the learning of the average or superior students.
Hoban and VanOrmer (204) report that the difficulty of a film depends not only on its subject matter but also on the learner's intelligence, training, or previous knowledge of the subject. There is some evidence that experience in viewing films or "film literacy" develops with increased viewing of and learning from films, and this factor may increase the viewer's ability to learn from the films. This is supported by reports from the Australian Commonwealth Office of Education (86), and VanderMeer (427).

Nelson and VanderMeer (311) reported on the results of modifying the spoken commentary of an animated film for the level of the learner audience and stated that all simplified commentaries were consistently superior to the original commentary (but not significantly), and that the best had the shortest sentences and the most personal pronouns.
CHAPTER IV

COLOR AS AN INFLUENCE IN DEVICE EFFECTIVENESS

Color has been given separate consideration here for although research information pertaining to the effect of color has direct application to most teaching devices, the research and findings with few exceptions (265), (426) in film, and (277), (288), (411) in color as a controllable environmental facility, have been quite well divided between human preferences for colors, in many aspects, and the effectiveness of different colors in advertising copy. A review of the research under both these general headings will be given here.

Most of this research information was found in two Agrisearch reports, December 1955 (4) and March, 1956 (5).

Color Preferences

A teacher competes for group attention and it would appear prudent for him to arrange things so that his bit of information has an advantage over other bits.

As the color of material or device presentation is one of the factors that can be manipulated it is important for teachers to know which color or combination of colors is most effective for the particular material intended for a particular audience. Of the many things that will affect the understanding
of our material the first will be exposure. If the group's attention is not caught by our material, we lose our chance of exposing them to it. Colorful things attract attention and if the group we want to reach prefers the color or colors we use, we increase the chances for exposure.

Color preference has stimulated research for many years. In 1867 Jastrow (229) reported the results of a study of color preference for single colors and for color combinations. He reported that:

1. Blue was chosen by about 1/4 of the subjects and red by about 1/8 of the subjects. (4500 persons at the World's Columbian Exposition).
2. The least preferred colors were orange and its shades toward yellow and red.
3. The darker colors were preferred over the lighter.
4. There was a decided preference for the primary colors as opposed to the intermediate colors.
5. No combination of colors was as decided a favourite as was blue among the single colors.
6. The three most preferred combinations, in order, were: red with violet, red with blue, and blue with violet.
7. The color combinations most generally avoided were orange with green, orange with violet, and lighter orange with lighter blue. (229)

In 1922, Garth (156) reported a very interesting study of the color preferences of 559 full-blooded Indians, 560 whites and 176 people of mixed blood.

### Racial Color Preferences

<table>
<thead>
<tr>
<th>Rank</th>
<th>Indians</th>
<th>Mixed Bloods</th>
<th>Whites</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Red</td>
<td>Blue</td>
<td>Blue</td>
</tr>
<tr>
<td>2</td>
<td>Blue</td>
<td>Red</td>
<td>Green</td>
</tr>
<tr>
<td>3</td>
<td>Violet</td>
<td>Violet</td>
<td>Red</td>
</tr>
<tr>
<td>4</td>
<td>Green</td>
<td>White</td>
<td>Violet</td>
</tr>
<tr>
<td>5</td>
<td>Orange</td>
<td>Green</td>
<td>Orange</td>
</tr>
<tr>
<td>6</td>
<td>Yellow</td>
<td>Orange</td>
<td>Yellow</td>
</tr>
<tr>
<td>7</td>
<td>White</td>
<td>Yellow</td>
<td>White  (156)</td>
</tr>
</tbody>
</table>
In another early study Luckeisch (270) found that the colors whose dominant hues were near the end of the spectrum (blue-violet) were preferred by more people and that the order of preference from high to low was: blue, red, purple, green, orange and yellow.

Other research was carried out later by Dorcus (121), Walton and others (442) and St. George (386). For the sake of convenience or easy reference, the color preferences of both men and women, as reported by the mentioned research, (4) is presented here in chart form.

<table>
<thead>
<tr>
<th></th>
<th>Jastrow</th>
<th>Garth</th>
<th>Dorcus</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Men</strong></td>
<td><strong>Women</strong></td>
<td><strong>Men</strong></td>
<td><strong>Women</strong></td>
</tr>
<tr>
<td>Blue and Red</td>
<td>Blue</td>
<td>Red</td>
<td>Blue</td>
</tr>
<tr>
<td>its related</td>
<td>Green</td>
<td>Orange</td>
<td>Violet</td>
</tr>
<tr>
<td>Colors</td>
<td>Orange</td>
<td>Red</td>
<td>Yellow</td>
</tr>
</tbody>
</table>

Walton and others

<table>
<thead>
<tr>
<th></th>
<th><strong>Men</strong></th>
<th><strong>Women</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td>Red</td>
<td>Green</td>
</tr>
<tr>
<td>Red</td>
<td>Violet</td>
<td>Blue</td>
</tr>
<tr>
<td>Green</td>
<td>Blue</td>
<td>Red</td>
</tr>
<tr>
<td>Violet</td>
<td>Green</td>
<td>Orange</td>
</tr>
<tr>
<td>Orange</td>
<td>Yellow</td>
<td>Violet</td>
</tr>
<tr>
<td>Yellow</td>
<td>Orange</td>
<td>(4)</td>
</tr>
</tbody>
</table>

St. George

The findings from two other surveys, one in Agriculture (12) and the other in Home Economics (379), suggest that men prefer green while women prefer red.

When all the research is considered certain regularities can be noted:

(1) Both men and women appear to be fond of blue.
(2) Violet appears to fall at the middle of the preference range for both groups, rating slightly higher with women.

(3) Red appears to be a greater favourite with women.

(4) Green tends to be at the upper end of the preference range and yellow and orange at the lower end of the range for both men and women. (4)

In general then:

1. For both men and women, blue and red tend to be the more highly preferred colors, while yellow and orange tend to be the less highly preferred.

2. The darker colors tend to be preferred over the lighter colors.

3. Combination of the more highly preferred colors tend to be more attractive than combinations using colors of high and low preference.

4. School children and adults do not differ greatly in their color preferences.

5. The color preferences of women tend to vary more than those of men.

6. Social conditions, environment, and other factors help to determine color preferences. (4)

In deciding the color of the educational device or material some consideration should also be made for the nationality of the people to be involved in the learning situation. As pointed out in Time Magazine, 20 September 1963 (402), although purple is a noble shade in Japan it represents death
in Burma. And in Formosa, red is considered a very lucky color despite the political connotations. These are only two examples of many that could be noted.

**The Use of Color in Advertising and Communicating Generally**

In some early research Nelson (309) found that:

1. More colored than uncolored ads were remembered by 27 people, 5 remembered the same number of black and white as colored ads and 4 remembered more black and white ads.
2. Colored ads were recalled a total of 233 times, uncolored ones 142 times - an advantage of 66% in favour of color.
3. Taking into account the "general" mentions, colored ads were recalled a total of 262 times, uncolored 182 times, - an advantage of 44% in favour of color.
4. Using prevailing ad rates for black and white and four-color, the additional cost for color can be justified on the basis of added recall. (309)

Warner and Franzen (444) made a comparative study of the impact of four-color and black and white ads using one of each as a pair for comparison of results for interest and impact. They reported:

1. In most cases, the colored member of a pair had the advantage in both interest and impact value.
2. The advantage of color appeared to be greater in the case of impact.
3. In interest value, color usually - but not always - outweighed such factors as text, appeal, etc.
(4) For impact, the differences were usually larger for like comparisons, - color with color, and black and white with black and white, - and smaller for unlike comparisons. The investigators noted that in view of the added cost of color a careful consideration of purpose in relation to the cost might curb uncritical use of expensive presentations. (444)

Nixon's (318) study showed that:

1. Color is inferior in attention power. Even in attracting initial attention, it is not nearly as effective as pictures of people.

2. Color is more effective than black and white in attracting initial attention, but it loses this advantage rapidly. After 10 seconds, the black and white competitor becomes slightly superior in getting attention.

3. Color has a considerable effect in increasing memory of that which appears in color. (318)

He urged that color should not be too blindly accepted as a potent attention device and that differences or novelty or change may be more basic attention factors. He also stated that colored ads among other colored ads need not expect to profit especially in terms of extra attention. This last point appears to be contradicted by Nelson's (309) finding of greater differences in impact between colored ads or between black and white than between color and black and white.

Two McGraw-Hill, (213) and (18), studies showed that, without exception, two-color ads were better read than black
and white in every industrial product group. However it was observed that adding color to an ad does not automatically bring gains in readership. Many black and white ads surpassed two-color ads within the same product group because of such factors as more effective copy and illustration. Effective use of color, however, appeared to be of definite help in promoting readership.

A further McGraw-Hill (422) analysis of 946 ads for visibility and for the frequency with which five standard colors were used is summarized in the next chart. Visibility ratings are based on blue = 100, and frequency of use is based on 946 ads = 100%.

<table>
<thead>
<tr>
<th>Color</th>
<th>Visibility</th>
<th>Frequency of Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orange</td>
<td>118</td>
<td>16.4%</td>
</tr>
<tr>
<td>Yellow</td>
<td>113</td>
<td>10.3%</td>
</tr>
<tr>
<td>Green</td>
<td>103</td>
<td>7.5%</td>
</tr>
<tr>
<td>Red</td>
<td>102</td>
<td>55.8%</td>
</tr>
<tr>
<td>Blue</td>
<td>100</td>
<td>10% (422)</td>
</tr>
</tbody>
</table>

An obvious inference is that the more visible colors are not the ones that are most often used.

McGraw-Hill (439) then investigated if the increased cost in the use of color paid for itself in greater visibility or exposure. A survey based on 1063 single and double-page ads appearing in five issues of a McGraw-Hill publication produced the following information table. For purposes of comparison, the average percent of readers who recalled seeing a single-page, black and white ad and the cost of a single-page, black and white ad were assigned a base rating of 100.
All comparisons were in terms of an increase over the base figure.

## Color Visibility and Cost Comparisons

<table>
<thead>
<tr>
<th>Size and Type of Ad</th>
<th>Visibility</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-page black and white</td>
<td>Base</td>
<td>Base</td>
</tr>
<tr>
<td>Single-page two color</td>
<td>34</td>
<td>13</td>
</tr>
<tr>
<td>Double-page black and white</td>
<td>132</td>
<td>100</td>
</tr>
<tr>
<td>Double-page two color</td>
<td>180</td>
<td>127(\text{ (439)})</td>
</tr>
</tbody>
</table>

It seems clear that readers recall two-color ads better than black and white, whether single or double page. In terms of cost, a 13% increase for a single-page, two-color ad will increase visibility by 34%. Similarly, for double pages, an increase of 127% in cost by using two colors increases visibility by 180%. However a decision to use color can be complicated by the fact that cost is measured in dollars and visibility in readers. For example a 100% increase in cost may represent a jump from $300 to $600, while a 200% increase in readers may represent a jump from 10 to 30 readers. The question then becomes, - "Are 20 extra readers worth $300 extra dollars?"

Perhaps the most common use of color in printed work is to combine colored paper and colored ink. The resulting effect may or may not be pleasing, but strictly on legibility, Hackl (179) using psychological tests, ranked the various color combinations as follows: -

1. Black on Yellow  
2. Green on White  
3. Blue on White  
4. White on Blue  
5. Black on White  
6. Yellow on Black  
7. White on Red  
8. White on Orange  
9. White on Black  
10. Red on Yellow  
11. Green on Red  
12. Red on Green (179)
The particular shade of any color is, of course, an important variable. Important too, is the fact that legibility is only one of the factors determining the effective use of color.

Warden and Flynn (443) confirmed an old belief that darker colors tend to make things look heavier and smaller, and lighter colors tend to make things look lighter and larger.

Most of these research findings, although pertaining directly to advertising, have application to many of the devices used in the teaching of adults, whether the device is three dimensional, printed, or projected, or other. The use of color is accepted as an important consideration in teaching when it is realized that teaching depends on communicating and communicating relies on bits of information and "exposure" or the "effectiveness of the advertising".

These discussed advertising research results (5) are collected and presented here for easy reference: -

(1) Other factors being equal, people tend to remember colored objects better than uncolored objects.
(2) Printed material in color tends to get higher readership than similar material in black and white.
(3) For like content, color is more effective than black and white in attracting initial attention.
(4) Orange and yellow tend to be highly visible colors; green, red, and blue tend to have low visibility.
(5) Red is the most frequently used color although it is the next to lowest in visibility.
(6) The most highly legible color combinations are in order, black on yellow, green on white, blue on white, white on blue, black on white.
(7) The least legible color combinations are red on yellow, green on red, and red on green.
(8) Darker colors tend to make things look heavier and smaller.
(9) Lighter colors tend to make things look lighter and larger.
CHAPTER V.

SUMMARY AND CONCLUSIONS

There has been much research completed in the last thirty years that compares the relative effectiveness of several instructional devices in adult education. Some of this valuable and appreciated research was reviewed previously when dealing with the relative effectiveness of the Diffusion Devices, - the distributed (all types), and radio and TV. Other comparisons made by Gibson (159), Collican (84) and Tait (395) point up the comparative effectiveness of several teaching devices; but additional comparisons will be made again here in the Summary section for they do indicate the relative effectiveness of many of the devices and bring us, in a natural way, to a point where generalizations are in order.

In 1932, Hearne (190) investigated the factors which affect the influences of the meeting as a means of extension teaching, in the field of agriculture. He used a population of 893 adults at 32 meetings and the results reported were as follows:
<table>
<thead>
<tr>
<th>Presentation Method</th>
<th>% of Farmers Exposed Who Were Influenced</th>
<th>Practices Changed per Farm Attributed to Meeting (all farms)</th>
<th>Final Index</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Index 1/ Percent</td>
<td>Index 1/ Percent</td>
<td></td>
</tr>
<tr>
<td>Lecture &amp; Slidefilm</td>
<td>148  56.6</td>
<td>163 .88</td>
<td>155</td>
</tr>
<tr>
<td>Lecture &amp; Chart</td>
<td>123  47.2</td>
<td>161 .87</td>
<td>142</td>
</tr>
<tr>
<td>Lecture &amp; Local Leader</td>
<td>117  44.8</td>
<td>139 .75</td>
<td>128</td>
</tr>
<tr>
<td>Lecture &amp; Discussion</td>
<td>117  44.8</td>
<td>126 .68</td>
<td>121</td>
</tr>
<tr>
<td>Lecture Only</td>
<td>100  38.3</td>
<td>100 .54</td>
<td>100</td>
</tr>
<tr>
<td>All Meeting</td>
<td>46.1</td>
<td>.73</td>
<td>(190)</td>
</tr>
</tbody>
</table>

In each case the figure for the lecture-only method was considered 100 and the index for each of the other methods was calculated from this. The final index, 2/, was calculated by adding the index for percentage of farmers influenced to the index for practices changed per farm. The resulting sum for each method was divided by sum of the indices for the lecture only method i.e. 200, after multiplying by 100. It is apparent that the lecture-only method of presentation was the weakest of the five studied.

Schaffter, (356) in reporting on the training of young women for military service, determined that although many teachers in women's service training schools singled out visual aids for specific approval, even more of them approved a combination of various teaching methods usually including
visual aids. She recorded several proposals, as follows:

1. Varied methods of instruction to meet group needs, stressing applicatory phases and performance testing.
2. A combination of lectures and film.
3. The intensified training method making use of visual aids, teacher demonstrations and field trips.
4. The close coordination between films and classroom work; the lecture method; and student participation.
5. The method of presentation, the liberal use of conferences, the constant emphasis on morale and leadership, the valuable experiences which evolved from group living, the active program of health and physical fitness have contributed many splendid ideas which may be included in civilian school programs. (356)

As reported previously, Torkelson (408) found that with students of superior ability there was little difference in the comparative effectiveness of a mock-up, a cutaway and a series of charts and with groups of average ability the mock-up was favoured over manual illustrations and transparencies.

As reviewed earlier, Swanson (393) investigated the relative effectiveness of training aids designed for use in mobile training detachments and employed by instructors in conjunction with a lecture presentation. The devices used and studied were operating mock-ups, non-operating mock-ups, cutaway mock-ups, animated panels, charts, and symbolic diagrams. The results of this study showed that there was no appreciable difference in effectiveness among the various
training aids employed. However, the results also suggested that simple and cheap training aids used with a well prepared lecture may be as effective as complex or expensive ones. Two years later, Swanson and Aukes (392) made an evaluation of training devices used in the teaching of B-47 Fuel, Hydraulic and Rudder Power Control Systems to Air Force personnel, and, once again, the study failed to show any significant differences in effectiveness among the various training aids involved, in terms of test scores immediately after the lecture and 6 to 8 weeks later.

In 1954 Newman and Highland (315) made an experimental comparison of four methods of teaching a five-day course in "Principles of Radio" and reported that instruction by Film and TV could reduce instructional time by about 20%. They added that a subject might be taught for 1 or 2 hours per day by film but it is doubtful if 8 hours per day of instruction could be given by film, - due to resultant fatigue and eye strain. More important they noted that the difference between effective and ineffective instruction seems to depend largely on factors that are internal to a particular presentation rather than being dependent on the method of presentation. The U.S. Air Force reported a similar study in 1956 conducted by the same two gentlemen, Newman and Highland (314). This time matched classes were taught a 5 day course in Principles of Radio by:
(1) Instructors rated above average in instructional ability, or
(2) Workbook and tape recordings, or
(3) Mimeographed notebook, or
(4) Tape recordings and slides.

The post course examination showed no appreciable difference among the classes taught by a mass media method and that taught by an instructor.

Bodenhamer (42) studied the effect of presenting informative speeches with and without the use of visual aids to voluntary adult audiences and reported the following.
(1) Adult audiences learned more from speeches supplemented with visual aids.
(2) There was no difference in the increase in learning derived from visuals between lower age groups, and higher age groups.
(3) Adults of higher levels of education benefited more than adults of lower levels of education from the use of visuals.
(4) Adult audiences presented an informative speech with visual aids perceived the visual aids as increasing the effectiveness of the speech to a higher degree than adult audiences presented the speech without visuals.
(5) Increase in educational level was positively associated with the belief that visuals add to the overall effectiveness of a speech. (42)

The use and effectiveness of instructional devices in adult education must be, to some extent, conditioned by the needs and biases of the group. There have been several
research studies reported which indicate that what an observer or student perceives is not solely determined by his physical capacities as perception involves the needs of a person, his biases, his attitudes, his whole being. Communicators and teachers must realize that their messages will be interpreted in the light of needs and biases. Levine, Chein and Murphy (262) illustrated that a state of bodily need can alter the perception of the environment when they showed that hungry people perceive more food items in response to ambiguous stimuli than do people who are not hungry. Another interesting research work, completed by Bruner and Goodman (59), which has not been validated for adults but which may have some application, could be reviewed here. They found that children tended to estimate all coins to be larger than they really were. The size of the over-estimates increased successively for nickels, dimes and quarters, but dropped somewhat for half-dollars. Another group of children were required to estimate the size of cardboard discs instead of coins and in this case there were practically no overestimates. It was also found that children with less money, from poorer homes, made larger overestimates of coin size than did the rich children. Again rich children overestimated only the size of the half-dollar whereas poorer children tended to estimate all coins larger than they really were.

In another study in the same theme Cooper (92) examined a communication - persuasion situation and demonstrated that
when a communicator sends a message, he will likely inject his own biases into it. He reported that the communicator's (or teacher's) message contains information about the way in which he has thought of the event and, in addition, protects his own self or ego. The receiver (or student) perceives messages according to his ego needs. The messages (or information bits or education) that fits the receiver's ego needs are perceived as "good" while those that do not are evaluated as "poor". The receiver (or student) needs to accept, reject, or intercept in order to protect his ego.

Assuming that we know that students will interpret information according to their individual motives, we still do not know for sure which needs and motives are relevant. Successful teaching may be a question of first assessing the relevant needs and motives of students (or receivers) and then designing communications, - the teaching situation complete with devices, to fit in such a way as to result in a "true" or the best possible representation of the event. This type of teaching is not easy. No matter how we view the task, the situation is clear: - people perceive what they need.

In review, it may be mentioned here that the 120 research studies pertaining to teaching devices, reported in the "Encyclopedia of Educational Research" by Hoban, Finn and Dale (202), and also the extensive review of pertinent research reported in "The A-V Bibliography" by McClusky (278), support
the claim that teaching devices, when properly used in the
teaching situation, can accomplish the following: - (202, p. 84)

(1) They supply a concrete basis for conceptual thinking
and hence reduce meaningless word-responses of students.
(2) They have a high degree of interest for students.
(3) They make learning more permanent.
(4) They offer a reality of experience which stimulates
self-activity on the part of pupils.
(5) They develop a continuity of thought; this is
especially true of motion pictures.
(6) They contribute to growth of meaning and hence to
vocabulary development.
(7) They provide experiences not easily obtained through
other materials and contribute to the efficiency, depth,
and variety of learning. (202, p. 84)

These points represent the distillation of a vast amount of
research by many investigators.

The governing principle for the use of a particular
teaching device should be that it is better than any other
device or material for that specific teaching situation; if it
is not better, its use is not justified.

As Brunner (60) said, "Most authors agree that adult
education can be successfully conducted using any audio-visual
aid (device) or combination of aids, and that the question of
effectiveness must take into consideration the habits and
abilities, (including needs and biases, as mentioned previously)
of the potential participants with regard to the technique"
(and device).

In conclusion it can be said that in this review of
the research pertaining to the use of instructional devices in
adult education we have seen that the judicious use of these
devices can improve the effectiveness of most teaching
situations, - whether imparting knowledge or conveying a skill or bringing about a desired change in attitude.

It was shown that much more and better use could and should be made of film and TV in the teaching process. Also that care must be exercised to ensure that the material used fulfils the requirements of "readability" and "length" for the group concerned, and that the factor of color is always considered as a controllable component of the device, - whether printed matter, or other, in the overall learning situation.

The size of the group involved in the learning process was shown to be an important consideration and a definite factor that can modify the effectiveness of the learning that can occur.

The theory behind the effective use of a three dimensional instructional device or mock-up turned out to be rather more complicated than it seemed at first encounter. It was shown to depend on the teaching objective, - whether the presentation of information knowledge, or the measurement of performance to a criteria, or the improvement of performance for ultimate transfer to the actual equipment.

It was found that there is still a large segment of the North American population that can be reached more easily by radio than any other medium.

Also, the effect of a well designed and advertised "exhibit" or "result demonstration" can make very significant contributions to adult education.
Some surprise was experienced in finding the tremendous amount of research on programmed instruction that had been completed in recent years, and the promising, wide-ranging application of programmed instruction to such a variety of teaching situations. Also the advances that have been noted in sleep-learning are quite remarkable.

It would seem that the device reported as "tecknamation display" will probably enjoy some degree of popularity in the near future as it is relatively inexpensive and very effective.

As the demand for more and more education becomes more widespread and accepted as a requirement for more people, greater use will be made of any of the devices that can be used to help speed up the reading process, particularly the reading pacer.
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Appendix I.

The Family Tree of Instructional Devices (figure 3), is a graphic presentation of the suggested typology illustrating the device differentiation, relationships and organization.
Family Tree of Instructional Devices

- Live
- Mechanical
- Three Dimensional
- Two Dimensional
  - Non-Projected
  - Projected
- Group Size
- Arrange-ment of Learners
- Audio
- Visual
- Practice
- Drill
- Performance
- Physical
- Organizational
- Illustrative
- Re-Inforcing
- Environmental
- Distributed
- Extension

Instructional Devices for Individuals and Groups

Instructional Diffusion Devices

The Teacher
Appendix II

The chart shown as figure 4 is presented to assist in classifying the effectiveness of instructional devices according to their degree of abstraction or concreteness and with reference to the relative amount of student participation possible in learning situation use.
A Chart to Assist in Classifying the Effectiveness of Instructional Devices According to their Degree of Abstraction or Concreteness and with Reference to the Relative Amount of Student Participation Possible in Learning Situation Use.

<table>
<thead>
<tr>
<th>Degree of Participation or Sense Involvement of the Student</th>
<th>Degree of Device Abstraction</th>
<th>Degree of Device Concreteness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passive: minimum faculty involvement. No provision for any student participation.</td>
<td>Abstract: only learned symbolic reference to learning experience.</td>
<td>Direct concrete Experience</td>
</tr>
<tr>
<td>Limited involvement of senses possible. Some provision made for student participation.</td>
<td>Semi-Abstract: words only in generalizations - without reference to a particular teaching-learning situation.</td>
<td>Simulated direct experience</td>
</tr>
<tr>
<td>Limited sense involvement provided for all or most students.</td>
<td>Somewhat removed, - communication has some relation to direct experience.</td>
<td>Lecture with graphic aids; words with reference to illustrations of learning situation.</td>
</tr>
<tr>
<td>Opportunity provided for extensive and sustained sense involvement.</td>
<td>Direct concrete Experience</td>
<td>Lecture accompanying the real learning situation.</td>
</tr>
<tr>
<td>Full sense participation in learning situation. Maximum faculty involvement.</td>
<td>X Group discussion</td>
<td>Use of actual equipment in controlled learning situation.</td>
</tr>
</tbody>
</table>

X These represent combination of abstraction and participation which are logically impossible.
The chart (figure 4) is an adaptation of that suggested by Clinton (82). He entitled his "A Scale for Classifying Educational Techniques According to Degree of Abstraction From Direct Experience of Content and Degree of Participation of the Student in the Learning Experience."

Much of what he said with reference to "techniques" is readily applicable to "devices". The extent and duration of overt participation in the learning experience where a device or devices is/are used depends to a degree upon individual and situational factors. Some learning situations make no demands upon the student; others require limited participation. All possible devices may be arranged in an arbitrary scale according to the degree of overt participation permitted or required or inherent, in the use of the device.

An "abstraction scale" may be regarded as a continuum along which devices may be located with respect to the polar ideals of concrete and abstract, according to the degree of removal from reality or the symbolism inherent in the use of the device.

In figure 4 the vertical dimension represents an arbitrary scale of overt participation possible in the device use for a learning situation, modified to permit inclusion of those aspects of the device which tend to facilitate identification or ego involvement.

The horizontal dimension represents a succession of five points along the concrete - abstract continuum. The
chart provides a means of classification which discriminates among devices according to those aspects of participation in the learning situation which are operable because of the inherent characteristics of the device and are, therefore, within the control of the teacher, or agent, and agency.

A resolution of the two considerations, degree of concreteness and degree of participation or ego involvement gives a measure of the degree of device effectiveness, and this was, basically, Hoban's (27) original presentation (figure 1). He stated that the value of a teaching device is a function of its degree of reality, of the nature and extent of the learner's experience, of the objectives of instruction in the particular learning situation and of the intellectual maturity of the learner. He generalized on the relative effectiveness of the various teaching devices by saying it is in direct ratio to the individual's stage of learning and development.