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ABSTRACT

A technical data file concerned with the technology of Instructional System Development suitable for a variety of users was developed. The file was prepared in a way amenable to later computerized storage and retrieval. General information sources and indexes of highly probable relevance were reviewed with key words and relevant specialty journals covering the period 1950 to 1973 were searched. Abstracts of articles providing opinion, new methodology, evaluative summary and literature reviews were of a summarizing descriptive nature. Abstracts of articles reporting sampling studies, correlational analysis, and experimental data were prepared more comprehensively so that they might often be used in lieu of the article. A common format was used with a bibliographic/indexing information page and an evaluation checklist being included. The principal results of the effort are as follows: 1) a paper file of 2,693 abstracts, 2) a card file of titles, 3) a coordinate index, 4) a comprehensive key work index and bibliography, and 5) MT/ST tapes of 1,950 of the abstracts. Incidental to the development, comprehensive guidelines for abstracting this type of literature and a compendium of author-noted research-and-development needs were prepared. (Author)

AFHRL-TR-73-41

AIR FORCE HUMAN RESOURCES LABORATORY

DEVELOPMENT OF A TECHNICAL DATA FILE ON THE DESIGN AND USE OF INSTRUCTIONAL SYSTEMS

By

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December 1973

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This technical report has been reviewed and is approved.

Gordon A. Eckstrand, Chief
Advanced Systems Division

Approved for publication
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This report describes the development of a technical data file concerned with the technology of Instructional System Development suitable for a variety of users. The file was prepared in a way amenable to later computerized storage and retrieval. General information sources and indexes of highly probable relevant content were reviewed with key words and relevant specialty journals covering the period 1950 to 1973 were searched. Abstracts of articles providing opinion, new methodology, evaluative summary and literature review were of a

20. (continued)

summarizing descriptive nature. Abstracts of articles reporting sampling studies, correlational analysis, and experimental data were prepared more comprehensively so that they might often be used in lieu of the article. A common format was used with a bibliographic/indexing information page and an evaluation checklist being included. The principal results of the effort are as follows: (1) a paper file of 2,693 abstracts, (2) a card file of titles, (3) a coordinate index, (4) a comprehensive key word index and bibliography, and (5) MT/ST tapes of 1,950 of the abstracts. Incidental to the development, comprehensive guidelines for abstracting this type of literature and a compendium of author-noted research-and-development needs were prepared.

PREFACE

This report was prepared by Applied Science Associates, Inc. (ASA), Valencia, Pennsylvania, under Air Force Contract F33615-72-C-1884. The work described herein was accomplished under Project No. 7907, Conditions of Effective Training and Transfer. The project was administered by the Advanced Systems Division. From contract initiation on 15 June 1972 through 31 December 1972, the technical monitor was Horace H. Valverde (now retired). Dr. Theodore E. Cotterman assumed the technical monitorship of the contract for the final months of the effort. Sanford P. Schumacher was the principal investigator.

This report, the first of four volumes prepared under the contract, is a final technical report.[1] It covers the work accomplished from 15 June 1972 through 15 June 1973.

The author wishes to acknowledge the cooperation and assistance of the many individuals from ASA who contributed to this effort. Zita Glasgow, Margaret Nesbitt, and Dr. Robert Swezey made many valuable contributions to the developmental activities. Special appreciation is expressed to Dr. Richard B. Pearlstein and Patricia W. Martin, who supervised the efforts of the abstractors. The diligence of the abstractors including, Jan Berlin, Sylvia Sue d'Ambrosi, Christine Doll, Peter Fehrenbach, Kenneth Hausman, Susan Koh, Gale Kornhauser, Jane Reynolds, Kathryn Sharretts, Ann P. Smith, Elissa Weidaw, and Marlo Wiggans made the file possible. Also acknowledged is the work of Ann Kocher, Judy Schumacher, and Ethel Westerman who typed the abstracts on the MT/ST and performed the numerous other clerical and secretarial tasks so graciously. And finally, special thanks are due to Susan Colwell who not only organized the production of the file and

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[1] The following technical reports were prepared also:

Schumacher, S. P., Swezey, R. W., Pearlstein, R. B., & Valverde, H. H. *Guidelines for abstracting technical literature on instructional system development.* Dayton, Ohio: Air Force Human Resources Laboratory, Wright-Patterson Air Force Base, June 1973, in press. AFHRL-TR-74-13.

Schumacher, S. P., Pearlstein, R. B., & Martin, P. W. *A comprehensive key word index and bibliography on instructional system development.* Dayton, Ohio: Air Force Human Resources Laboratory, Wright-Patterson Air Force Base, June 1973, in press. AFHRL-TR-74-14.

Schumacher, S. P. & Wiltman, S. *A compendium of research and development needs on instructional system development.* Dayton, Ohio: Air Force Human Resources Laboratory, Wright-Patterson Air Force Base, October 1973, in press. AFHRL-TR-74-15.

supervised the typing of the abstracts, but also handled the countless details without a hitch. Additionally, the author acknowledges the assistance provided by the following persons: Mr. William Mace, Air Force Foreign Technology Division; Dr. Ross Morgan, Air Force Human Resources Laboratory; and Mr. Frederick L. Scheffler, University of Dayton.

SUMMARY

Purpose

The purpose of this work was the development of a technical data file concerned with the technology for Instructional System Development (ISD) suitable for a variety of users. The file was to be prepared in a way amenable to later computerized storage and retrieval.

Approach

Considerable initial attention was given to planning and testing the major processes involved. These are (1) identification of items for inclusion, (2) abstracting individual documents, (3) decisions regarding indexing, formatting, and other particulars of file development, and (4) production of the file. In order to accomplish the selective search (necessitated by the limited nature of the effort) the best procedure seemed to be to review general information sources and indexes of highly probable relevant content with key words and also to search relevant specialty journals covering the period 1950 to June 1973. Abstracting was accomplished by a technical team which had (as individuals) received careful pretraining in the designed procedures and which was continuously monitored as to output quality. A detailed handbook or guidelines on specific procedures was available for training and for use during the work. Abstracts of articles providing opinion, new methodology, evaluative summary, and literature review were of a summarizing descriptive nature. Abstracts of articles reporting sampling studies, correlational analysis, and experimental data were prepared more comprehensively so that, for many purposes, the abstract could be used in lieu of the article. A common format was used with a bibliographic/indexing information page and an evaluation checklist being included in addition to the main abstract. Thus, provisions were made for convenient storage and retrieval and comprehensive coordinate indexing. Production was via IBM MT/ST so that hard copy as well as tapes readily convertible for computer input were prepared. Special procedures for preparation were followed to ease the difficulties of any later computerization.

Results

The principal results of the effort are as follows: (1) a paper file of 2,693 abstracts, (2) a card file of titles, (3) a coordinate index, (4) a comprehensive key word index and bibliography, and (5) MT/ST tapes of 1,950 of the abstracts. Incidental to the development, comprehensive

guidelines for abstracting this type of literature and a compendium of author-noted research-and-development needs were prepared.

Conclusions

Although not a complete file on instructional technology, the file developed does represent a considerable proportion (perhaps twenty percent) of the relevant literature. Furthermore, by selectively including the recent literature of 1950 onward, the utility of the file is enhanced. The comprehensive indexing and evaluation coding still further improves the immediate usefulness as well as the potential for using the file as the basis of a computerized system. In short, the file represents a good start toward a complete information system on instructional technology.

This summary was prepared by T. E. Cotterman, Training Technology Branch, Advanced Systems Division, Air Force Human Resources Laboratory

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SECTION I - INTRODUCTION

Purpose

The purpose of this effort was to prepare a comprehensive set of descriptive and informative abstracts of the literature related to the technology of Instructional Systems Development (ISD). It was planned that the abstracts might later be used as input to a computerized technical data file that will provide prescriptive information for ISD personnel (including researchers, managers, and designers of instructional systems). Until that time, the abstracts will be used in a paper-file format.

Background and Discussion

The technology of ISD evolved over the past two decades through the efforts of learning theorists, educators, educational researchers, and human factors researchers. In each phase of development the technology has been applied with great vigor (and varying amounts of success) to military, industrial, and educational learning situations.

Perhaps in part because of the variety of its foundations and applications, the gulf between instructional technology and its implementation continues to persist to an unconscionable degree. Although many problems in instructional technology remain to be solved, much of the necessary information is available in the relevant technical literature. Ready access to such information is needed not only by the designers and managers of instructional systems, but also by the researchers whose efforts may contribute to the refinement of the technology.

Sources of Information

Reference to the information is found in a variety of sources and locations. In many cases, practitioners have little time available for a comprehensive search for available abstracts, much less for the acquisition and study of the original documents--an activity that is often required because the available abstracts do not contain information to expedite the decisions of either the instructional system designer or researcher.

The literature relating to the technology of ISD is varied. The major types of documents are:

1. Opinion articles
2. Methodological developments

3. Evaluative summaries

4. Literature reviews

5. Bibliographies

6. Statistical sampling studies

7. Correlational research studies

8. Research studies in which variables are manipulated

User Needs

Depending on their particular needs and the amount of time available, designers and managers (practitioners) as well as researchers may need information from any or all of the eight kinds of documents. To a large extent, properly prepared abstracts of research studies can eliminate the requirement for returning to the original documents. Abstracts of the other types of documents can greatly facilitate the decision as to whether the original document should be viewed.

Although there is considerable overlap, the needs of the instructional system designer and the researcher are not always identical. The designer and managers must develop an operational system in the face of a host of resource limitations and time constraints. As practitioners, they encounter, for instance, predictable problems for which specific guidance is required (e.g., the development of objectives, sequencing of objectives, selection or development of media). Descriptive abstracts stating the nature and scope of a specific document will serve the practitioner's needs--if the abstracts and original document are appropriately indexed (accessible), and if the document is evaluated in terms of the practitioner's needs.

Researchers, especially during the problem definition and hypothesis formulation phases of their work, need more detailed abstracts that describe the purpose, method, results, and supportable conclusions of related research work. The researcher needs informative abstracts of research studies which concisely present information of high probable significance in the original record. When combined with an appropriate evaluation, such abstracts obviate the need for the researcher to obtain many original source documents. And, they are also useful for the practitioner who requires this level of detail for his instructional system design activities.

Finally, all types of users can use prescriptive information of the sort contemplated for the computerized file. With appropriate coding and indexing the computer can search for relevant data items from both descriptive abstracts (prepared primarily for the practitioner) and informative abstracts (prepared primarily for the researcher). For example, an English language (i.e., non-computer) version of a user query to the computerized

file might be: "List summaries of all methodological development articles (evaluated as useful for ISD) that discuss the use of color as a medium. Also, list conclusions of experimental studies (only those judged methodologically sound) that investigate the use of color as a medium."

This example, representing selective retrieval, only hints at the potential uses of a prescriptive search-and-retrieval system. For instance, a user of the prescriptive file might query as follows: "Tabulate the results of all methodologically sound experimental studies published since 1965 which found that the use of color had a significant effect on learning." Or, going one step further, a user could query: "Given the following characteristics of the learning task, does the literature support the use of color as a medium?" Obviously, such queries require extensive coding and indexing of the abstracts, as well as a sophisticated search-and-retrieval system.

The Status of the AFHRL Technical Data File

Although the implementation of a prescriptive search-and-retrieval system remains to be accomplished, the necessary ingredients exist. The feasibility of the computerized file has been demonstrated (Reference Number 6). The present effort has produced comprehensive abstracts of approximately 20 percent of the relevant technical literature and all these appropriately indexed and coded for use in a computerized file. Until a computerized search-and-retrieval system is implemented, the file will be available in notebooks in a form that can be easily converted to computer input.

Report Overview

The remainder of this report describes the methodology used in literature search, the process used in preparing the abstract, and a summary of the results of the effort. The report concludes with three appendixes. The first contains examples of a descriptive and an informative abstract. Appendix II contains the special typing requirements for preparing abstracts suitable for computer input. The third appendix lists the references for 45 specific journal articles which are relevant to ISD but which were not abstracted.

SECTION II - METHODOLOGY

Introduction

This section describes the four major processes followed in developing the technical data file:

1. The literature search
2. The abstracting process
3. The file development
4. The production of the file

The development of these procedures was facilitated by earlier work in abstracting material for the Handbook for the Designers of Instructional Systems (Reference Number 7).

The Literature Search

Overview

It was estimated that abstracts of 10,000 to 15,000 documents could reasonably be prepared as part of a technical data file on the design and use of instructional systems. However, it was clear from the outset that the current effort could only scratch the surface of the relevant literature. In fact, about 20 percent of the potentially relevant documents were abstracted. The objective was, therefore, to search for and select documents of highest potential benefit to users of the file.

The following general guidelines for the search were established:

1. Establish a list of search terms (key words) relative to ISD.
2. Search general information sources of high probable relevant content first. Such sources offer a number of advantages:
    a. They are usually comprehensively indexed. The index provides a quick method for examining a large number of document titles and search terms.
    b. They sometimes contain mini-abstracts that facilitate selection of relevant documents.
    c. Cumulatively, they provide a reasonably comprehensive listing of titles produced since 1950.

3. Search specific journals containing a reasonably high proportion of relevant articles and studies. Search the most recent volumes first, and work backwards in proportion to the payoff in each journal.

At the conclusion of the effort, a general-level search covering 1950 through June 1973 was completed. Furthermore, a detailed search of the most recent volumes of relevant journals was completed, and some journals providing especially useful studies or articles were abstracted from 1950 to the present.

The Search Terms

Early in the project, a list of search terms relevant to ISD was developed. The development of the listing was conducted in four stages:

1. The "first cut" was developed from existing key word lists and from specific, highly relevant documents. The sources used were:

    a. Subject indexes from Tufts Human Factors Bibliography (Reference Number 5), American Psychological Association, and Educational Resources Information Center.

    b. Air Force Manuals 50-1 and 50-2 (Reference Numbers 2 and 3).

    c. Department of the Army CON Reg-350-100-1 (Reference Number 4).

    d. Air Training Command Library, XPTIA, Training Research and Development Directorate.

2. The list was expanded to include media-related terms gleaned from the review of specific documents.

3. The list was further expanded to include common experimental variables gleaned from the review of specific research studies.

4. The final list was reviewed for consistency with sources. Redundancies were eliminated, and potentially confusing or ambiguous terms were defined.

The completed list of over 600 common search terms and their definitions are given in the abstractor's guidelines (Reference Number 9).

Sources Searched

The list of search terms was used to key the search of the 11 general information sources in Table 1. The general sources were employed for three purposes:

1. To find relevant general documents and texts for which descriptive abstracts would be prepared.

2. To find government and commercial agency technical reports of research studies for which comprehensive informative abstracts would be prepared.

3. To build (from relevant titles) a preliminary list of journals that probably contain relevant articles and research studies.

The list of 48 journals searched during the project is shown in Table 2.

Searching entire journals offered two advantages over expanding the search of the general sources:

1. The comprehensiveness of the search was insured. Search of specific journals facilitated bookkeeping, reduced redundancy in the search effort and permitted clear definition of the extent of the search.

2. Specific competencies of each individual abstractor could be compared at this early stage to the subject matter and to the levels of statistical and technological sophistication of each journal to be abstracted. This permitted abstracting assignments that insured the abstractor's full comprehension of the material to be covered.

The journals in Table 2 were generally searched in the following manner. Titles and abstracts (when available) of 1970-1972 issues were reviewed. Next, the preceding three years' issues of each journal were reviewed. Finally, the process of reviewing back issues in increments of three years was continued only for journals generally exhibiting a high proportion of relevant documents.

The Selection Process

The major inputs for selecting relevant documents were the titles of reports and journal articles, and their associated descriptive abstracts (when available). The following five-step selection process was used to select articles to be abstracted from the list of titles and abstracts.

STEP 1: Reject the document if it is primarily concerned with:

a. Animal training

Table 1

General Information Sources

SOURCE	YEARS
Human Factors Bibliographic Series (Ref. Number 5)	1950-1965
Other Bibliographies (e.g., Reference Number 11)	1950-1965
Organizational Bibliographies (AIR, ASA, HumRRO, LRDC)	1950-1972
Miscellaneous Sources (e.g., Reference Number 12)	1950-1971
ERIC/CIJE	1966-1972
Defense Documentation Center	1950-1971
Psychological Abstracts	1966-1971
Annual Review of Psychology	1950-1972
Bibliographic Index	1950-1972
Education Index	1950-1972
United States Office of Education (USOE) Research Reports	1956-1972

Table 2

Journals Searched

American Behavioral Scientist	Journal of Experimental Education
American Education	Journal of General Psychology
American Educational Research Journal	Journal of Programmed Instruction
American Journal of Psychology	Journal of Psychology
American Psychologist	Journal of Reading Behavior
Audiovisual Instruction	Journal of School Psychology
AV Communication Review	Journal of Verbal Learning and Verbal Behavior
California Journal of Educational Research	NEA Research Bulletin
Comparative Education Review	Perceptual and Motor Skills
Contemporary Education	Personnel Journal
Educational and Psychological Measurement	Personnel Psychology
Educational Record	Psychological Monographs
Educational Research Bulletin	Psychological Record
Educational Screen and Audiovisual Guide	Psychological Reports
Educational Technology	Psychological Review
Harvard Educational Review	Psychology in the Schools
Human Factors	Quarterly Journal of Experimental Psychology
Journal of Applied Behavior Analysis	Research Quarterly
Journal of Applied Behavioral Science	Review of Educational Research
Journal of Applied Psychology	School Management
Journal of Communication	School and Society
Journal of Educational Psychology	Training and Development Journal
Journal of Educational Research	Training in Business and Industry
Journal of Experimental Analysis of Behavior	USAF Instructors Journal

b. Training of children

c. Unusual learning environments such as:

(1) Weightlessness

(2) Under water

(3) Centrifuge

d. Unusual trainee states such as:

(1) Fatigue and sleeplessness

(2) Drug states

(3) Brain damage

e. "Irrelevant" tasks such as:

(1) Music

(2) Art

(3) Maze learning

STEP 2: Reject the article unless it is related primarily to instruction as reflected in the ISD process. This includes determination and specification of training requirements, operationalization of training objectives, development of testing procedures, development of instructional methods, validation of instructional methods, application of instructional technology, and evaluation of the instructing system.

STEP 3: Reject the article unless the title or abstract contains or implies the following positive identifier terms or cognates. (NOTE: These positive identifier terms were selected to cover the five stages of the ISD Model in AFM 50-2. See Reference Number 2.)

a. Systems approach to learning (Instructional Systems, Instructional Systems Development, Systems Approach to Training)

b. Task analysis (Job Analysis)

c. Simulation training.

d. On-the-job training

e. Training equipment (Training Devices)

f. Performance testing

g. Skill training (Skill Acquisition)

h. Computer-managed instruction (NOTE: CAI is considered here as a subset of CMI)

i. Media (Audiovisual Media, Multimedia, etc.)

j. Educational technology (Training Technology)

k. Programmed instruction

l. Strategies for instruction

m. Teaching machines

n. Group pacing

o. Student-centered instruction (LCI, Self-Instruction, Self-Paced Instruction)

p. Individually prescribed instruction

q. Field evaluation

r. Job performance evaluation

s. Instructional equipment

STEP 4: Divide remaining titles having potential for abstracting into two groups:

a. Those that are definitely relevant.

b. Those which may be relevant.

STEP 5: List titles (and short abstracts when available) for all doubtful items and conduct a staff discussion to decide whether or not to abstract. Consult AFHRL as necessary.

As the staff gained experience, it was discovered that this process did not filter out enough of the marginally useful documents. Articles with catchy titles which tended to rehash well-established principles were falling through the net and being assigned to abstractors. But, it was found that if the selection criteria were made stringent enough to exclude these articles, many truly valuable ones were also eliminated. Because a few of the specific journals proved to contain most of the relatively useless articles, they were eliminated as primary sources. In this way most of the journals that were searched yielded a reasonable proportion of articles and studies relevant to instructional system development.

The Abstracting Process

In order to prepare 2,700 technical abstracts in accordance with the project schedule, a proceduralized production process was required, supplemented with extensive quality assurance activities. To provide a clear understanding of the abstracting process used, the following topics will be discussed:

1. The two types of abstracts
2. The abstract form
3. The selection and training of abstractors
4. The assignment of articles to abstractors
5. The preparation of acceptable abstracts

Types of Abstracts

Two general types of abstracts were prepared during this effort: Type I (descriptive) abstracts of special value to designers, and Type II (informative) abstracts primarily for use by researchers.

Type I Abstracts. Type I abstracts were prepared for opinion articles, methodological development articles, evaluative summaries, literature reviews, and bibliographies. In contrast to Type II abstracts, Type I abstracts cannot take the place of the document. They summarize the contents sufficiently so that a user of the technical data file can determine whether the original document is appropriate for his needs. These abstracts include a statement of the interrelationships among topics, and their relative emphases. Within the confines of reasonable space limitations, items in the document which are of particular relevance for the instructional system designer (e.g., a short procedure for evaluating the effectiveness of CAI) are noted. Type I abstracts also include an evaluation of each document's clarity, readability, and unique contribution to the ISD technology.

Type II Abstracts. Type II abstracts were prepared for statistical sampling studies, correlational research, and research studies that manipulate variables. Type II abstracts are sufficiently detailed that a user of the technical data file need not go back to the original document (unless he has an unusually detailed requirement, such as actually replicating the research that was reported). Type II abstracts include a summary of (1) the problem posed by the investigation, (2) the method, (3) the results, and (4) the discussion/conclusions sections of the document. The last major section of the Type II abstract is an evaluation, which includes: (1) a consideration of the validity, overall clarity, and appropriateness of the research design; (2) an evaluation of the appropriateness of the conclusions; and (3) a statement about the relevance of the work for ISD.

The Abstract Form

Examples of a completed Type I and Type II abstract are in Appendix I. Both types of abstract were prepared on the same general form. The form was designed with two purposes in mind: (1) it permits the extensive coding required for computerizing the file, and (2) it allows temporary use of the abstract in a paper file. Portions of the form are appropriate to every abstract. Other parts are relevant only to particular documents having specific characteristics. A blank Abstract Form (for the hand-written abstract) is presented in Figure 1.[2] In the following paragraphs, the numbered subsections of Figure 1 are discussed.

Page 1 of the Abstract Form ("First" Page)

1. Sequence Number. The sequence number was assigned to identify the order of document acquisition. It is also the number used in the bibliographic master list. (See Reference Number 8.)

2. Abstract Type. The abstractor checked off whether a Type I or Type II abstract was prepared.

3. Reference Information. This section, filled in by the typist, is based on the bibliographic reference cited by the abstractor on Page 2 of the Abstract Form. The information was repeated on the first page to facilitate coding of the individual bibliographic items (author, title, publisher, report number, and date) for computerization of the file.

4. General Search Terms. The general search terms were assigned by the abstractor after reviewing the article. These words constitute the primary means of search for the abstracts. The possible search terms have been compiled into a Directory of General Search Terms. This directory (and definitions of the terms), presented in the abstractor's guidelines (Reference Number 9), helped abstractors use standardized terminology.

5. Unique Search Terms. Unique search terms, assigned by the abstractors, are words that are specific to a given document. For example, they may be descriptions of major systems involved, trade names for particular types of media used or discussed, new terms discussed at length in the document, or the names of authors discussed in detail in the document.

6. Suggestions for Additional Research. The authors of documents often mention suggestions or implications for future research and development. These suggestions or implications were summarized by the abstractor. A compendium of these is

[2] NOTE: The typed abstracts in the Appendix were prepared from special typing instructions (See Appendix II) and differ slightly in format from the original abstract done by the abstractors.

SEQUENCE NO. _____ ①
ABSTRACT TYPE: I ____ II ____ ②

ABSTRACT FORM

AUTHOR(S):

TITLE:

③

PUBLISHER:

REPORT NUMBER: DATE:

GENERAL SEARCH TERMS: ④

UNIQUE SEARCH TERMS: ⑤

SUGGESTIONS FOR ADDITIONAL RESEARCH: ⑥

CROSS REFERENCE: (SEQUENCE NUMBERS) ⑦

Figure 1. Abstract Form

SEQUENCE NO. _____ (8)

BIBLIOGRAPHIC REFERENCE: _____ (9)

BODY OF ABSTRACT: _____ (10)

(Continue on Next Page)

EVALUATION OF DOCUMENT: _____ (11)

(NUMBER OF PAGES _____)
(NUMBER OF REFERENCES _____) (12)
(INITIALS OF ABSTRACTOR _____)

Figure 1. (continued)

SUMMARY AND EVALUATION FORM

SEQUENCE NO ______

(13)

1. CHECKLISTS FOR EVALUATING TYPE I & TYPE II DOCUMENTS

1A. INSTRUCTIONS

These checklists are aids for evaluating documents. Check items only in List 1B or 1C. All items may not apply to a specific document.

- If an item does not apply in any way, mark the NA box in the space to the left of the item.
- If a document fully satisfies an item criterion, mark the 1 box to the left of the item.
- If a document only partially satisfies an item criterion, mark the 2 box to the left of the item.
- If a document fails to satisfy an item criterion, mark the 3 box to the left of the item.

If you rate an item 2 or 3, make a brief note on scratch paper describing the defect.

1B. EVALUATION CHECKLIST FOR TYPE I ABSTRACTS

NA | 1 | 2 | 3

Descriptive Summary of Content:

1. Title of document describes contents.
2. Headings and subheadings outline contents.
3. Area of interest is delineated clearly.
4. Reasons for dealing with this area are clear.
5. Problem area is covered adequately.
6. Approach to problem area is appropriate.
7. Limitations of approach are covered.
8. Important terms are defined.
9. Relationship of this document to other relevant literature is stated.
10. Reviews of research are clear and concise.
11. Reviews of research specify designs employed.
12. Graphs and tables are presented clearly.
13. Conclusions are stated clearly.
14. Conclusions are substantiated by evidence presented in the document.
15. Conclusions are confined to the problem area discussed in the document.
16. Implications for future research are logically formulated.
17. Bibliography is properly organized and presented clearly.

Clarity and Usefulness

18. Document does not rehash established principles.
19. Document presents applications relevant to ISD.
20. Document presents concepts relevant to ISD.
21. Conclusions are important for ISD.
22. Style of writing is appropriate for typical ISD users.
23. Document is written clearly.
24. Document is reasonably easy to follow and is not confusing.
25. Tone of the document displays an unbiased, impartial scientific attitude.

1C. EVALUATION CHECKLIST FOR TYPE II ABSTRACTS

NA | 1 | 2 | 3

Introduction

1. Title of document adequately describes contents.
2. Problem is stated clearly.
3. Reasons for investigating problem are clear.
4. Assumptions are stated clearly.
5. Limitations of the study are stated.
6. Important terms are defined.
7. Relationship of the problem to previous research is clear.
8. Previous research is reviewed adequately for author's purposes.
9. Hypotheses are stated clearly.

Method

10. Population is adequately described as to size, location, age, and other characteristics relevant to the research.
11. Method of sampling is adequately described and is appropriate.
12. Sample is adequately described as to size, location, age, and other relevant characteristics.
13. Research design is described fully.
14. Rationale for specific research design is adequately justified.
15. Research design is best suited for solution of the problem.
16. The effects of independent variables are not confounded with the effects of uncontrolled, extraneous variables.
17. The effects of independent variables are not confounded with the effects of motivational variables.
18. Control groups are appropriate for comparison with experimental groups.
19. Independent variables are adequately specified. (Qualitatively)
20. Dependent variables are adequately specified. (Qualitatively)
21. Variables are operationally defined. (Quantitative, generally)
22. Appropriate measures are selected for dependent variables.
23. Experimenter manipulates what he says he manipulates.
24. Conditions under which experiment was conducted are clearly specified and delineated in sufficient detail.
25. Research design is free of other specific weaknesses.
26. Data gathering methods or procedures are described in sufficient detail to allow replication.
27. Data gathering methods or procedures follow from the research design, methods or procedures are appropriate to the solution of the problem.
28. Data gathering methods or procedures do not introduce artifactual biases into data.
29. Researcher has taken appropriate steps to eliminate or control for experimenter bias and self fulfilling prophecy.

Results

30. Data gathering methods or procedures are used correctly.
31. Reliability of measuring instruments is established.
32. Validity of measuring instruments is established.
33. Appropriate methods are selected to analyze the data in accordance with those indicated by the research design.
34. Methods used to analyze the data are used correctly.
35. Results of the analyses are presented clearly.
36. Graphs and tables are presented clearly.
37. Only significant results are introduced as meaningful data.
38. Confidence levels are stated clearly and if unusual, justified.
39. Unusual statistical procedures or unusual applications of standard procedures are described clearly and justified.
40. Transformed data are clearly specified as such and methods of conversion are stated clearly and adequately justified.

Discussion

41. Conclusions are stated clearly.
42. Conclusions are substantiated by the evidence presented.
43. Generalizations are confined to the population from which the sample was drawn.
44. Conclusions relate only to the parameters of the investigation that were specified under experimental conditions.

NA | 1 | 2 | 3

45. Inferential and interpretive conclusions are clearly specified as such.
46. Inferential and interpretive conclusions are justified.
47. Speculations, guesses, and theorizing are not presented as conclusions that follow from the data.
48. Implications for future research are logically formulated.

Clarity and Usefulness:

49. Report is written clearly.
50. Report is logically organized.
51. Report is reasonably easy to follow and is not confusing.
52. Tone of the report displays an unbiased, impartial scientific attitude.
53. Report is of good overall quality.
54. Report is of importance to the problem area.

14A

2. DOCUMENT X TOPIC PROFILE

14B

ISD Topic No. (AFM 50-2)

		Type I Abstract						Type II Abstract		I or II
		Opinion Article	Methodological Development	Evaluative Summary	Literature Review	Bibliography	Statistical Summary Survey	Correlational Research	Research Study (Experimental Var.)	Other Specify
1	Determine Job (or Activity) Performance Requirements									
2	Determine Education or Training Requirements									
3	Determine Instructional Objectives									
3	Develop Tests									
4	Select Media/Methods									
4	Develop Instructional Materials									
4	Validate and Revise Instructional Materials									
5	Conduct Instructional Program									
5	Evaluate Instructional Program									
Other Specify ______										

3. MEDIA/INSTRUCTIONAL METHODS DISCUSSED

14C

(14)

3A. COMMUNICATION MEDIA

Audio
- ☐ Radio
- ☐ Tape Recorder
- ☐ Record Player
- ☐ Listening Lab

Visual
- ☐ Filmstrip (Silent)
- ☐ Motion Picture as Repetitive Loop (Silent)
- ☐ Textbook
- ☐ Microform

Audiovisual
- ☐ Sound/Slide Projector
- ☐ Filmstrip/Sound
- ☐ Television
- ☐ Motion Picture
- ☐ Motion Picture as Repetitive Loop

3B. ENVIRONMENTAL MEDIA/AIDS

- ☐ Simulator
- ☐ Part Task Trainer
- ☐ Whole Task Trainer
- ☐ Procedures Trainer
- ☐ Games
- ☐ Role Play
- ☐ Sociodrama
- ☐ Operational Equipment

3C. TUTORIAL MEDIA

- ☐ CAI CMI
- ☐ Programmed Text
- ☐ Teaching Machines
- ☐ Learning Lab

3D. MULTIMEDIA

______

______

______

3E. VISUAL AIDS

Graphics
- ☐ Charts
- ☐ Diagrams
- ☐ Graphs
- ☐ Illustrations/Drawings
- ☐ Photographs

Exhibits
- ☐ Cut-A-Ways
- ☐ Mockups
- ☐ Models

Projected Images
- ☐ Opaque Projections
- ☐ Overhead Transparencies
- ☐ Slides

3F. METHODS OF INSTRUCTION

- ☐ Tutorial
- ☐ Lecture
- ☐ Recitation
- ☐ Discussion
- ☐ Demonstration
- ☐ Simulation
- ☐ Peer Training
- ☐ Team Training

3G. OTHER: SPECIFY

______

______

______

______

______

4. TYPES AND METHODS OF RESEARCH EMPLOYED (FOR TYPE II DOCUMENTS ONLY)

14D

4A. TYPE OF RESEARCH

- ☐ Basic
- ☐ Lab Study
- ☐ Applied
- ☐ Field Study

4B. METHOD OF RESEARCH

- ☐ Historical
- ☐ Descriptive
- ☐ Case & Field
- ☐ Developmental
- ☐ Causal Comparative or "Ex Post Facto"
- ☐ Correlational
- ☐ True Experimental
- ☐ Quasi Experimental
- ☐ Action
- ☐ Other, Specify ______

Figure 1. (continued)

presented in a technical research memorandum (see Reference Number 10).

7. Cross Reference. This section of the Abstract Form was used to reference the sequence numbers of closely related documents.

Page 2 of the Abstract Form ("Second" Page)

8. Sequence Number. Same as Number 1.

9. Bibliographic Reference. The complete bibliographic reference was cited by the abstractor. The American Psychological Association (APA) Publication Manual provided the standard format for citation. Excerpts from the 1967 edition of this manual detailing the mechanics of citing references are included in the abstractor's guidelines.

10. Body of Abstract. The body of the abstract was prepared according to the procedures described in the abstractor's guidelines. It consists of a condensation of the document content. (The procedures for completing the body of the abstract differed, depending on whether a Type I or Type II abstract was being prepared.)

11. Evaluation of Document. The evaluation was prepared according to the procedures in the abstractor's guidelines.

12. Number of Pages, Number of References, Initials of Abstractor. These items, filled in by the abstractor, provided a record of the total number of pages and references in the document, and identified the abstractor.

Page 3 of Abstract Form ("Last" Page)

13. Sequence Number. Same as Number 1.

14. Summary and Evaluation Form. The "last" page of the Abstract Form served a fourfold purpose:

    a. The abstractor used it as a convenient tool for summarizing a document by filling out the form while reading the article. The process of completing the form furnished the abstractor with most of the information necessary to prepare a Type I or Type II abstract.

    b. Filling out the Evaluation Checklists portion of the form (14A) provided the abstractor with a convenient summary for writing the evaluation portion of the abstract.

    c. The form provided a useful encapsulation of the type of document, topics discussed, types and methods of

research employed or discussed, and media and approaches to training discussed. A user of the paper technical data file can assess in a glance the suitability of a document for his needs.

d. Finally, the most important characteristics of the document are synthesized in one place, thus facilitating the computerization of the technical data file.

The Evaluation Checklist (14A) was completed by following the instructions printed on the form. The ISD topics covered in the report were checked off in the column(s) corresponding to the type of document being reviewed (14B). Next, the boxes beside all media and methods discussed in the article were checked (14C). Finally, for Type II documents, types and methods of research employed were marked (14D).

The Selection and Training of Abstractors

Selecting Abstractors. Four abstractors were selected, based on application of four selection criteria. Each selected abstractor was required to:

1. Have a degree in Psychology, or an area related to Instructional Technology.

2. Have a general knowledge of the abstracting process.

3. Be familiar with the instructional system development process.

4. Be qualified to evaluate experimental studies in terms of their design, methodology, and application of statistical techniques.

Candidates satisfying the selection criteria were given one Air Force guidance document (e.g., AFM 50-2--see Reference Number 2), one experimental study, and a copy of the abstractor's guidelines. They were asked to prepare abstracts for the documents using the guidelines. It was found that abstractors who produced acceptable abstracts under these selection conditions almost always, with formal training and a short period of relevant feedback, produced excellent abstracts in the production phase. On the other hand, those who produced marginal or poor abstracts during selection did not usually exceed marginal performance during production. Once the abstractors were selected, they were given reading materials and scheduled for a training seminar.

The Training Seminar. The reading materials given to the abstractors included:

1. Schumacher, S. P., Swezey, R. W., Pearlstein, R. B., & Valverde, H. H. *Guidelines for abstracting technical literature on instructional system development.* Dayton, Ohio: Air Force Human Resources Laboratory, Wright-Patterson Air Force Base, June 1973, in press. AFHRL-TRM-73-

2. Department of the Air Force. *Instructional system development.* Washington, D. C.: Author, December 1970. AFM 50-2.

3. Campbell, D. T., & Stanley, J. C. *Experimental and quasi-experimental designs for research.* Chicago: Rand McNally, 1966.

4. Ten examples of Type I abstracts and ten examples of Type II abstracts (a sample of each appears in Appendix I).

The seminar was devoted to a practicum in which the following activities were accomplished:

1. The abstractor's guidelines were reviewed and discussed.

2. Abstractors prepared two Type I and two Type II abstracts from original documents. All abstractors reviewed the same documents and participated in a group discussion and critique.

On-Job Training. The abstractor training did not end with the seminar; intense job training was given when the abstractors began to review documents. One experienced staff member was appointed as supervisor of the abstracting activities and accomplished the following on-job training/quality assurance activities:

1. The first document abstracted by each abstractor was independently abstracted by the supervisor.

2. The two abstracts were compared and appropriate feedback was given to the abstractor.

3. For the first month of abstracting activity, every fifth abstract prepared by each abstractor was critiqued by the supervisor and appropriate feedback given.

4. As judged necessary, later abstracts were spot-checked by the supervisor to guard against deterioration of quality.

The Assignment of Articles to Abstractors

The assignment process was accomplished in the following five steps:

1. A competency profile was developed for each abstractor (Figure 2). This profile indicated knowledges possessed by the abstractor as well as the degree of difficulty that he could handle regarding the general area(s) likely to be covered in the articles.

2. Each article selected was assigned a similar profile based on the title, mini-abstract, and source of the document.

AREA	DEGREE OF COMPETENCY		
	Great	Moderate	Minimum
Statistics & Experimental Design			x
Educational Technology		x	
Military/Industrial Esoterica			x
Cybernetic Detail	x		

Figure 2. Sample Abstractor Competency Profile

3. Profiles were matched in order to assign articles to abstractors. For example, an abstractor with a minimum level of statistical competency (as in Figure 2) was not assigned an article (or a journal) with difficult statistics and experimental design.

4. As a further check, the abstractors examined each document, and were obliged to: (a) decide if the document seemed too difficult for them, and (b) return such documents for assignment to another abstractor.

5. The order in which the selected articles were assigned to the abstractors was determined by such factors as:

    a. The amount of material of major import in the article as opposed to its minor detail.

    b. The amount of material in the article with obvious military training application.

    c. The amount of contemporary information in the article as opposed to possibly outdated information.

The Preparation of Acceptable Abstracts

The details of the abstracting process are presented step-by-step in the abstractor's guidelines (Reference Number 9). The process was proceduralized as much as possible to insure that comprehensive abstracts were prepared. To insure the consistent high quality of the abstracts, three quality assurance measures were employed throughout the contract:

1. The supervisor made a technical evaluation of five percent of the abstracts, selected at random (stratified by abstractor

work load). To accomplish the technical evaluation, the supervisor:

a. Reviewed the source document and described the critical contents which every abstract must contain.

b. Compared the abstract against the list of critical contents.

c. Provided feedback to the abstractor when the abstract was deficient or excessive, and had the abstractor revise the abstract accordingly.

d. Evaluated the revision and provided feedback, as needed.

e. Reviewed enough other abstracts (from those prepared previously) to insure that the problems were not pervasive.

f. Kept a record describing each abstractor's performance in the technical evaluation.

g. Initiated remedial training or other appropriate action to insure high quality of abstracts.

2. Five percent of the articles that were abstracted at libraries were cross-assigned to two abstractors. The supervisor compared these abstracts to insure that the guidelines were being conscientiously applied when the abstractors worked on their own in the libraries.

3. A random sample of approximately 25 percent of the abstracts was edited by the supervisor. The editing process involved reading the abstracts to insure they were complete, clear, and internally consistent. A vocabulary check was also conducted to insure that the selected search terms accurately represented the detailed written abstract. Significant editorial or vocabulary problems were noted on the abstractor's performance record and remedial action was taken, as appropriate.

The File Development

Obviously, the most basic requirement for the file was that it be readily usable. Therefore, considerable thought was given to the nature of the file and its indexing system. The basic requirements determined for the technical data file were that it be in paper form, that it be indexed and cross-indexed, that it be amenable to eventual translation into a computer format, and that it be updatable (living).

The Paper File

A number of indexing approaches were considered, but the system which best satisfied the requirement for a paper file appeared to be a form of coordinate indexing (Reference Numbers 1 and 12). The coordinate indexing system employed involves the use of a Master List and coordinate index forms (index cards). The Master List contained the titles of all abstracted documents numbered in the order in which they were abstracted. (See Reference Number 8 for a complete bibliography.) Each index card bore a heading consisting of one general search (retrieval) term (see Reference Number 8 for complete list of retrieval terms), and each card was divided into ten columns. After a document was abstracted, it received the next sequential number on the Master List. That number was then entered in a column on each of the coordinate index cards headed by a retrieval term that might be used to locate the document. If the last digit of the number was 0, for example, the number was entered in the first column. If it was 1, it was entered in the second column, and so on. Having ten columns on each card facilitates cross-comparison between two or more retrieval terms because it insures relatively short lists of numbers in each column. Figure 3 depicts an example of application of the system for two retrieval terms--videotape and lecture. Note that document numbers 26, 135, 232, 311, and 413 have been circled. This indicates that the documents (and abstracts) bearing the numbers would contain material suggested by both videotape and lecture.

The coordinate index form is a versatile temporary storage medium which facilitates the search of multiple key words in a paper file. It also permits easy translation to a variety of other systems. Of course, the computerization of the system will permit an even more efficient means of retrieval, and cross-sorting by multiple variables.

The Computer File

The considerations for easy computerization of the file were more complex. A primary consideration was to permit flexibility in the coding of the document information. Also, some efficient means of inputting the paper file to the computer was required. These requirements had to be satisfied (in so far as possible) without anticipating any specific computer search-and-retrieval system. (The draft report of a feasibility study for the computer search-and-retrieval system was completed in March 1973--Reference Number 6.)

Design to Permit Ease of Coding. Flexibility was the goal. Without prior knowledge of the design requirements for a computerized file, it was decided to provide the designer with as many coding options as possible. The following 14 information items were selected as potentially useful:

1. Specific bibliographic information (e.g., author, date).

2. General search terms (a defined list of terms to be used by the abstractors in coding the documents).

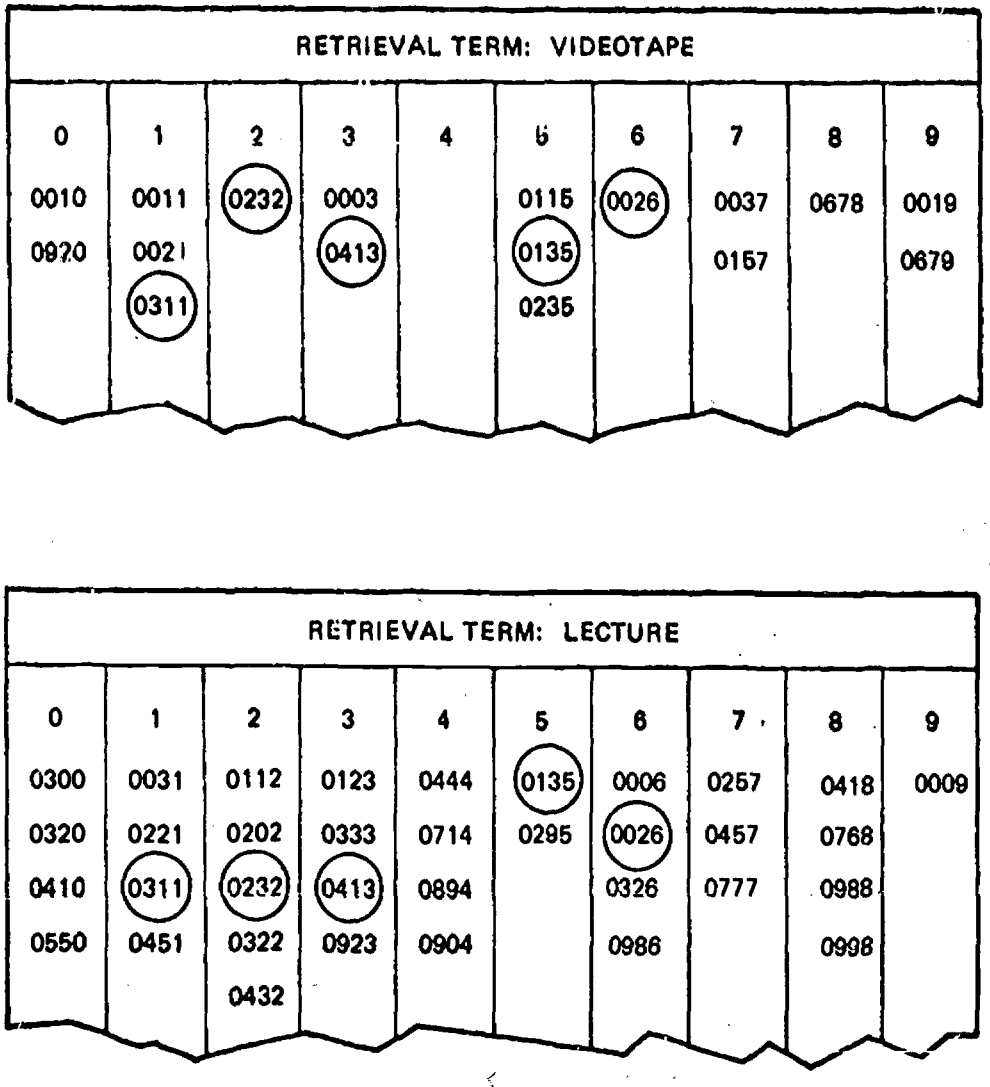

Figure 3. Sample Coordinate Indexing Application

3. Unique search terms (important terms not listed as general search terms).

4. Needs for additional research.

5. Cross reference to related documents.

6. Complete bibliographic reference.

7. Abstracts divided into sections (for Type I: Contents and Clarity; for Type II: Purpose, Methods, Results, and Discussion).

8. Supportable conclusions (distinguished from discussion of results).

9. A summary evaluation of the document.

10. Individual evaluation ratings covering major aspects of the content, writing, methodology, and design of the studies.

11. Specification of the type of article (e.g., opinion article, correlational research).

12. Specification of the major ISD activity to which the work relates.

13. Identification of all media or instructional methods discussed or investigated at length in the article.

14. Identification of the type and method of research (e.g., field study, quasi-experimental).

To facilitate coding, each of these items was separately entered on the abstract form. (See discussion on Pages 19-24.)

The feasibility study (Reference Number 6) demonstrated the use of a computerized search-and-retrieval system. The demonstration system required four additional information items that were not specifically covered on the abstract form. These items, which were easily derived from the Type II abstracts, are:

1. Subject population description

2. Independent variable(s)

3. Dependent variable(s)

4. Measurement technique(s)/statistical method(s)

Design to Permit Ease of Inputting the Paper File to the Computer. Initial estimates were that the abstracts would require over 3,000 single-spaced typed pages. The desirability of avoiding retyping these pages for

computer input (e.g., by keypunch) is obvious. Three options for providing a more direct means of inputting were considered:

1. Typing in Optical Character Reader (OCR) font. The typed abstracts would be processed through an OCR and translated to computer-readable tape.

2. Typing in OCR font on an IBM Magnetic Tape Selectric Typewriter (MT/ST). Copy would be processed as in No. 1 above.

3. Typing in standard font on an MT/ST and converting the MT/ST cartridges directly to computer readable tape.

A survey was made of the costs and benefits of these options. Factors considered were:

1. Availability of conversion equipment (OCR or MT/ST cartridge converter) to the Air Force Human Resources Laboratory (AFHRL).

2. Costs to AFHRL to use conversion equipment.

3. Comparative typing-time requirements.

4. Readability of the paper file (e.g., currently available OCRs require all capital letters and special characters to denote specific functions).

5. Ease of making corrections, additions, or deletions to abstracts prior to conversion.

6. Ease of entering additional codes prior to conversion.

Following a study of these considerations, the third option proved to be clearly optimal. Consequently, it was recommended that:

1. The file should be typed in a standard font for ease of readability of the paper file.

2. The body of the abstracts should be typed on MT/ST tape cartridges.[3]

3. The "first" and "last" pages, containing the majority of the accessing information for each abstract, should <u>not</u> be typed on the MT/ST until after the appropriate access codes were specified.

---

[3] MT/ST tapes provided a convenient means for adding access information after the feasibility study identified the codes. Ten blank lines were left at the end of each MT/ST tape to permit later addition of access codes within the body of the abstract.

4. The IBM 2495 (available to AFHRL) or similar conversion equipment should be used to convert MT/ST tapes directly to computer-readable tape.[4]

Tryout of the Planned Computer File. Two tryouts of the computer filing system were conducted. In the first, a sample of 10 MT/ST cartridges were processed with the IBM 2495 at the Foreign Technology Division at Wright-Patterson Air Force Base. This trial successfully demonstrated that the MT/ST cartridges could be translated to computer-readable tapes. The second trial was conducted by the University of Dayton on a sample of 500 abstracts. This trial successfully demonstrated the feasibility of the storage-and-retrieval system the University of Dayton was evaluating. Both trials indicated several important considerations for preparation of the MT/ST tapes:

1. The alignment of the MT/ST characters on the MT/ST tape bands is critical. (The MT/ST reads the information relatively slowly and accepts a wider alignment tolerance than the faster IBM 2495 converter.)

2. Additional paragraph and other information delimiters should be added to the MT/ST tapes. (This could be handled by revising the search-and-retrieval system program.)

3. The sequence number should be entered with each separate file. (This could be handled by revising the search-and-retrieval program.)

4. Lower case "L" and alphabetic "O" should not be used to represent the numbers one and zero. (This could be handled by revising the search-and-retrieval program.)

5. Terminology should be as consistent as possible within and across tapes (e.g., AV Communication Review, not A V Communication Review or A-V Communication Review, even though the publisher used both of these in the past).

These findings represented relatively minor problems. The MT/ST tapes are suitable for entry to the computer. With minor refinements, search-and-retrieval programs can be adapted to handle the present MT/ST tape configuration. If an operational final version of the search-and-retrieval system is prepared, close coordination will be necessary to insure that additional MT/ST tapes satisfy the program input requirements.

[4] After the codes were determined in the feasibility study, a second computer tape could be made from appropriately coded MT/ST tapes of the information on the "first" and "last" pages. This information could be merged with the primary computer tape containing the abstracts.

Summary of File Contents

The final technical data file consists of the following:

1. A coordinate index of the general search terms.

2. A complete card index of all titles searched, including (when available) the short abstract from the document source (e.g., Psychological Abstracts).

3. A complete paper file of abstracts. Each abstract is in three sections:

   a. The "first" page contains a separate listing of information items (bibliographic information, search terms, and needs for additional research). The separate listing of these items permits easy coding for computerizing the file.

   b. The "second" page contains the complete bibliographic reference, a Type I or II abstract, and an evaluation of the document. This portion of the file was typed on MT/ST cartridges which can be easily converted to computer-readable tapes.

   c. The "third" page contains a completed Summary and Evaluation Form for the abstract. This form identifies numerous parameters related to the content, structure, and quality of the article. The information can be easily coded for computerizing the file.

4. A complete bibliography of all abstracted documents on MT/ST tape. The bibliography, ordered by sequence number, and a complete key word index is presented in Reference Number 8.

The Production of the File

File production was divided into two general activities: (1) preparation of the abstract from the original document, and (2) preparation of the final-typed abstract on MT/ST tapes.

Producing Abstracts

The abstract production process was discussed earlier (see Section II, The Abstracting Process). The three key elements of the process were:

1. Careful selection of articles for abstracting based on a prescribed routine.

2. Assignment of articles to abstractors on the basis of a profile of abstractor competencies.

3. Extensive quality control measures by the supervisor to ensure that abstractors were following the procedures in the abstractor's guidelines.

Including supervision time and the time to hire and train abstractors[5], approximately 2-1/4 hours were required to select the article and produce an abstract that was ready for typing. This represents an average time. There were significant variations, depending on whether a Type I or Type II abstract was being produced.

Typing Abstracts

The process of typing abstracts on the MT/ST required specific procedures to insure that they could be processed on the IBM 2495. However, in order to produce a complete file, "first" and "last" pages had to be prepared as well.

"First" and "Last" Pages. As abstracts were received by the clerical staff, the following steps were taken to produce the file:

1. The bibliographic reference was typed on the Master List (on the MT/ST). The reference was typed in the standard format prescribed in the APA Publications Manual.

2. Each reference was entered on the card file.

3. The general search terms on the "first" page were checked against the list of standard terms. As necessary, changes were made to insure that the listing on the abstract was accurate, and that the terms were entered in the coordinate index file.

4. The "first" page was typed and proofed.

5. The "last" page was produced and proofed.

Typing Abstracts on the MT/ST. To successfully prepare MT/ST tapes, a number of special typing considerations must be observed. Among these are:

1. Preparing the tape.

2. Coding the data fields on the tapes.

---

[5]The time to hire and train abstractors proved to be a significant factor since due to attrition, 13 abstractors were employed in the course of the effort.

3. General typing of the abstracts.

4. Entry of special characters/symbols.

5. Administrative procedures to keep the production process on schedule.

The details of the MT/ST typing considerations were summarized in a project memorandum. This memorandum is attached as Appendix II of this report.

SECTION III - RESULTS AND DISCUSSION

Overview

The final file comprises 2,693 abstracts of technical literature, and is the most comprehensive file produced to date in this area. Scheffler, et al, (Reference Number 6), summarize the characteristics of the file: ". . . the comprehensive abstracts represent a thorough document surrogate data base from which one actually can retrieve facts and principles as well as evaluate data regarding ISD. As such, the data base is unique, since other IS&R (information search and retrieval) systems in no way provide the depth of analysis and comprehensiveness of coverage in the field of training and educational research as well as instructional system design."

In this section the sources searched and the compendium of research and development needs are reviewed. This section concludes with recommendations for completing the file.

Sources Searched

Two types of sources were searched: general information sources and specific journals.

General Information Sources

The general information sources in Table 1 (p. 14) were searched early in the project. The focus of this search was to find significant texts and methodological development articles, bibliographies, and reviews which had a significant impact on the emerging technology. Most of the first 700 items in the bibliography were identified from the general sources (Reference Number 8). Approximately 20 percent of the first 700 items resulted from the references in texts, articles, bibliographies, and reviews that were abstracted. The general sources also provided a resource for identifying journals which might be profitably reviewed. As mentioned in Section II (p. 13), the search of specific journals offered significant advantages for abstractor assignment and for control of the search. Furthermore, although it could reasonably be assumed that much of the dated, but useful experimental data would be incorporated topically in texts and other Type I documents, the journals themselves would be the only adequate source for preparing the informative Type II abstracts.

Specific Journals

Forty-eight journals were reviewed. As mentioned earlier, the strategy was to review the most recent volumes first and then work backwards. Journals which yielded the highest number of relevant articles were searched more completely (in some cases as far back as 1952). However, twenty-one of these journals provided few relevant articles. When upon careful review of a number of issues, a journal was found to be generally not relevant for ISD purposes, it was not searched any further. (This is not to say that these journals would not provide information useful for ISD if they were searched with broader selection criteria.)

Figure 4 shows all journals searched in which relevant articles were found. Figure 5 shows the journals which provided three or fewer articles satisfying the selection criteria. Appendix III lists the references for articles that were selected for abstracting, but which due to time constraints, could not be abstracted.

The Compendium of Research and Development Needs

Many authors, especially those of Type II documents, cited needs for additional research. Each need was recorded on the "first" page of the abstract form. These needs were arranged in a compendium of research and development requirements and submitted as a separate report (see Reference Number 10).

Many of the requirements in the compendium can be understood without reference to the original document. However, before utilizing specific items in the compendium, the user will probably want to examine the original article, its title, or the abstract. For this reason, each need in the compendium is concluded with a reference to the sequence number in the file and the year of publication of the original article.

The contents of the compendium are summarized in Figure 6. Some of the more broadly stated needs appear under two or more categories in the compendium.

Recommendations

The technical data file developed under this contract covers a considerable portion, but by no means all of the relevant technical literature. A complete file would contain from 10,000 to 15,000 such abstracts. Because of its bulk and the difficulty of distributing the paper file, the utility of the paper file is severely limited. Therefore, early development of a computerized file is highly recommended.

SEARCHED, RELEVANT ARTICLES ABSTRACTED

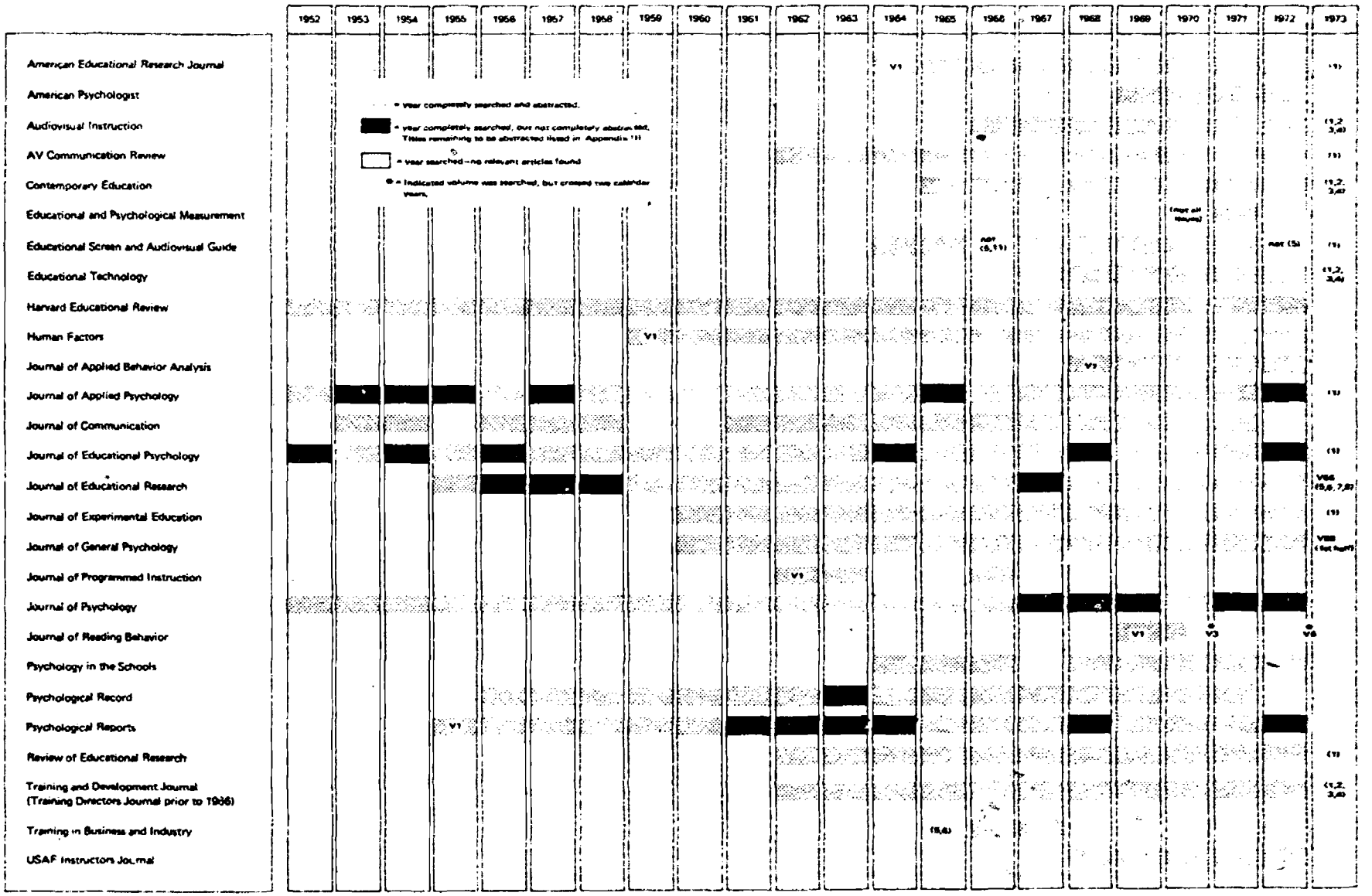

Figure 4. Journals from Which Relevant Articles Were Abstracted

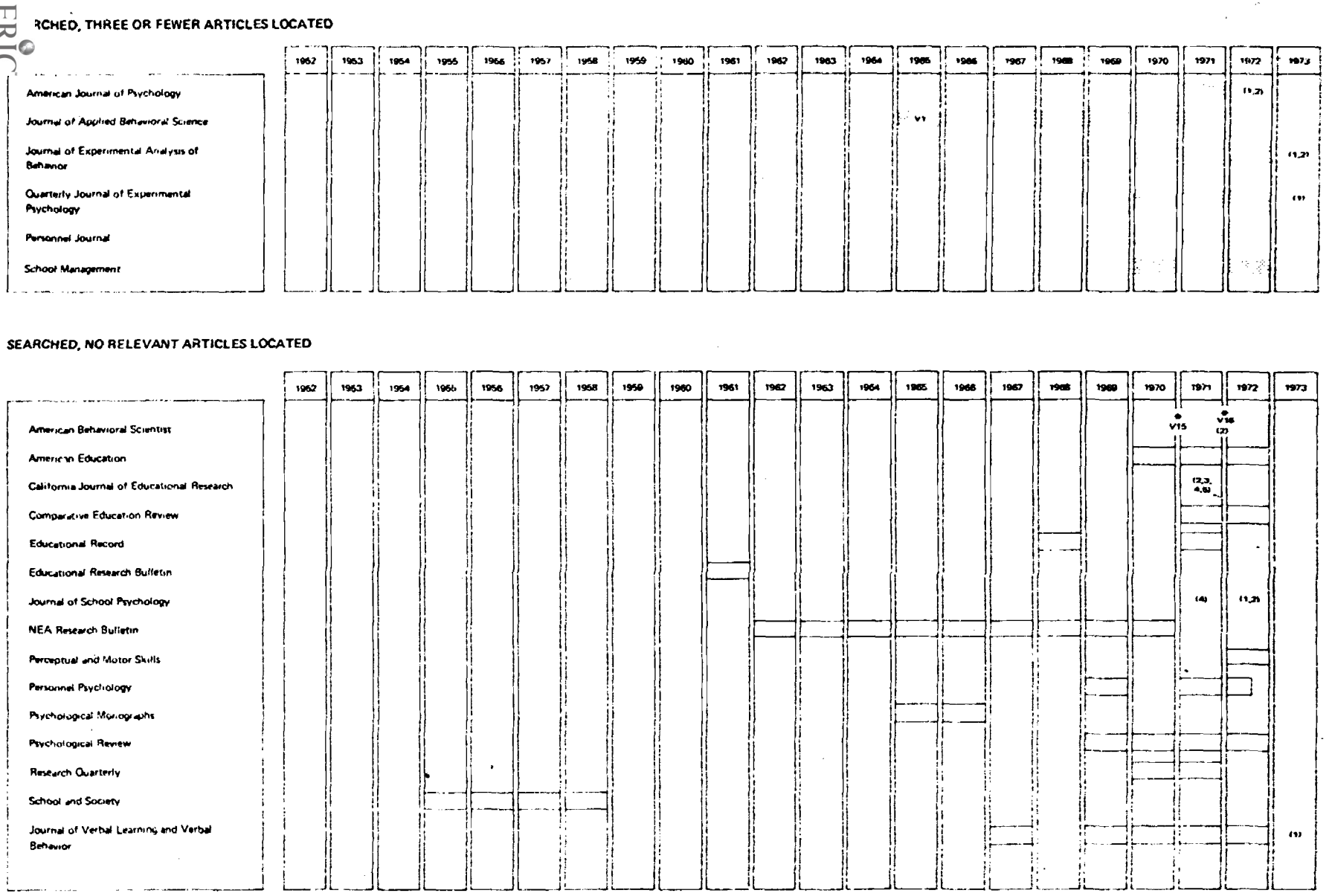

Figure 5. Journals That Yielded Three or Fewer Relevant Articles for Abstraction

DETERMINE JOB PERFORMANCE REQUIREMENTS

- Task Descriptions
- Performance Requirements
- Classification of Tasks
- Predicting Future Performance Requirements

DETERMINE TRAINING REQUIREMENTS

DETERMINE CRITERION OBJECTIVES

DEVELOP CRITERION-REFERENCED TESTS

- Test Construction
- Effects of Testing
- Test Reliability and Validity

SELECT MEDIA/METHODS

- Audio Devices
- Visual Devices
- Audio-Visual Devices
- Visual Aids
- CAI
- Programmed Instruction
- Instructional Devices
- Methods of Instruction
- Media Comparison

DEVELOP INSTRUCTIONAL MATERIALS

- Learning Theories
- Instructional Techniques
- Factors Affecting Learning

EVALUATE INSTRUCTIONAL PROGRAM

- Analyze/Evaluate Program Data
- Evaluate Instructors
- Investigate Student Characteristics
- Investigate Effects of Student-Instructor Interactions
- Investigate the Effects of the Learning Environment

Figure 6. Contents of Compendium of Research and Development Needs (See Technical Research Memorandum - Reference Number 10)

Computerizing the File

The feasibility of computerizing the file has been demonstrated. The primary recommendations for its development are:

1. The final requirements for abstract content and coding in the preparation of the abstracts should be developed jointly by the organizations responsible for computerizing the file and for preparing the abstracts.

2. Provision should be made in the software of the search-and-retrieval system to accommodate the abstracts produced to date. Possibly some level of intermediate processing will be required after the computer tape of abstracts is produced. Additional abstracts that are prepared should not require intermediate processing.

Completing the File

The recommended procedure for completing the preparation of abstracts for the file is:

1. Determine and revise (as necessary) the abstract/production process to insure that abstracts and MT/ST tapes are compatible with the requirements of the search-and-retrieval system.

2. Prepare abstracts for those titles already selected (see Appendix III).

3. Complete the search of journals listed in Figure 4 back to 1952.

4. Return to the general information sources listed in Table 1 and search these sources for experimental (Type II) studies not already in the file.

5. Conduct a comprehensive search, and abstract the relevant works in the various Air Force Libraries (e.g., the AFHRL Library, the Air Training Command Library).

6. Continue abstracting relevant journals (Figure 4) for 1973 and beyond.

7. Develop a program for keeping the file up to date. Minimally, this will involve continuation with 5 and 6 above, as well as the identification of new general sources and texts relevant to the technology.

Suiting the File to User Needs

To be maximally useful, the search-and-retrieval system and the abstracts must be suited to user needs. It is suggested that the file, as now configured (2,693 abstracts), be subjected to use-testing in both the paper and the computerized search-and-retrieval configurations. Certainly the file, in its current state, will aid practitioners and researchers. But as it is used, ways to improve the abstracts and the search-and-retrieval mechanism will surely be determined. The system should be continually responsive to user needs. If the production system is modified to satisfy these needs, the addition of further increments of abstracts will improve not only the comprehensiveness of the file, but also its utility.

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11. Smith, R. G., Jr. *An annotated bibliography on the design of instructional systems.* Alexandria, Virginia: The George Washington University Human Resources Research Office, May 1967. Technical Report 67-5.

12. U. S. Naval Training Device Center. *Coordinate index and abstracts of training device literature.* Port Washington, New York. December 1957. NAVEXOS P-1735.

APPENDIX I

EXAMPLES OF A TYPE I AND II ABSTRACT

SEQUENCE NO. 691
ABSTRACT TYPE: I X II

ABSTRACT FORM

AUTHOR(S): G. L. Gropper

TITLE: The Design of Stimulus Materials in Response-Oriented Programs

PUBLISHER: AV Communication Review

REPORT NUMBER: Volume 18 DATE: 1970

GENERAL SEARCH TERMS:

Auto-Instruction Program
Chaining
Cue
Discrimination
Generalization
Graphics
Handbook
Learning Facilitation
Materials, Preparation
Participation of Learner
Practice
Presentation Methods
Printed Material
Programmed Instruction (PI)
Prompt
Response
Sequencing
Stimulus Characteristics
Stimulus Presentation
Time Factors
Visual Materials

UNIQUE SEARCH TERMS:

Response-Oriented Program

SUGGESTIONS FOR ADDITIONAL RESEARCH:

NONE

CROSS REFERENCE: (SEQUENCE NUMBERS)

000691 600 Gropper, G. L. The design of stimulus materials in response-oriented programs. "AV Communication Review," 1970, "18," 129-159.

000691 700 This paper proposed and offered evidence that the impact of response practice on learning effectiveness and efficiency can be heightened by systematic organization of stimulus materials that control such practice. A discussion of the similarities and differences between response- and stimulus-oriented technologists was presented. One of the differences is in the systematic approach which the response-oriented technologist takes in organizing stimulus materials so that the practice of relevant discriminations, generalizations, and chains may be optimally facilitated. It is a question of presenting the kinds of contexts and cues that can contribute optimally to the acquisition of those three skills that underlie all learning; i.e., discriminations, generalizations, and chains.

Spatial organization of stimulus materials has the potential for diverse applications. The applications described in this report included: (1) language learning; (2) learning facts, concepts, and principles in physical science, behavior theory, and instructional technology; and (3) learning procedures. The effectiveness of the techniques depended on two properties of diagrammatic presentation--spatial organization and the capacity to present the "big picture." Spatial variables included adjacency, separation, grouping, enclosure, and order. Comparison of spatially enclosed and separated stimulus material formed the basis for the practice and acquisition of discriminations and generalizations. Relaxing stimulus material in one square to that in other squares formed the basis for the practice and acquisition of associations and chains. Practice and acquisition of discriminations, generalizations, and chains was further facilitated by "big picture" statements presented in a diagram appearing on a single page.

This document included several examples of stimulus materials organized in the ways described.

000691 800 EVALUATION--This article was of very good quality; the exemplary diagrams which were included were extremely helpful in understanding the text. Examples of applied research in this area were discussed in detail. Applications relevant to ISD were presented which seemed to be particularly related to the development of handbooks or manuals. (R=11, P=31, EMW)

SEQUENCE NO. 691

1. CHECKLISTS FOR EVALUATING TYPE I & TYPE II DOCUMENTS

1A. INSTRUCTIONS

These checklists are aids for evaluating documents. Check items only in List 1B or 1C. All items may not apply to a specific document.

- If an item does not apply in any way, mark the NA box in the space to the left of the item.
- If a document fully satisfies an item criterion, mark the 1 box to the left of the item.
- If a document only partially satisfies an item criterion, mark the 2 box to the left of the item.
- If a document fails to satisfy an item criterion, mark the 3 box to the left of the item.

If you rate an item 2 or 3, make a brief note on scratch paper describing the defect.

1B. EVALUATION CHECKLIST FOR TYPE I ABSTRACTS

NA | 1 | 2 | 3

Descriptive Summary of Content:

1. Title of document describes contents.
2. Headings and subheadings outline contents.
3. Area of interest is delineated clearly.
4. Reasons for dealing with this area are clear.
5. Problem area is covered adequately.
6. Approach to problem area is appropriate.
7. Limitations of approach are covered.
8. Important terms are defined.
9. Relationship of this document to other relevant literature is stated.
10. Reviews of research are clear and concise.
11. Reviews of research specify designs employed.
12. Graphs and tables are presented clearly.
13. Conclusions are stated clearly.
14. Conclusions are substantiated by evidence presented in the document.
15. Conclusions are confined to the problem area discussed in the document.
16. Implications for future research are logically formulated.
17. Bibliography is properly organized and presented clearly.

Clarity and Usefulness:

18. Document does not rehash established principles.
19. Document presents *applications* relevant to ISD.
20. Document presents concepts relevant to ISD.
21. Conclusions are important for ISD.
22. Style of writing is appropriate for typical ISD users.
23. Document is written clearly.
24. Document is reasonably easy to follow and is not confusing.
25. Tone of the document displays an unbiased, impartial scientific attitude.

1C. EVALUATION CHECKLIST FOR TYPE II ABSTRACTS

NA | 1 | 2 | 3

Introduction:

1. Title of document adequately describes contents.
2. Problem is stated clearly.
3. Reasons for investigating problem are clear.
4. Assumptions are stated clearly.
5. Limitations of the study are stated.
6. Important terms are defined.
7. Relationship of the problem to previous research is clear.
8. Previous research is reviewed adequately for author's purposes.
9. Hypotheses are stated clearly.

Method:

10. Population is adequately described as to size, location, age, and other characteristics relevant to the research.
11. Method of sampling is adequately described and is appropriate.
12. Sample is adequately described as to size, location, age, and other relevant characteristics.
13. Research design is described fully.
14. Rationale for specific research design is adequately justified.
15. Research design is best suited for solution of the problem.
16. The effects of independent variables are not confounded with the effects of uncontrolled, extraneous variables.
17. The effects of independent variables are not confounded with the effects of motivational variables.
18. Control groups are appropriate for comparison with experimental groups.
19. Independent variables are adequately specified. (Qualitatively)
20. Dependent variables are adequately specified. (Qualitatively)
21. Variables are operationally defined. (Quantitative, generally)
22. Appropriate measures are selected for dependent variables.
23. Experimenter manipulates what he says he manipulates.
24. Conditions under which experiment was conducted are clearly specified and delineated in sufficient detail.
25. Research design is free of other specific weaknesses.
26. Data-gathering methods or procedures are described in sufficient detail to allow *replication*.
27. Data-gathering methods or procedures follow from the research design; methods or procedures are appropriate to the solution of the problem.
28. Data-gathering methods or procedures do not introduce artifactual biases into data.
29. Researcher has taken appropriate steps to eliminate or control for experimenter bias and self fulfilling prophecy.

Results:

30. Data-gathering methods or procedures are used correctly.
31. Reliability of measuring instruments is established.
32. Validity of measuring instruments is established.
33. Appropriate methods are selected to analyze the data in accordance with those *indicated by the research design.*
34. Methods used to analyze the data are used correctly.
35. Results of the analyses are presented clearly.
36. Graphs and tables are presented clearly.
37. Only significant results are introduced as meaningful data.
38. Confidence levels are stated clearly and if unusual, justified.
39. Unusual statistical procedures or unusual applications of standard procedures are described clearly and justified.
40. Transformed data are clearly specified as such and methods of conversion are stated clearly and adequately justified.

Discussion:

41. Conclusions are stated clearly.
42. Conclusions are substantiated by the evidence presented.
43. Generalizations are confined to the population from which the sample was drawn.
44. Conclusions relate only to the parameters of the investigation that were specified under experimental conditions.

NA | 1 | 2 | 3

45. Inferential and interpretive conclusions are clearly specified as such.
46. Inferential and interpretive conclusions are justified.
47. Speculations, guesses, and theorizing are not presented as conclusions that follow from the data.
48. Implications for future research are logically formulated.

Clarity and Usefulness:

49. Report is written clearly.
50. Report is logically organized.
51. Report is reasonably easy to follow and is not confusing.
52. Tone of the report displays an unbiased, impartial scientific attitude.
53. Report is of good overall quality.
54. Report is of importance to the problem area.

2. DOCUMENT X TOPIC PROFILE

ISD Topic No. (AFM 50-2)		Type I Abstract						Type II Abstract				# of ( )
		Opinion Article	Methodological Development	Evaluative Summary	Literature Review	Bibliography	Statistical Sampling Study	Correlational Research	Research Study (Manufactured Var.)	Other Specify:		
1	Determine Job (or Activity) Performance Requirements											
2	Determine Education or Training Requirements											
3	Determine Instructional Objectives											
3	Develop Tests											
4	Select Media/Methods											
.	Develop Instructional Materials		✓									
4	Validate and Revise Instructional Materials											
5	Conduct Instructional Program											
5	Evaluate Instructional Program											
Other Specify:												

3. MEDIA/INSTRUCTIONAL METHODS DISCUSSED

3A. COMMUNICATION MEDIA

Audio:
- ☐ Radio
- ☐ Tape Recorder
- ☐ Record Player
- ☐ Listening Lab

Visual:
- ☐ Filmstrip (Silent)
- ☐ Motion Picture as Repetitive Loop (Silent)
- ☒ Textbook
- ☐ Microform

Audiovisual:
- ☐ *Sound/Slide Projector*
- ☐ Filmstrip/Sound
- ☐ Television
- ☐ Motion Picture
- ☐ Motion Picture as Repetitive Loop

3B. ENVIRONMENTAL MEDIA/AIDS

- ☐ Simulator
- ☐ Part-Task Trainer
- ☐ Whole-Task Trainer
- ☐ Procedures Trainer
- ☐ Games
- ☐ Role Play
- ☐ Sociodrama
- ☐ Operational Equipment

3C. TUTORIAL MEDIA

- ☐ CAI/CMI
- ☒ Programmed Text
- ☐ Teaching Machines
- ☐ Learning Lab

3D. MULTIMEDIA

3E. VISUAL AIDS

Graphics:
- ☐ Charts
- ☒ Diagrams
- ☐ Graphs
- ☐ Illustrations/ Drawings
- ☐ Photographs

Exhibits:
- ☐ Cut-A-Ways
- ☐ Mockups
- ☐ Models

Projected Images:
- ☐ Opaque Projections
- ☐ Overhead Transparencies
- ☐ Slides

3F. METHODS OF INSTRUCTION

- ☐ Tutorial
- ☐ Lecture
- ☐ Recitation
- ☐ Discussion
- ☐ Demonstration
- ☐ Self-Instruction
- ☐ Simulation
- ☐ Peer Training
- ☐ Team Training

3G. OTHER: SPECIFY

4. TYPES AND METHODS OF RESEARCH EMPLOYED (FOR TYPE II DOCUMENTS ONLY)

4A. TYPE OF RESEARCH

- ☐ Basic
- ☐ Lab Study
- ☐ Applied
- ☐ Field Study

4B. METHOD OF RESEARCH

- ☐ Historical
- ☐ Descriptive
- ☐ Case & Field
- ☐ Developmental
- ☐ Causal Comparative or "Ex Post Facto"
- ☐ Correlational
- ☐ True Experimental
- ☐ Quasi-Experimental
- ☐ Action
- ☐ Other, Specify: _____

SEQUENCE NO. 715
ABSTRACT TYPE: I ____ II X

ABSTRACT FORM

AUTHOR(S): F. M. Dwyer

TITLE: Color as an Instructional Variable

PUBLISHER: AV Communication Review

REPORT NUMBER: Volume 19 DATE: 1971

GENERAL SEARCH TERMS:

Aids, Instructional
Attention
Audio Tape
Black and White
Color
Criterion Test
Graphics
Learning Facilitation
Listening
Materials, Preparation
Media, Evaluation of
Pictorial Test
Realism
Recognition
Slide Projector
Sound/Slide
Stimulus Characteristics
Symbolic Diagram
Visual Materials
Visuals, Use of

UNIQUE SEARCH TERMS:

NONE

SUGGESTIONS FOR ADDITIONAL RESEARCH:

NONE

CROSS REFERENCE: (SEQUENCE NUMBERS)

000715 600 Dwyer, F. M. Color as an instructional variable. "AV Communication Review," 1971, "19" 399-416.

000715 700 Conflicting research findings were cited concerning the effects of color in instructional materials. In addition to pointing out this need for further empirical study, the author also presented a theoretical justification for his study, based on the "realism theories" of Morris, Carpenter, Gibson, and Dale.

The study tested the following null hypotheses: (1) there are no differences in achievement (on the five criterial measures specified in this study) among students receiving oral instruction complemented by visual illustrations possessing different amounts of realistic detail; and (2) there are no differences in achievement on the five criterial measures between students receiving black-and-white illustrations and those receiving colored illustrations to complement oral instruction.

The independent variable was the type of visual illustrations each group received. There were eight experimental groups and one control group: (1) no visuals (control group); (2) simple line illustrations (black and white); (3) simple line illustrations (colored); (4) detailed, shaded drawings (black and white); (5) detailed shaded drawings (colored); (6) heart model photographs (black and white); (7) heart model photographs (colored); (8) realistic heart photographs (black and white); and (9) realistic heart photographs (colored). (Author included samples of illustrations.)

The dependent measure consisted of five criterial measures: Test A--drawing, 18 items; Test B--identification, 20 items; Test C--terminology, 20 items; Test D--comprehension, 20 items; and Test E--total criterial, which was a 78-point composite of the first four tests. The corresponding Kuder-Richardson Formula 20 reliabilities were .76, .86, .77, .82, and .93, respectively.

Method: The Ss were 261 college students enrolled in a lower level psychology course and randomly assigned to one of the nine treatment groups. The Otis Quick-Scoring Mental Ability Test was used as a pre-test. The Hartley test for homogeneity of variance and an ANOVA were conducted on the IQ scores. In no case did the observed values reach the criterial value for a p .LT. .05; i.e., no differences among average group IQ's were demonstrated.

The oral instruction, a 2000-word instructional unit describing the human heart and its functioning, was presented to the students by means of an audiotape recorder. Audio signals on the tape cued the changing of the slides so that both the oral and visual instruction presented relatively the same information simultaneously. The rate and number of words per minute were identical for each presentation.

An ANOVA was conducted on the scores achieved by the students in the nine treatment groups for each criterial measure. Where significant F-ratios (p .LT. .05) were found to exist, differences between pairs of means were analyzed via Tukey's W-Procedure.

Results: On all criterial measures, significant differences were found to exist among the means of the nine treatment groups. Except for test C (F=2.39; df=8/252; p .LT. .05), the F-ratios for the ANOVA were all significant beyond the .01 level. The statistical findings for tests A, B, D, and E were: F=8.26,

df=8/252, p .LT. .01; F=6.49, df=8/252, p .LT. .01; F=3.64, df=8/252, p .LT. .01; and F=5.92, df=8/252, p .LT. .01, respectively.

The effectiveness of the various slide sequences in improving student achievement on the criterial measures was measured via the Tukey W-Procedure.

For test A: treatment 2 was most effective; treatment 3 was more effective than treatments 1, 7, 8, and 9; treatment 5 was more effective than treatments 1, 8, and 9; treatment 7 was more effective than treatments 1 and 6.

For test B: treatment 5 was most effective; treatment 5 more effective than 1, 8, and 9; 3 more effective than 8 and 9; 7 more effective than 8 and 9.

For test C: treatment 1 was as effective as visual treatments.

For test D: treatment 1 was as effective as visual treatments; treatment 3 more effective than 6 and 9.

For test E: treatment 3 most effective; 3 more effective than 1, 6, 8, and 9; 5 more effective than 8 and 9; 7 more effective than 8 and 9.

Conclusions: **IN TERMS OF INSTRUCTIONAL EFFECTIVENESS, ECONOMY, AND SIMPLICITY OF PRODUCTION, THE RESULTS OF THIS STUDY INDICATED THAT: (1) THE SIMPLE LINE PRESENTATION WAS MOST EFFECTIVE IN FACILITATING ACHIEVEMENT ON THE DRAWING TEST: (2) THE DETAILED, SHADED DRAWING PRESENTATION (COLOR) WAS MOST EFFECTIVE IN FACILITATING ACHIEVEMENT ON THE IDENTIFICATION TEST: (3) THE ORAL PRESENTATION WITHOUT VISUALS WAS AS EFFECTIVE AS THE VISUALIZED TREATMENTS IN PROMOTING STUDENT ACHIEVEMENT ON THE TERMINILOGY AND COMPREHENSION TESTS: AND (4) THE SIMPLE LINE PRESENTATION (COLOR) WAS MOST EFFECTIVE IN PROMOTING STUDENT ACHIEVEMENT ON THE TOTAL CRITERIAL TEST. IT WAS FOUND THAT COLOR TREATMENTS WERE MORE EFFECTIVE THAN BLACK AND WHITE TREATMENTS IN 11 INSTANCES, AND IN 10 INSTANCES, CERTAIN COLOR TREATMENTS WERE FOUND TO BE MORE EFFECTIVE THAN OTHER COLOR TREATMENTS.**

000715 800 EVALUATION--The authors failed to mention whether the instructional materials were given to groups or individuals. In addition the title of the article did not indicate that this study was concerned with the effectiveness of different types of illustrations, as well as the effectiveness of color. Useful explanations of the various findings were included in the author's discussion. Except for the author's occasional acceptance of his null hypotheses, this study was basically sound and has important implications for ISD in that it directly related types of instructional materials to specific types of criterion tests. However, no suggestions for future research were given. (R=42, P=18, EMW)

SUMMARY AND EVALUATION FORM

SEQUENCE NO. 715

1. CHECKLISTS FOR EVALUATING TYPE I & TYPE II DOCUMENTS

1A. INSTRUCTIONS

These checklists are aids for evaluating documents. Check items only in List 1B or 1C. All items may not apply to a specific document.

0 If an item does not apply in any way, mark the N.A box in the space to the left of the item.

0 If a document fully satisfies an item criterion, mark the 1 box to the left of the item.

0 If a document only partially satisfies an item criterion, mark the 2 box to the left of the item.

0 If a document fails to satisfy an item criterion, mark the 3 box to the left of the item.

If you rate an item 2 or 3, make a brief note on scratch paper describing the defect.

1B. EVALUATION CHECKLIST FOR TYPE I ABSTRACTS

N/A 1 2 3

Descriptive Summary of Content:

1. Title of document describes contents.
2. Headings and subheadings outline contents.
3. Area of interest is delineated clearly.
4. Reasons for dealing with this area are clear.
5. Problem area is covered adequately.
6. Approach to problem area is appropriate.
7. Limitations of approach are covered.
8. Important terms are defined.
9. Relationship of this document to other relevant literature is stated.
10. Reviews of research are clear and concise.
11. Reviews of research specify designs employed.
12. Graphs and tables are presented clearly.
13. Conclusions are stated clearly.
14. Conclusions are substantiated by evidence presented in the document.
15. Conclusions are confined to the problem area discussed in the document.
16. Implications for future research are logically formulated.
17. Bibliography is properly organized and presented clearly.

Clarity and Usefulness:

18. Document does not rehash established principles.
19. Document presents applications relevant to ISD.
20. Document presents concepts relevant to ISD.
21. Conclusions are important for ISD.
22. Style of writing is appropriate for typical ISD users.
23. Document is written clearly.
24. Document is reasonably easy to follow and is not confusing.
25. Tone of the document displays an unbiased, impartial scientific attitude.

1C. EVALUATION CHECKLIST FOR TYPE II ABSTRACTS

N/A 1 2 3

Introduction:

1. Title of document adequately describes contents.
2. Problem is stated clearly.
3. Reasons for investigating problem are clear.
4. Assumptions are stated clearly.
5. Limitations of the study are stated.
6. Important terms are defined.
7. Relationship of the problem to previous research is clear.
8. Previous research is reviewed adequately for author's purposes.
9. Hypotheses are stated clearly.

Method:

10. Population is adequately described as to size, location, age, and other characteristics relevant to the research.
11. Method of sampling is adequately described and is appropriate.
12. Sample is adequately described as to size, location, age, and other relevant characteristics.
13. Research design is described fully.
14. Rationale for specific research design is adequately justified.
15. Research design is best suited for solution of the problem.
16. The effects of independent variables are not confounded with the effects of uncontrolled, extraneous variables.
17. The effects of independent variables are not confounded with the effects of motivational variables.
18. Control groups are appropriate for comparison with experimental groups.
19. Independent variables are adequately specified. (Qualitatively)
20. Dependent variables are adequately specified. (Quantitatively)
21. Variables are operationally defined. (Quantitative, generally)
22. Appropriate measures are selected for dependent variables.
23. Experimenter manipulates what he says he manipulates.
24. Conditions under which experiment was conducted are clearly specified and delineated in sufficient detail.
25. Research design is free of other specific weaknesses.
26. Data-gathering methods or procedures are described in sufficient detail to allow replication.
27. Data-gathering methods or procedures follow from the research design; methods or procedures are appropriate to the solution of the problem.
28. Data-gathering methods or procedures do not introduce artifactual biases into data.
29. Researcher has taken appropriate steps to eliminate or control for experimenter bias and self-fulfilling prophecy.

Results:

30. Data-gathering methods or procedures are used correctly.
31. Reliability of measuring instruments is established.
32. Validity of measuring instruments is established.
33. Appropriate methods are selected to analyze the data in accordance with those indicated by the research design.
34. Methods used to analyze the data are used correctly.
35. Results of the analyses are presented clearly.
36. Graphs and tables are presented clearly.
37. Only significant results are introduced as meaningful data.
38. Confidence levels are stated clearly and if unusual, justified.
39. Unusual statistical procedures or unusual applications of standard procedures are described clearly and justified.
40. Transformed data are clearly specified as such and methods of conversion are stated clearly and adequately justified.

Discussion:

41. Conclusions are stated clearly.
42. Conclusions are substantiated by the evidence presented.
43. Generalizations are confined to the population from which the sample was drawn.
44. Conclusions relate only to the parameters of the investigation that were specified under experimental conditions.
46. Inferential and interpretive conclusions are clearly specified as such.
46. Inferential and interpretive conclusions are justified.
47. Speculations, guesses, and theorizing are not presented as conclusions that follow from the data.
48. Implications for future research are logically formulated.

Clarity and Usefulness:

49. Report is written clearly.
50. Report is logically organized.
51. Report is reasonably easy to follow and is not confusing.
52. Tone of the report displays an unbiased, impartial scientific attitude.
53. Report is of good overall quality.
54. Report is of importance to the problem area.

2. DOCUMENT X TOPIC PROFILE

ISD Topic No. (AFM 50-2)		Type I Abstract						Type II Abstract				I or II
		Opinion Article	Methodological Development	Evaluative Summary	Literature Review	Bibliography	Statistical Summarizing Study	Correlational Research	Research Study (Manipulated Var.)	Other Specify:		
1	Determine Job (or Activity) Performance Requirements											
2	Determine Education or Training Requirements											
3	Determine Instructional Objectives											
3	Develop Tests											
4	Select Media/Methods								✓			
4	Develop Instructional Materials								✓			
4	Validate and Revise Instructional Materials											
5	Conduct Instructional Program											
5	Evaluate Instructional Program											
Other Specify:												

3. MEDIA/INSTRUCTIONAL METHODS DISCUSSED

3A. COMMUNICATION MEDIA

Audio:
- ☐ Radio
- ☒ Tape Recorder
- ☐ Record Player
- ☐ Listening Lab

Visual:
- ☐ Filmstrip (Silent)
- ☐ Motion Picture as Repetitive Loop (Silent)
- ☐ Textbook
- ☐ Microform

Audiovisual:
- ☒ Sound/Slide Projector
- ☐ Filmstrip/Sound
- ☐ Television
- ☐ Motion Picture
- ☐ Motion Picture as Repetitive Loop

3B. ENVIRONMENTAL MEDIA/AIDS

- ☐ Simulator
- ☐ Part-Task Trainer
- ☐ Whole-Task Trainer
- ☐ Procedures Trainer
- ☐ Games
- ☐ Role Play
- ☐ Sociodrama
- ☐ Operational Equipment

3C. TUTORIAL MEDIA

- ☐ CAI/CMI
- ☐ Programmed Text
- ☐ Teaching Machines
- ☐ Learning Lab

3D. MULTIMEDIA

_____

_____

_____

3E. VISUAL AIDS

Graphics:
- ☐ Charts
- ☒ Diagrams
- ☐ Graphs
- ☒ Illustrations/ Drawings
- ☒ Photographs

Exhibits:
- ☐ Cut-A-Ways
- ☐ Mockups
- ☒ Models

Projected Images:
- ☐ Opaque Projections
- ☐ Overhead Transparencies
- ☐ Slides

3F. METHODS OF INSTRUCTION

- ☐ Tutorial
- ☒ Lecture
- ☐ Recitation
- ☐ Discussion
- ☐ Demonstration
- ☐ Self-Instruction
- ☐ Simulation
- ☐ Peer Training
- ☐ Team Training

3G. OTHER: SPECIFY

_____

_____

_____

_____

_____

4. TYPES AND METHODS OF RESEARCH EMPLOYED (FOR TYPE II DOCUMENTS ONLY)

4A. TYPE OF RESEARCH

- ☐ Basic
- ☒ Lab Study
- ☒ Applied
- ☐ Field Study

4B. METHOD OF RESEARCH

- ☐ Historical
- ☐ Descriptive
- ☐ Case & Field
- ☐ Developmental
- ☐ Causal Comparative or "Ex Post Facto"
- ☐ Correlational
- ☒ True Experimental
- ☐ Quasi-Experimental
- ☐ Action
- ☐ Other, Specify: _____

APPENDIX II

MT/ST TYPING REQUIREMENTS

INTER-OFFICE MEMO

From: M. W. Nesbitt, S. D. Colwell

To: MT/ST Typists

Subject: MT/ST Typing Requirements for Abstracts

Date: 29 August 1972

Conversion of the MT/ST tapes to computer-readable magnetic tapes imposes certain requirements on the MT/ST typing. The rules which must be followed are outlined here.

Material To Be Typed

Only the second page of the abstract will be put on tape. The four data elements are:

1. The bibliographic reference
2. The abstract
3. The evaluation
4. The number of references (R=) and pages (P=), and the abstractor's initials

Tape Preparation

Before placing a tape cartridge on the tape station hub, the tape must be taut to preclude wrinkling or improper loading. This is accomplished by placing the fingers inside the inner ring and turning the cartridge as far as possible until the tape tightens.

Every fifth tape should be checked for misalignment, using the following procedures:

1. Draw out 2 feet of tape.
2. Apply chemical fluid supplied by IBM to tape surface.
3. Using a magnifying glass, check that characters are centered within the spaces of the tape.

Special Codes Required

Each tape will begin with the same codes. These codes are necessary to allow the computer program to retrieve entire abstracts and/or data elements, where desirable. As shown in Figure 1, the codes consist of:

Area A: A Feed Code and a Reference Code, then the 5-digit identifier (A1234), another Reference Code, and two Carriage Returns.

Area B: A sequential tape number, beginning with a 0001, a space, a Stop Transfer Code, a Reference Code, an underscore, the digits "01" and a space.

Area C: The abstract sequence number, beginning with 000001, and a space.

Area D: An access number (600) and then a space before the bibliographic reference. This same number, 600, will be inserted before every bibliographic reference. The reference will then be typed, using quotes instead of an underscore for the document title. A Stop Transfer Code, a Reference Code, and two Carriage Returns will be typed.

Area E: The abstract sequence number is repeated, a space, and then the access number (700) is typed indicating the body of the abstract. The same number, 700, will be inserted before every abstract text. (If the abstract contains experimental results, refer to the section on "Special Symbols.") After the last line of the abstract, a Stop Transfer Code, a Reference Code, and two Carriage Returns are inserted.

Area F: The abstract sequence number is repeated, then a space, and then the access number (800) is typed indicating that the evaluation follows. This same number, 800, will be inserted before every evaluation. After typing the final entries (R=?, P=?, XXX), a Stop Transfer Code, a Reference Code, and two Carriage Returns are inserted.

The typing of this abstract is now completed. The next sequence number will be entered, and the procedure is repeated again as shown in Figure 1, where sequence number 000009 is the last abstract. When the end of the tape is reached, the procedure for ending the file is as follows:

1. When error light comes on, signaling the end of tape, the typist must line return twice for each abstract on the tape (e.g., 3 abstracts, 6 lines; 4 abstracts, 8 lines). A maximum of 10 Line Returns should be made for tapes on which 5 or more abstracts are typed. The typist should

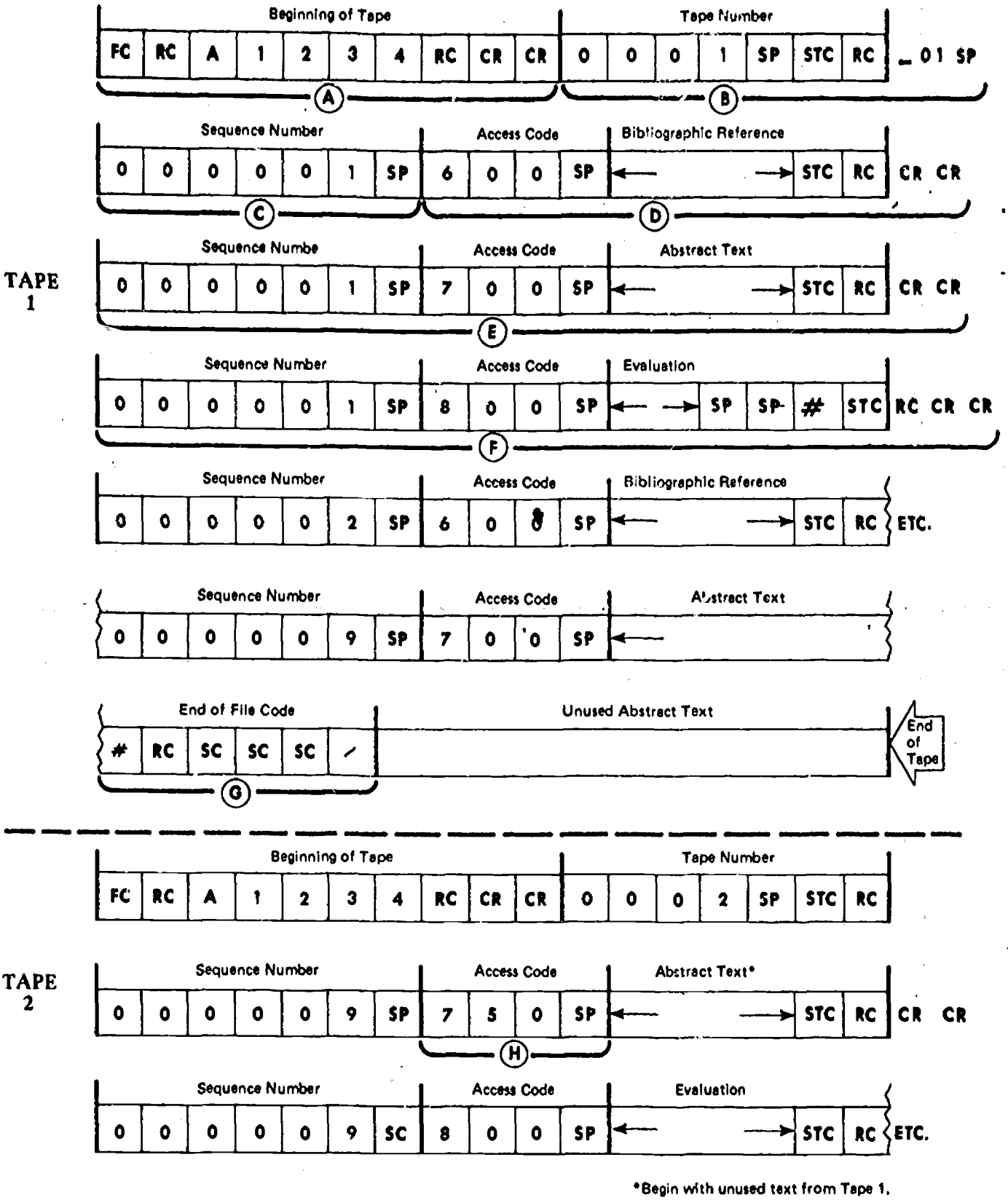


Figure 1. Sample MT/ST Tape

line return to a period, so that the body of the abstract on that tape will end with a complete sentence. Begin the End of File Code at that point. This extra space will allow the tape to be coded at a later date for access by the computer.

2. Area G of Figure 1 illustrates the proper End of File Code. First, a pound sign (#) is keyed, then a Reference Code and three Stop Codes, followed by a slash (/).

3. When starting a new tape, the typist must be careful about the initial coding. The first codes from Area A are the same, but the tape number is increased by 1 (e.g., to 0002). If a new abstract is being started, use the new sequence number and proceed as if it were the first tape. If a portion of the abstract (reference, abstract, or evaluation) is continued from the previous tape, the access code changes from 600 (bibliographic reference), 700 (abstract text), or 800 (evaluation) to 650, 750, or 850, indicating to the computer that this data is to follow the earlier element. (See Area H in Figure 1.) Each of the basic codes will be increased by 50 if they are used to designate an item which has been split in this way. It is unlikely, however, that the bibliographic reference code would ever need to be repeated, since references are typically quite short.

Special Typing Requirements

Unused Buttons

The two MT/ST buttons which cannot be used on the abstracts are the Backspace Code (BC) button and the Automatic Search Code (ASC) button. Data recorded will not contain underscored words or centered headings, so the BC will not be necessary. Also, it will not be acceptable to hyphenate words, so the BC will not be needed for this procedure. The ASC button cannot be used since the computer tape cannot be searched by this means.

Typing at End of Line

The Carrier Return (CR) Key records a Feed Code and a space. If a CR immediately follows a space, the output will be two spaces. For this reason, when a space would normally be recorded at the end of the typing line (followed by the CR), record instead only the CR. This rule will not hold if a colon or period falls at the end of the line.

Paragraphing

No indentions will be used, even for numbered items. All lines will be left-hand justified.

Reference Codes will not be used for each paragraph in the Type I abstracts. However, Type II abstracts will receive Reference Codes for each paragraph with a major heading (e.g., Method, Results) to facilitate computer retrieval of data.

To facilitate the computer's spacing, an extra space must be entered before the last Carrier Return in each paragraph.

Correcting Errors

The Feed Code (FC) which advances the tape to block out unwanted characters must be used with discretion on computer input data. If more than five or six characters are incorrect, use the Line Return procedure for corrections instead of Feed Coding the characters out.

Conclusions (Type II Abstracts)

Where experimental conclusions appear in a bracketed sentence on the handwritten copy, the sentence should be preceded by two asterisks (**), typed in all caps, and followed by two asterisks(**). For example:

> The authors concluded that **METHOD OF PRESENTATION DOES AFFECT THE READABILITY OF THE MATERIAL ON THE GRAPHS, FIGURE IDENTIFICATION, AND SYMBOL TRANSLATION TESTS AND THAT OFFSET COPY GAVE BETTER READABILITY THAN EITHER NEGATIVE OR POSITIVE MICROFICHES ON THESE THREE TESTS.**

Special Symbols

Symbols which must be avoided in typing MT/ST tapes of the abstracts are:

1. The pound sign (#)
2. The cent sign (¢)
3. The exclamation point (!)

Experimental results will often appear in the Type II abstracts, and may contain numerical symbols or symbols which require translation by the

typist, to assure that they are acceptable by the computer. The following list illustrates the necessary changes.

This	Not This
.LT.	<
.GT.	>
.GE.	≥
.LE.	≤
sum	Σ
frequency	f
mean	$\bar{x}$
Alpha	α

General Typing Instructions

Margins

The standard margins for the recording of abstracts are 15-90.

Paragraphing

No paragraph indentions will be used; all material will be left-hand justified. Typing will be single-spaced, with a double-space between paragraphs. Also, "EVALUATION--" will be typed in all caps and will precede the text of the evaluation.

Listings

All listings of two (2) lines or less will be strung out in the sentence with parentheses around the identifying number or letter. All first divisions will be numbered with Arabic numbers (1, 2, 3, etc.) and the next division, with lower case letters (a, b, c, etc.).

Sentence Structure

When possible, use complete sentences to express information.

Paper

Draft paper will be used for recording of abstracts. Special 60# Marathon paper will be supplied for final copy of the abstracts.

Proofing

At the end of a typing period, the typist should take all completed tapes, log sheets, and abstracts from the station to be proofed. Labels should be prepared for each tape, a typed version of the log sheet completed, and the abstracts carefully proofed for any errors. It will then be that typist's duty to make all corrections to those tapes at the beginning of her next typing period. This will prevent an enormous proofing-correcting process at the end of the contract.

Administrative

Log Sheets

A log sheet will be prepared for each MT/ST tape and will contain the following information:

1. Tape number.
2. Sequence numbers of abstracts which appear on that tape.
3. A listing of the reference codes and a description of what is found at each code.

For all tapes, the description for reference codes 01 and 02 is standard and an "S" is preprinted on the sheet. For Type I abstracts the appropriate codes are: B (Sequence No.) for bibliographic reference, A for body of abstract, E for evaluation, and S for the standard End of File code. The Type II abstracts will be referenced in the same way, except that A1, A2, A3, etc., will be used for each paragraph of the abstract that contains a major heading. Figures 2 and 3 present example log sheets for Type I and II abstracts respectively. Frequently, however, Type I and II abstracts will be found on one tape.

A solid line should be drawn across the Description column showing the end of each abstract. If an abstract is continued to the next tape, this would be indicated by a dotted line. (See Figures 2 and 3.)

A handwritten log sheet should be prepared as the recording is being done and a final sheet should be typed after a day's activities. Log sheets will be kept in the MT/ST drawers.

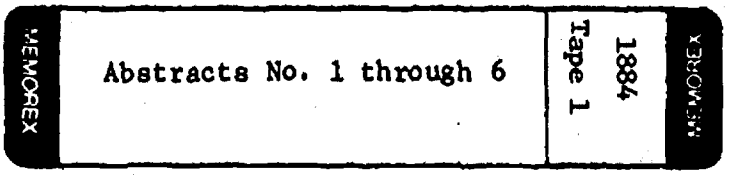
MT/ST Tapes

Memorex MT/ST tapes are numbered consecutively in boxes of five (5) and are kept in the MT/ST work area. As needed, each box (containing 5 tapes) should be taken to the MT/ST for recording and returned to the original carton when completed.

As each tape is completed, a label (blue) should be prepared which contains the following information:

1. Contract No. (1884)
2. Tape No.
3. Abstract Sequence Nos. which appear on the tape

The following is an example of such a label. It should be placed on the face of the tape, just below the tape number.



TAPE NO. 5

ABSTRACT SEQUENCE NO. 24 THROUGH 30

Reference Code	Description	Reference Code	Description
01	S	41	
02	S	42	
03	B (24)	43	
04	A	44	
05	E	45	
06	B (25)	46	
07	A	47	
08	E	48	
09	B (26)	49	
10	A	50	
11	E	51	
12	B (27)	52	
13	A	53	
14	E	54	
15	B (28)	55	
16	A	56	
17	E	57	
18	B (29)	58	
19	A	59	
20	E	60	
21	B (30)	61	
22	A	62	
23	S	63	
24		64	
25		65	
26		66	
27		67	
28		68	
29		69	
30		70	
31		71	
32		72	
33		73	
34		74	
35		75	
36		76	
37		77	
38		78	
39		79	
40			

Figure 2. Type I Document (with last abstract continued on next tape)

TAPE NO. 6

ABSTRACT SEQUENCE NO. 30 THROUGH 36

Reference Code	Description	Reference Code	Description
01	S	41	
02	- - - S - - - - -	42	
03	A	43	
04	E	44	
05	B (31)	45	
06	A	46	
07	E	47	
08	B (32)	48	
09	A	49	
10	E	50	
11	B (33)	51	
12	A	52	
13	E	53	
14	B (34)	54	
15	A	55	
16	E	56	
17	B (35)	57	
18	A	58	
19	E	59	
20	B (36)	60	
21	A	61	
22	E	62	
23	S	63	
24		64	
25		65	
26		66	
27		67	
28		68	
29		69	
30		70	
31		71	
32		72	
33		73	
34		74	
35		75	
36		76	
37		77	
38		78	
39		79	
40			

Figure 2. (continued)

TAPE NO. 5

ABSTRACT SEQUENCE NO. 24 THROUGH 30

Reference Code	Description	Reference Code	Description
01	S	41	S
02	S	42	
03	B (24)	43	
04	A1	44	
05	A2	45	
06	A3	46	
07	A4	47	
08	E	48	
09	B (25)	49	
10	A1	50	
11	A2	51	
12	A3	52	
13	E	53	
14	B (26)	54	
15	A1	55	
16	A2	56	
17	A3	57	
18	E	58	
19	B (27)	59	
20	A1	60	
21	A2	61	
22	A3	62	
23	A4	63	
24	E	64	
25	B (28)	65	
26	A1	66	
27	A2	67	
28	E	68	
29	B (29)	69	
30	A1	70	
31	A2	71	
32	A3	72	
33	A4	73	
34	E	74	
35	B (30)	75	
36	A1	76	
37	A2	77	
38	A3	78	
39	A4	79	
40	E		

Figure 3. Type II Document

000700 600 Dwyer, F. M., Jr. Exploratory studies in the effectiveness of visual illustrations. "AV Communication Review," 1970, "18," 235-249.

000700 700 The studies reviewed in this article investigated the problem of which types of visual instruction are most efficient in facilitating student achievement of different types of educational objectives. Conflicting theories about the effectiveness of realistic visual aids were presented. The author described his own study, which tested the effectiveness of simple line drawings, detailed drawings, and realistic photographs of a heart when these illustrations accompanied a taped lecture on the functioning of the heart. He found that the simple line drawings were significantly more effective in promoting student achievement on drawing, identification, and total criterial tests. In addition, an oral presentation was as effective as presentations with visuals on terminology and comprehension tests. In a similar study using college students, oral presentation alone was as effective as visually complemented treatments on four out of five criterial measures. Several explanations were advanced to explain these results.

Another study used the same text and illustrations in the form of a programmed text. The results of this study indicated that the use of visual illustrations to complement programmed instruction is an effective way to improve achievement of objectives measured by drawing, identification, and total criterial tests.

An extension of the same study added color as an instructional variable. It was found that for specific objectives and for students in certain grade levels, color appears to be an important variable for improving student achievement.

Three similar studies were reported, each using a different medium: (1) television, (2) telebeam projector producing a front projection image, and (3) projector producing a rear-screen image. The same results occurred in each study. The oral presentation without visuals was found to be as effective as the visually complemented treatments on four of the five criterial tests. The exception was the drawing test, for which the simple line presentation was significantly more effective.

The author concluded the article with a list of guidelines for the production and use of visual illustrations used for instructional purposes.

000700 800 EVALUATION--This article is relevant to ISD as it contained suggestions and guidelines for the preparation and use of visual materials. The research designs were described adequately and studies were presented in logical sequence. However, in the studies discussed, the researcher has often accepted his implied null hypothesis, translating a "not significantly different than" into an "as equally effective as." (R=30, P=15, EMW)

Figure 4. Sample Type I Abstract

000704 600 Houser, R. L., Houser, E. J., & Van Modfrans, A. P. Learning a motion and a nonmotion concept by motion picture versus slide presentation. "AV Communication Review," "18," 425-430.

000704 700 This study was related to the area of selection of media for most effective teaching. The effect of presenting a basic stimulus characteristic via two media with differing ability to present that characteristic was investigated. The authors hypothesized that: (1) the use of motion picture film would facilitate the learning of a concept involving motion as a defining attribute; (2) there would be no differences in learning between a motion picture and a slide presentation in the learning of a nonmotion concept; and (3) repetition would facilitate learning a new concept.

Method: The Ss were 41 volunteers from education classes at a large midwestern university. They were randomly assigned to four groups. The 72 stimulus patterns used in this study were irregular geometric shapes which differed in shape, angularity, size, and activity. Each was generated by choosing at random six pairs of numbers corresponding to points in a matrix. Lines were drawn between the points in a clockwise direction according to the order in which the pairs were drawn. For 36 of the figures, the sharp angles were smoothed out using a French curve. Figures were selected at random for the presentation of both motion and nonmotion concepts.

There were four experimental groups with the following presentations: (1) 5 motion and 5 nonmotion exemplars by motion picture; (2) 10 motion and 10 nonmotion exemplars by motion picture; (3) 5 motion and 5 nonmotion exemplars by slides; and (4) 10 motion and 10 nonmotion exemplars by slides.

The presentations on motion pictures were filmed on black-and-white 8mm. film. Each sequence lasted 10 seconds with motion (90-degree rotation about the geometric center) occurring between seconds 5-8, or with no motion occurring. The Ss were asked to learn to label the various stimulus sequences with the nonsense syllables FIK or GEF for nonmotion and motion sequences, respectively. The slide presentations were identical except that the motion occurred in two discrete 45-degree rotations at the fifth and seventh seconds of the sequence. The Ss similarly labeled these with FIK or GEF.

The dependent measure were the number of motion and nonmotion concepts correctly identified. The two independent variables were the number of presentations and the visual medium used.

Results: An ANOVA was performed on the means of the number of motion concepts correctly identified. The Ss with the motion picture treatment correctly identified significantly more motion concepts than the slide treatment group ($F=65.87$; $df=1/40$; p .LT. .001). The effect for number of presentations and the interaction of treatment and number of presentations were not significant. The number of nonmotion concepts correctly identified was significantly higher for the motion picture presentations than for slide presentations ($F=37.54$; $df=1/40$; p .LT. .001). The effect for number of presentations was also significant ($F=6.58$; $df=1/40$; p .LT. .05). More

Figure 5. Sample Type II Abstract

nonmotion concepts were correctly identified when subjects received 20 presentations than when subjects received 10 presentations.

Conclusions: **IN THE CASE WHERE MOTION IS A DEFINING ATTRIBUTE OF A CONCEPT, MORE EFFECTIVE LEARNING IS ACHIEVED WHEN THAT CONCEPT IS PRESENTED USING MOTION PICTURES THAN WHEN IT IS PRESENTED USING SLIDES.**

000704 800 EVALUATION--This research would best serve as groundwork for future research. No mention was made of previous related research. The title was somewaht deceptive, since "concept identification" seems to be more descriptive of the task than is "concept learning." This study has little applicability to ISD because of the nature of the task Ss were asked to perform. However, the idea of using motion pictures to present concepts involving motion, although obvious, is useful for ISD. (R=3, P=6, EMW)

Figure 5. Sample Type II Abstract (continued)

APPENDIX III

RELEVANT ARTICLES NOT ABSTRACTED

Appendix III

Relevant Articles Not Abstracted

Aiken, E. G. Delayed feedback effects on learning and retention of Morse Code symbols. *Psychological Reports*, 1968, *22*, 723-730.

Anderson, R. C., Faust, G. W., & Roderick, M. C. "Over-prompting" in programmed instruction. *Journal of Educational Psychology*, 1968, *59*, 88- .

Ash, P., & Hobaugh, T. R. Some primary ratable characteristics of instructional films. *Journal of Applied Psychology*, 1953, *37*, 293-299.

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Bucky, S. F., Spielberger, C. D., & Bale, R. M. Effects of instructions on measures of state and trait anxiety in flight students. *Journal of Applied Psychology*, 1972, *56*, 275-276.

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Dwyer, F. M. An analysis of the instructional effectiveness of visual illustrations presented via television. *The Journal of Psychology*, 1969, *72*, 61-64.

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Grant, D. L., & Caplan, N. Studies in the reliability of the short-answer essay examination. *Journal of Educational Research*, 1957, *51*, 109-116.

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Johnson, G. B., Jr. A method for evaluating research articles in education. *Journal of Educational Research*, 1957, *51*, 149-151.

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Klare, G. R. Measures of the readability of written communication: An evaluation. *Journal of Educational Psychology*, 1952, *43*, 385-399.

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