THE DEVELOPMENT OF A PROTOTYPE FOR A SELF-INSTRUCTIONAL LEARNING UNIT TO SERVE CONTINUING EDUCATION NEEDS OF TEACHERS

by

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B.Ed., University of British Columbia, 1964

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE (EDUCATION)
in the Faculty
of
Education

Simon Fraser University

April, 1975

APPROVAL

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Degree: Master of Science (Education)

Title of Thesis: The Development of a Prototype for a Self-Instructional Learning Unit to Serve Continuing Education Needs of Teachers

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ABSTRACT

The purpose of this study was to produce a self-instructional learning unit that could serve as a prototype for meeting specific professional educational needs of teachers. The unit was intended to provide teachers with basic content information about a specific curriculum area as well as with a methodological approach to teaching this material to children. The metric system was chosen as the topic for the prototype unit because of its obvious and immediate application to the present needs of teachers, given the fact that the metric system is being introduced in Canada, and that the public schools are called upon to aid in the educational aspects of the metrification program.

The study includes a review of the relevant literature focussing upon four major areas: the literature related to the learning process itself including means of increasing the probability of learning; in-service or continuing education of teachers; technical considerations related to the design of self instructional systems; and the usefulness of available media, especially in the context of self instruction.

From the literature review twenty-two criteria are derived. These criteria are used to design the prototype kit. A full description of their application is provided.

The completed learning unit was presented to three teachers who rated the unit in terms of how well the learning principles had been embodied in its design. It was found that

the principles derived from the literature were capable of application to a specific self-instructional context and that they, in fact, had been applied. A summary of the teachers' comments is included as are their statements about the general effectiveness of the learning unit.

Suggestions for further study are provided.

ACKNOWLEDGEMENTS

The author would like to acknowledge the assistance of Dr. Milton McClaren who provided firm guidance without stifling the author's enthusiasm. Dr. J. F. Ellis gave the author preliminary advice and assisted materially with the design of the thesis.

Practical assistance came from Wayne Fagrie, Gaye Rowles, Audrey Kharadly and Marian Reid. Shirley Heap helped materially with the structure of the finished product and suffered through the author's inimitable hand.

A very special mention must be made of the many sacrifices made by the author's wife and later family who offered support for "Dad's Fesis" and gave up many hours of pleasure and companionship over the many years of this period of study.

To everyone else who offered support and assistance I thank you. Through this work I have come to realize the value and meaning of cooperation and friendship.

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Chapter 1

INTRODUCTION TO THE STUDY

Purpose of the Study

This study sought to: (1) produce a prototypical model of a self-instructional learning unit for teachers; (2) utilize accepted learning principles in the design of the prototype; (3) suggest changes and modifications to the prototype based upon user evaluations; (4) provide future developers of self-instructional materials with a format for developing learning units; and (5) suggest other areas of study and application that may prove fruitful.

Importance of this Study

The continuing in-service education of any professional group is of vital importance given the rate of growth of knowledge at present, as well as increasing demands for better service which are being placed upon most professions by the public. The teaching profession is no exception. This was underlined by a recent (June 1974) letter from the British Columbia Minister of Education to the Joint Board of Teacher Education. The letter states:

> "The Government of B. C. is concerned about the general problem of providing an adequate program of in-service training for teachers. In my opinion, present levels of in-service training are inadequate and poorly organized. They seem to be developed on an "ad hoc" basis through the many school districts of the province." (see Appendix 1)

Teachers also feel the need of better organized in-service education. In a sample of B. C. teachers polled by the British Columbia Teachers' Federation, 45% of those surveyed placed in-service education at the level of high priority.

In an age when knowledge and methodology is rapidly changing there is a need for a fast and flexible transfer of information. Teachers have a limited time for this transfer (or for in-service learning activity) while there are many of them spread across a large area. Travel is becoming increasingly expensive and often appropriate personnel for teacher in-service education are difficult to find, expensive to hire, and transportation of these resource persons is sometimes difficult. Other approaches to this problem have involved complex media such as television or network radio which are not often easily available for educational purposes. Books and related print materials are slow to produce and their effectiveness is often questioned. The basic problem therefore is: can we develop an approach to self instruction which is effective, easily produced, cheap, and, which can readily be mailed to its users?

Background of this Study

Teachers are usually faced with five alternatives in seeking to further their professional education. These are: (1) "workshops" held in, or near their schools; (2) conferences held at some place often remote from their homes; (3) summer courses held at a distant university, sometimes bearing no academic or professional credit; (4) personal reading of avail-

able books and journals; (5) face-to-face conferences and discussions with colleagues in their own or neighboring school districts. Recently another alternative has been provided by university courses offered off-campus in regional centers. However, at least in British Columbia, these courses are offered unpredictably, are small in number, and are subject to cancellation because of small enrolments.

As a teacher in a small interior town I personally experienced the problems of continuing my education. It was my opinion that the most successful methods were personal reading followed by courses taken during the summer months. The value of the reading lay in the fact that books were accessible and often I could apply what I learned with immediate value to my own teaching. Sojourns at summer school, although valuable professionally, involved major sacrifices both of money and of family holiday activities. Many of my colleagues were unable or unwilling to make these sacrifices. At this time I began thinking of more attractive and practical ways of providing continuing education to teachers employed in areas remote from university centers.

These deliberations were interrupted by an appointment to Simon Fraser University as an Associate of the Educational Foundations Centre. This appointment allowed me to visit several areas of central British Columbia where I had an opportunity to discuss the problem with other teachers. At this time there seemed to be no alternative offered to teachers except the

"workshop", usually entailing much expense to the sponsors and an expenditure of time and energy by resource people merely to reach the location of the "workshop". In discussing this with my colleagues the universality of this problem became evident. Travel to and from "workshops" can be difficult. Indeed, in winter, such travel can become impossible, or dangerous, and may trap resource people in remote areas and, in effect, frustrate them to the point of refusal to undertake other in-service education assignments.

In 1967, Dr. John Ellis of Simon Fraser University with the assistance of Alan Sprague of the British Columbia Teachers' Federation developed the concept of an "automated" conference for teachers. This blossomed into a project that became known as "Project COLE", an acronym for Creation of Learning Environments. I had the opportunity to work on this novel approach. COLE was designed by educators from both Simon Fraser University and the B. C. T. F. to enable teachers in distant areas to avail themselves of some current ideas and techniques in education. It utilized printed materials, graphics, slide transparencies, movies, records, audio tapes in reel and cassette form, videotapes and models to create a new and exciting learning environment with a minimum of on-site preparation by the producers. It was, in fact, an automated conference, which showed educators how educational materials could be packaged and sent anywhere on demand. COLE was really a smorgasbord of ideas about self-instructional

techniques, pointing to many alternative approaches to teacher in-service education.

Content Choice for the Learning Unit

Certain preliminary conditions were established for the topic content of the unit from the outset of this study. First, the prototype vehicle must actually represent an in-service education unit and should meet a known need of teachers. Second, it should be a functional, working model. With these conditions in mind the topic of the metric system was selected as the content of the prototype.

There were three major reasons why the author chose the metric system as a content focus. (1) The United States and Canada are the last major countries of the world to change their system of weights and measures to the Systeme International (SI), or, as it is known here, the metric system. In Canada the process of conversion has already begun and the B. C. Elementary School Curriculum now uses SI units exclusively up to year seven. While the children will graduate into a metric world we still have a teacher population that is on the whole ignorant of the metric system. (2) Teachers are greatly concerned with their unfamiliarity with and lack of knowledge about the SI system and are demanding in-service education activities that will allow them to learn about this system in order to enable them to teach it with confidence. (3) The author, because he was trained as a science teacher, understands

the SI system and its ramifications and has spent a year working with teachers in the Vancouver School District on this very problem. This, coupled with his belief in the superiority of the metric system would assure that the enthusiasm conveyed in the learning unit was real and not forced.

The prototype package will familiarize the teacher/learner with the background, rationale, and mechanics of the metric system with respect to commonly used units of length, area, volume, capacity, temperature and weight. It will also present some strategies for teaching these facts and concepts to children.

Delimitations of the Study

The literature of in-service education is afflicted with rather poor definitions of terms and a lack of solid research. In order to clarify the author's intent it is necessary to state the limits of this study. This study is a development of a prototype for a self-instructional learning unit to serve the continuing education needs of teachers.

This study is not: (1) a review of current offerings in self-instructional learning; (2) a validation of current learning theories; (3) a prototypical learning unit for any learner who wishes to learn about SI units; (4) a comparison of the effectiveness of various media; (5) an evaluation of a self-instructional learning unit.

Although this is not a study of the above it does relate to them and may assist others to investigate and study these areas.

Outline of the Study

This chapter has included discussions of the importance and the background to this study as well as a short section on the limits of this work. The literature review in Chapter 2 was done in order to extract acceptable criteria for the construction of the prototype. This review deals with principles of learning, needs of teachers with regard to in-service education, technical considerations of independent learning and media selection for the model unit. A list of criteria are derived from the literature and form the basis for the development of the unit.

In Chapter 3 the criteria derived from the literature review are discussed with regard to their application to this mediated in-service education package.

Chapter 4 deals with whether or not the prototypical kit actually satisfies the criteria applied in its' design. Three teacher users were presented with the unit and asked to evaluate whether the criteria as outlined in Chapter 3 were satisfied or not.

Chapter 5 discusses the apparent advantages and disadvantages of this mode of learning and offers some suggestions for improvement and modifications to this and other similar units.

The study offers some conclusions and suggestions for further study before summarizing the contents in a final statement.

Chapter 2

REVIEW OF THE LITERATURE

This chapter describes the literature the author has read with an end to deriving criteria for producing a prototype self-instructional package for teachers. Literature directly pertaining to this problem is scant if not non-existent. In order to ascertain what may be pertinent, several areas of the educational, psychological and technological literature were investigated and the following represents an eclectic review of these writings.

Because the literature on learning is large as is that on self-instruction and the application of educational media, this review focusses on the answers to several questions. First, what general principles can be identified as applying to all human learning, irrespective of context, and are these principles generally recognized by specialists in learning theory? Second, an attempt has been made to define generalizations which have been made about the nature of successful teacher in-service education programs, as opposed to descriptive accounts. The generalizations were sought as a guide to the development of design specifications for the prototype teacher in-service education package. Third, because the

technical literature in educational media is very large, that literature has been reviewed specifically in the context of principles which would apply to the design of self-instructional systems. The third section closely relates to the fourth section, which deals specifically with the use and application of specific media such as radio, television, video tape, and audio tape in the context of self-instruction. Thus the review has been selective in the sense that it has related to the problem of self-instruction in the context of teacher education.

Literature Related to the Learning Process Itself and the Means of Increasing the Probability of Learning

A direct assault on learning process was made by perusing two generally accepted texts on learning and learning theory. The first of these was by Travers (1967) and included a summarizing list of "important generalizations that may be used in the management of learning" (p. 508). This list of some sixty-six generalizations (see Appendix II) was partially redundant and certain portions of it were not applicable to this study. It was made clear that there existed several theoretical positions regarding learning process and any one of these could serve as a point of departure for the formation of criteria. However, no one theory was ubiquitous in its coverage of all aspects of learning process so a further search was made for generalizations from other sources.

A second list came to light in Hilgard (1960) and upon personal communication with three current and local learning theorists* a similar list (Appendix III) from a more recent edition of the same text by Hilgard and Bower (1966) was seen to provide a firm base from which to begin the formation of criteria.

A further aid to this formation came in the form of a third list (Appendix IV) prepared by Kirchner (1973) from a survey of leading educational experts in British Columbia. These experts were asked to rate each criterion in a list of potential criteria on a five point scale which range from "very important" to "unimportant". This survey produced a list of sixteen criteria for program design which would enhance the probability of learning. Kirchner's criteria were designed to be used with totally naive learners, namely, housewives learning electronics, whereas this study considers a group of professionals who will be learning vocationally related material.

Literature Related to In-service or Continuing Education of Teachers

The Dictionary of Education (Good, 1959) defines in-service

*Based on personal correspondence between the writer and Dr. O. A. Oldridge, Associate Professor, Faculty of Education, University of British Columbia, February 10 to March 3, 1970; Dr. T. J. Mallinson, Professor and Director, Communication Studies, Simon Fraser University, February 10 and 11, 1970; and personal correspondence and communication between the writer and Dr. Leone Prock, Associate Professor, Professional Foundations, Simon Fraser University, February 10 to May 15, 1970.

teacher education as "activities on the part of employed teachers that contribute to their professional growth and qualifications".

There are few detailed analyses or pieces of sound evidence that can be applied directly to an in-service education program. Kelly (1950) reviewed twenty studies of in-service education from 1920 - 1950 and found that most of the studies used questionnaires or survey devices, none of which reported any follow-up or further experimentation. Mork (1953) stated that the majority of studies of in-service education up to 1953 were based on "opinion and recommendation rather than research".

McFeaters (1954), after reviewing and analysing two hundred and fifty-three studies of in-service education programs from 1919 - 1951 found that the "workshop" was the most prevalent form of in-service education and also found that any attempts at evaluation of programs have had little influence upon the conduct of in-service teacher education.

Flanders (1963, pp. 7-8), after a review of the literature stated that:

> "Serious questions can be raised about the practical importance of surveys which presume to report a favorable reaction of educators toward in-service training. Most of these studies fail to get at the heart of the matter which is to determine what kinds of teachers like or dislike what types of in-service training, or what aspects of an in-service training program. Furthermore, it has been shown in studies of the reliability of both opinions and sociometric choices that the results may be quite different when the reactions reported are presumed to have, or will

> have, direct consequences for the person giving the report. It is one thing to be in favor of in-service training and quite another to assign part of your working day, during the next ten weeks, to in-service training activities."

The above studies certainly point out a serious gap in the research on in-service education. Many have written about existing in-service programs, (Wagoner, MacKenzie, 1969; Jacobsen, 1968; and Kelly, 1950) but very few authors have actually produced useable data upon which to formulate models with respect to in-service education. There are, however, a few studies which are "beacons" or "landmarks" in that they indicate possible directions for in-service education and support their arguments with evidence.

Finch (1969) used two hundred and seventy pairs of California teachers chosen for their similarities in age, personal history and teaching experience in the California system, but differing in the number of in-service education points they had obtained. These teachers were individually evaluated by peers and administrative staff and it was found that the ratings directly reflected the in-service activities of the teachers: the more in-service education points obtained, the higher the teacher's rating and vice versa. One conclusion that was very pertinent to the present study was that "the participation of elementary school teachers in district sponsored 'point' classes reflects their need for specific methods courses". To be more exact, specific methods courses were selected two and one half times more than most theoretical university or college

courses.

Lindberg (1971) says:

> "If what the teachers report they want is heeded, in-service science education methods courses will be taught, at least in part, by the discovery method, encouraging teachers to work with materials much as children in an elementary classroom would."

Hone and Carswell (1969) state that "the keynote to productive in-service science education is involvement-workshops (with equipment) in fact, not in name only."

Several studies in Britain have provided much more concrete evidence about teacher preferences and views regarding in-service education. Cane (1969) stated that 80% of a teaching sample of two thousand six hundred and one teachers in three representative counties of England and Wales declared positively their need for in-service education.

> "Teachers' preferences for arrangements were quite definite: they would like the bulk of in-service training to take place close to their own home or school, preferably during school hours, but failing that, at a convenient starting time after school, for a half day or full day at weekends, or for up to one week during vacation."

The reasons given for non-attendance at in-service activities were: cost of activity, dislike of travel, residence away from home and family, and domestic responsibilities. The findings suggest that provision for local rather than regional or national in-service education is even more urgent and important than the reduction in the expense of attending such training. Townsend (1969) reported that, "Teachers want courses in school times or in the evenings of school days rather than in holidays

or at weekends." The latter two choices were extremely unpopular.

Quine (1974) surveyed one hundred and fifty elementary teachers, principals and directors of elementary instruction to determine their opinions concerning the professional growth activities of teachers as well as to identify specific in-service needs of teachers. He found that an overwhelming majority of teachers feel a general and personal need for opportunities to increase their professional growth, preferably at the hands of other teachers. His recommendations from this study include the provision of routine opportunity for the continuance of professional activities which should be practical in application and specific in focus. He also recommended that the school should be recognized as an ideal laboratory for professional growth and that innovative pilot projects be established to explore new ways of developing professional competence.

There has been considerable interest of late in the individualization of teacher preparation (Edwards, 1973 and Esler, 1972). This movement stems from the premise that if children learn in different ways and at different rates then teachers in training and teachers continuing their education also learn at different rates and in different ways. Gill (1968) stated,

> "When emphasis in teacher preparation actually moves to the individual teacher and to an individual plan for his learning, continuous but changing as it must be throughout his

> career, teaching can then without question take its place as one of our professions."

This type of statement has led many workers to realize that changes in the format of teacher education must be sought. Newell (1969) stated,

> "If ways can be found to communicate learning experiences effectively without constant resource to a human instructor, or constant proximity to other learners, it becomes possible to think in terms of a more adventurous use of those two essential commodities, time and space."

Technical Considerations Related to the Design of Self Instruction Systems

One of the first major attempts at individualizing instruction at the university level was made by Postlethwait at Purdue University in 1961. He utilized individual tape recorders and film projectors to give the students information and instruction while they participated in a Biology laboratory exercise. His technique was well received and has been commercially published. Postlethwait presented a model to be examined--a working "audio-tutorial" system of individualizing at least the rate and timing of instruction. A closer working model was at hand at Simon Fraser University, and from personal communications and observations the author saw how the judicious use of tape recordings and visual materials could extend the reach of a single person or facility to any area at any time.

Siemankowski (1969) in a pilot report stated that the teaching techniques used in colleges and universities at present do not produce the type of individual needed to teach

in elementary schools. He was further influenced by Katagiri who reported, at a 1964 NASA conference on science education, that a multi-media approach to the teaching of science for non-science-oriented elementary education majors had produced achievement results superior to conventional teaching methods. In that particular group Siemankowski saw current research in the area of multi-media instruction to be in its infancy, as tapes and materials were just being developed. Indeed, there are very few research reports which cite concrete evidence as to the effects of multi-media approaches on learners. The literature is filled with the "good feeling" type of paper that was described before as being so prevalent in in-service education research.

Indeed, this is a characteristic of the literature of independent learning as well. James (1971) says,

> "By far the greater part of the volume of writings on correspondence education are descriptions which range in reliability from the persuasively promotional to the more objective apologias. If one were to exclude information presented by those who have a vested interest and a product to sell, there would be relatively little left."

Moore used the term "distance teaching" of adults.

> "Distance teaching may be defined as the family of instructional methods in which the teaching behaviours are executed apart from the learning behaviours, including those that in a contiguous situation would be performed in the learner's presence, so that communication between the teacher and the learner must be facilitated by print, electronics, mechanical or other devices." (Moore, 1973)

In an article published in 1972, Moore surveyed two thousand articles regarding "distance teaching" and he concluded that,

"Most of the literature was descriptive and very general." Indeed, less than ten percent could be described as dealing with instructional techniques and little of that was specifically concerned with adult instruction.

Liveright (1968) decried the general lack of acceptable definitions pertaining to adult education and stated that as research is still highly limited in this area "new educational methods, technology and media must be tested for use in adult education".

Tough (1967) designated twelve teaching tasks that self teachers must do for themselves because of the distance between teachers and learner. These tasks are:

Decide about a suitable place.
Consider or obtain money.
Decide when to learn, or for how long.
Choose the goal.
Decide how to achieve the goal.
Obtain or reach people, books, and other resources.
Deal with lack of desire for achieving the goal.
Deal with dislike of the necessary activities.
Deal with doubts about success.
Estimate level of knowledge and skill.
Deal with difficulty in understanding some part.
Decide to continue after reaching some goal.

Tough went on to analyze these tasks and listed many other details that provide a firm base to work from.

Edling (1970), in a comprehensive report on the status of individualized instruction in America says, "Individualized instruction in some form is a coming certainty". Meyer (1968) used a language laboratory in the education of mathematics students and concluded her report by saying that a kit approach should be tried. Stillwell (1969) used a variety of in-service educational materials in audio or visual formats and placed equipment in teachers' lounges so that a constant flow of changing materials was sampled, examined, re-examined or rejected at the teacher's own discretion. He concluded that the variety of materials that could be used in this fashion was limitless.

Jarolimek (1970), reported using six in-service packages which contained a detailed instructor's manual, instructional materials and videotaped teaching sequences. Eighty teachers used his materials in small groups after school as part of a credit course. The users had to respond to the materials in order to receive credit. However, there was no attempt to evaluate this project. Langer (1969) used videotaped sequences plus handbooks in a three day minicourse designed to change teachers' behaviour in classroom situations. He found that when the equipment was removed and the direct stimulus was gone, the behaviour changes that he was able to produce persisted.

Glazer (1974) trained biological laboratory technicians by using modules which contained 35 mm slides and reel tape recorders. There was no supportive data or control group established from which to draw conclusions.

Wellman (1970) criticized the cost of much of the new media as being prohibitive but found slides and filmstrips with projectors as well as cassette recorders within economic reach for home study programs.

One study closely relating to the present problem was reported by Pulley (1970) who produced supplementary and complimentary materials for correspondence students. His "MO-AV-PAK" consisted of a cassette player and a slide and film strip projector contained in a padded case which was mailable. His package "hardware" (cassette player and projector) cost about fifty dollars. To date there is no data on its usage or success.

A listing of In-Service Teacher Education Packages has appeared in The Journal of Teacher Education (Poliakoff, 1971). This listing was compiled from the ERIC Clearinghouse on Teacher Education and was composed of twenty-eight listings from eight sources. Of these listings there were only nine that used audio and visual media together. Four packages consisted of print only while nine used films plus print. The packages were generally concerned with broad topics such as "Arranging for Effective Demonstration Teaching", "Process Education for Teachers", "Non-Evaluative Classroom Observation", and "Systematic and Objective Analysis of Instruction". Many of the packages were prepared for college personnel or administrators within a school system. The time needed to complete the packages varied from two and one half hours to over one

hundred hours. The cost of the packages varied, (depending upon the media used) from no cost up to a purchase price of $1,425 or a rental of $175 for six weeks.

Kirchner (1973) surveyed twenty-seven leading B. C. educators to determine criteria to be used in the design of self-instructional kits and programs. The results of his survey do not fall into the categories of this literature review easily but several of his logistical considerations are pertinent and are listed below.

a) The various media (print, picture diagram, sound, etc.) used by the learner should be of good quality.

b) The learner should be permitted to repeat an activity until mastery is achieved.

c) The learner should have access to teacher assistance should unforseen difficulties arise.

d) The learner should be able to gain easy access to components and materials in a self-learning kit.

e) The learner should be able to identify easily all components in a self-learning kit.

f) The use of the kit will not require resources not normally found in the average home.

Literature Related to the Utility of the Various Media

All of the independent learning units described in a recent comprehensive listing by Poliakoff (1971) utilized print in their packages. Print has been universally described as

having a low cost and high reliability if read. It is easy to produce and in most of the independent learning units is the one component that the learner is allowed to retain.

Durham (1973) listed several of the technological devices and commented upon their strengths and weaknesses. His findings are summarized in Table I.

Radio classes were abandoned in Britain in 1946 (Peers, 1958) and Groombridge (1966) states, "TV is educationally most valuable when it is employed as a member of a teaching team and least valuable when it has to sustain the entire educational relationship with the viewer." Video tape is seen as being too expensive a system to be used in a self-instructional package (Pulley, 1970; Wellman, 1970; Durham, 1973) and it is recognized as the medium least frequently used in independent study (Linck, 1970).

Durham (1973) had a useful statement upon media choice.

> "Perhaps the most underused medium in the electronic media stable is slide/tape. The cost of the slide/tape presentation is a fraction of motion picture production, but the time required for advance planning and scripting compares very favorably ... The size and variety of the visual images can be more impressive than most motion pictures. Sound quality is true high fidelity and sometimes even stereo. However, the greatest advantage of the slide/tape medium is its flexibility and low cost. Updating information or correcting errors requires only a new audio tape and/or a new slide."

However,

> "There is very little evidence providing clear answers as to the best use of the new media, or with what precautions. Those in teacher education must be open and receptive to the wise use of

TABLE I

A Summary of the Findings of Durham (1973)

Medium	Reliability	Mailability	Operability	Cost
Film Motion Picture	moderate	projection equipment not mailable	difficult for novice	expensive
Film Strip	high	easily mailed	easy to use	inexpensive
Slides	high	easily mailed	easy to use	inexpensive
Video Tape	moderate	equipment cannot be mailed	difficult for novice	expensive
Disc Recordings	high	easily mailed	easy to use	very expensive to produce
Audio Tape Reel to Reel	high	equipment not mailable	moderately easy to use	moderate
Cassette	very high	easily mailed	easy to use	moderate

> simulated teaching materials, videotape feed back, autoinstructional materials, CAI, and the host of additional developments instructional technology will bring in the future." (Hermanowicz, 1969)

Criteria Derived from the Literature

The foregoing review of literature was conducted within the limits described at the first of this chapter (p. 8). An attempt was now made to produce a set of design specifications for a prototype teacher in-service self instructional unit having direct reference to generalizations found in the review. (See Table II).

First, Hilgard's (1966) list of "'Principles' Potentially Useful in Practice" was used as the major base for developing the criteria concerning learning which must be embodied by the prototypical kit. Hilgard was chosen from other possible authorities or theoreticians for several reasons.

First, the three educational psychologists referred to earlier (p. 10) had agreed that Hilgard's 1960 list represented a useful set of learning principles for this task. In addition Hilgard's 1966 list attempted to survey other major learning theories and to extract generalizations for use in practical applications. Finally, Hilgard produced a manageable number of such principles, making it possible to relate them directly to the design task at hand. It should be noted that only those principles stated by Hilgard were used as design specifications which had application to individual learning by adults in a self-instructional mode. Thus, for

example item C-1 in Appendix III, relating to post-natal developmental influences on learning is not capable of simple application in this design problem.

Special reference is made in the development of design specifications to Kirchner's (1973) study which developed a self-instructional learning package for adults. Kirchner "validated" his design criteria for both the software and hardware components of his kit by submitting them in a questionnaire survey device to a group of authorities in self-instruction. However, not all of Kirchner's specifications applied to this study because he attempted to develop a self-instructional system to teach the public at large a concept with which they would likely have no previous contact and for which they would have no immediate vocational use.

Table II relates the design criteria used in this study to the literature review and indicates which criteria stated by Hilgard or Kirchner have been combined or restated for this application. Appendix III lists Hilgard's (1966) principles in their entirety. Appendix IV lists Kirchner's (1973) specifications.

TABLE II

Derivation of Design Criteria

Criterion	Derivation
(1) The learner should be an active listener or viewer.	"The learner should be active rather than a passive listener or viewer." (Hilgard and Bower, 1966)
(2) Repetitive practice must be provided to ensure overlearning and to guarantee retention.	"Frequency of repetition is still important in acquiring skill, and in bringing enough overlearning to guarantee retention." (Hilgard and Bower, 1966) "The learner should be permitted to repeat an activity until mastery is achieved." (Kirchner, 1973)
(3) Practice must be done in varied contexts so the learning will become appropriate to a wide range of stimuli.	"Generalization and discrimination suggest the importance of practice in varied contexts, so that learning will become (or remain) appropriate to a wider (or more restricted) range of stimuli." (Hilgard and Bower, 1966) "The materials should require the learner to respond in a variety of ways including written and/or manipulative tasks." (Kirchner, 1973)

TABLE II (continued)

Criterion	Derivation
	"The materials should provide for varied activity (listening, reading, performing) on the part of the learner." (Kirchner, 1973)
(4) Reinforcement should be mainly positive and should occur at irregular intervals.	"... it is generally found that positive reinforcements (rewards, successes) are to be preferred to negative reinforcements (punishments, failures). (Hilgard and Bower, 1966)
	"It should be possible for the learner to receive immediate reinforcement in the form of verification of adequacy of his performance." (Kirchner, 1973)
	"Well-established habits are best maintained through the use of a schedule of reinforcement that is less than 100 percent." (Travers, 1967)
(5) The learner must want to learn the material.	"Drive conditions are important in learning ..." (Hilgard and Bower, 1966)
	"Rate of learning is related to the arousal level of the individual." (Travers, 1967)
	"The content and activities of the program should be interesting to the learner." (Kirchner, 1973)

TABLE II (continued)

Criterion	Derivation
(6) Correct answers to required responses should be readily available to the learner.	"Cognitive feedback confirms correct knowledge and corrects faulty learning." (Hilgard and Bower, 1966) "It should be possible for the learner to receive immediate reinforcement in the form of verification of adequacy of his performance." (Kirchner, 1973) "Correct answers to required responses should be readily available to the learner." (Kirchner, 1973) "The learner should have frequent opportunity to check his progress and to determine how well he is doing." (Kirchner, 1973)
(7) It should be possible for the learner to by-pass activities he has already mastered.	"It should be possible for the learner to by-pass activities he has already mastered." (Kirchner, 1973) "The learner's abilities are important, and provisions have to be made for slower and more rapid learners, as well as for those with specialised abilities." (Hilgard and Bower, 1966)
(8) The learner should be permitted to repeat an activity until mastery is achieved.	"The learner should be permitted to repeat an activity until mastery is achieved." (Kirchner, 1973)

TABLE II (continued)

Criterion		Derivation
		"The learner's abilities are important, and provisions have to be made for slower and more rapid learners, as well as for those with specialised abilities." (Hilgard and Bower, 1966)
(9)	Learning must be through understanding rather than by rote learning or learning by formula.	"... a learning problem should be so structured and presented that the essential features are open to the inspection of the learner." (Hilgard and Bower, 1966)
		"Learning with understanding is more permanent and more transferable than rote learning or learning by formula." (Hilgard and Bower, 1966)
		"Units of study within the program should assist the learner to make generalizations, draw conclusions and make applications." (Kirchner, 1973)
(10)	Learning should proceed from simple "wholes" through to more complex "wholes".	"... the direction from simple to complex is not from arbitrary, meaningless parts to meaningful wholes, but instead from simplified wholes to more complex wholes." (Hilgard and Bower, 1966)
(11)	Learning should be at a low anxiety level with constant comments upon the progress of the learner.	"... low anxiety learners do better if they are interrupted with comments on their progress." (Hilgard and Bower, 1966)

TABLE II (continued)

Criterion		Derivation
		"The learner should have frequent opportunity to check his progress and to determine how well he is doing." (Kirchner, 1973)
(12)	In-service education must be of a practical nature and specific in focus.	"If what the teachers report they want is heeded, in-service science education methods courses will be taught, at least in part, by the discovery method, encouraging teachers to work with materials much as children in an elementary classroom would." (Lindberg, 1971)
		"... the participation of elementary school teachers in district sponsored 'point' classes reflects their need for specific methods courses." (Finch, 1969)
		"Activities should be practical in application and specific in focus." (Quine, 1974)
(13)	In-service education should take place close to home or school.	"... they would like the bulk of in-service training to take place close to their own home or school" (Cane, 1969)
(14)	In-service education should take place in school time or in the early evening.	"... they would like the bulk of in-service training to take place close to their own home or school, preferably during school hours, but failing that, at a convenient starting time

TABLE II (continued)

Criterion		Derivation
		after school" (Cane, 1969) "Teachers want courses in school times or in the evenings of school days rather than in holidays or at weekends." (Townsend, 1969)
(15)	In-service education should be at the hands of other teachers wherever possible.	"Local programme consultants and practising teachers should be used for conducting activities." (Quine, 1974)
(16)	The components of the learning package must be as free from breakdown as possible and must be rugged enough to withstand use by novices as well as abuse in the postal shipping process.	"Maintaining equipment, ... packing and shipping, and getting materials to students at the proper time are examples of some problems that can occur." (Pulley, 1970) "... increased shipping costs, and malfunctioning equipment can cause administrative migraines." (Wellman, 1970)
(17)	The complete package must be capable of being sent through the public postal system.	"One of the limiting factors in using AV materials in the correspondence study program is that most students do not have easy access to both audio and visual equipment." (Pulley, 1970) "Schools want to use materials that fit reasonable tuition charges." (Wellman, 1970)

TABLE II (continued)

Criterion	Derivation
(18) The package must be capable of being operated by a learner who has had little or no training or experience in the operation of audio visual equipment.	Alluded to in the articles of Stillwell (1969), Pulley (1970) and Wellman (1970) but not specifically mentioned as concisely as criterion 18.
(19) The package should be flexible enough to permit many kinds of content areas to be handled by the basic components.	".. the variety of materials that could be used in this fashion is limitless." (Stillwell, 1969) "However, as more courses are developed and revised which incorporate AV materials, we will obtain data from which we can base some conclusions." (Pulley, 1970)
(20) The materials must not be prohibitively expensive and must not cost more than the maximum insurable limit set by the public postal system.	"But to provide each student with any one or a combination of a reel-to-reel tape recorder, phonograph, or some type of projector would be prohibitive both in terms of cost and mailability." (Pulley, 1970) "... audiovisual products are often too expensive for many home study schools." (Wellman, 1970)
(21) The package must be capable of operation in the average home or school.	Students need easy access to both audio and visual equipment. (Pulley, 1970)

TABLE II (continued)

Criterion	Derivation
	"Home study schools are experimenting with a wide variety of audiovisual equipment to supplement their printed course materials." (Wellman, 1970)
(22) The components of the package must be attractive and of high quality.	"The learning and instructional materials should be attractive in format." (Kirchner, 1973)
	"The various media (print, picture, diagram, sound, etc.) used by the learner should be of good quality." (Kirchner, 1973)

Chapter 3

THE APPLICATION OF THE CRITERIA TO THE PROTOTYPE LEARNING PACKAGE

This chapter begins with a general description of the package and its various components. Following this the twenty-two criteria are amplified and fully described as they pertain to this particular application.

Description of the Package

Appearance. The package is enclosed within a burnished aluminum box which has a volume of ten litres. The hinged lid is screwed down for security. The outside of the box is appropriately decorated and titled with black paint. (Plate 1)

Contents. The package opens to display a colorful instruction sheet which is attached to the inside of the lid. The contents are covered by a card which has further instructions and an index to the material. (Plate 2) The package contains three "lessons" and the materials for each of these are contained in a separate Styrofoam tray which has been sculpted to receive them. Beneath the index card there is a power cord for the tape recorder and two Styrofoam strips which wedge the materials into the box tightly. Beneath these two strips lie trays one and two and under these are the materials for lesson three plus the cassette recorder. (Plate 3) The entire box and materials are solidly put together and packed so there are

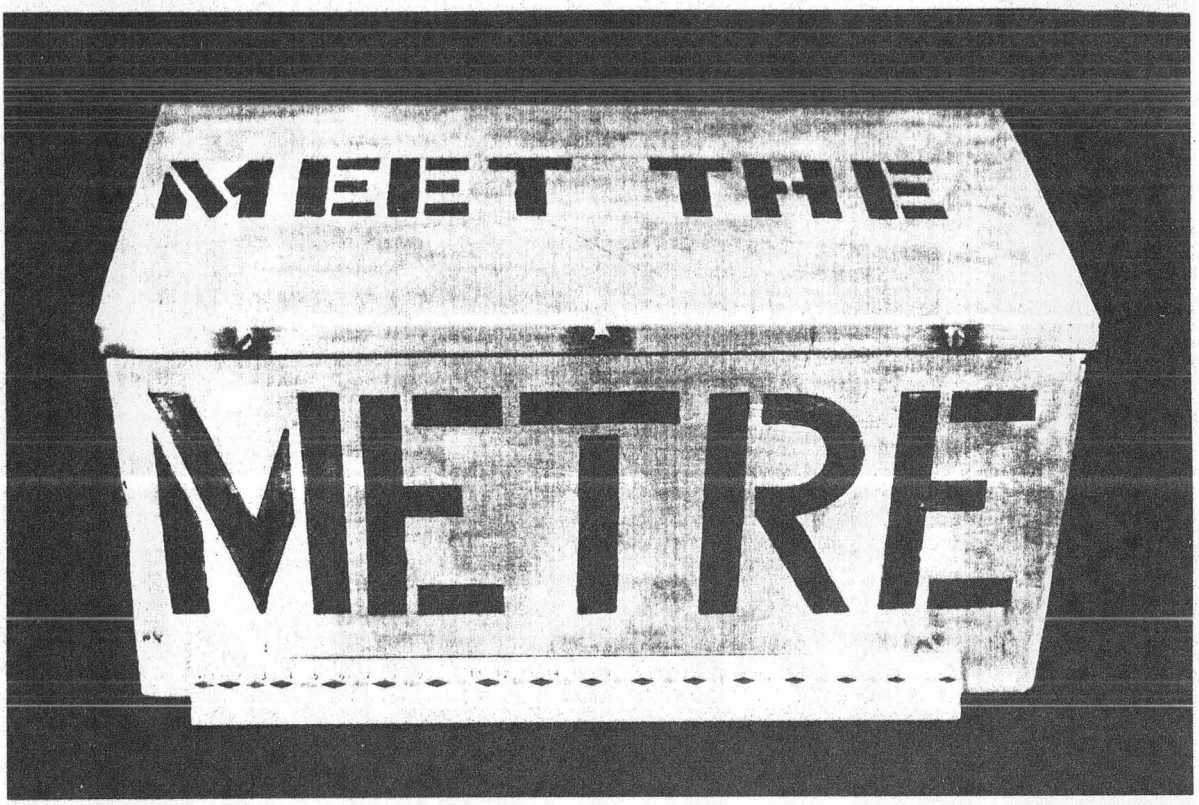

Plate 1. The Package.

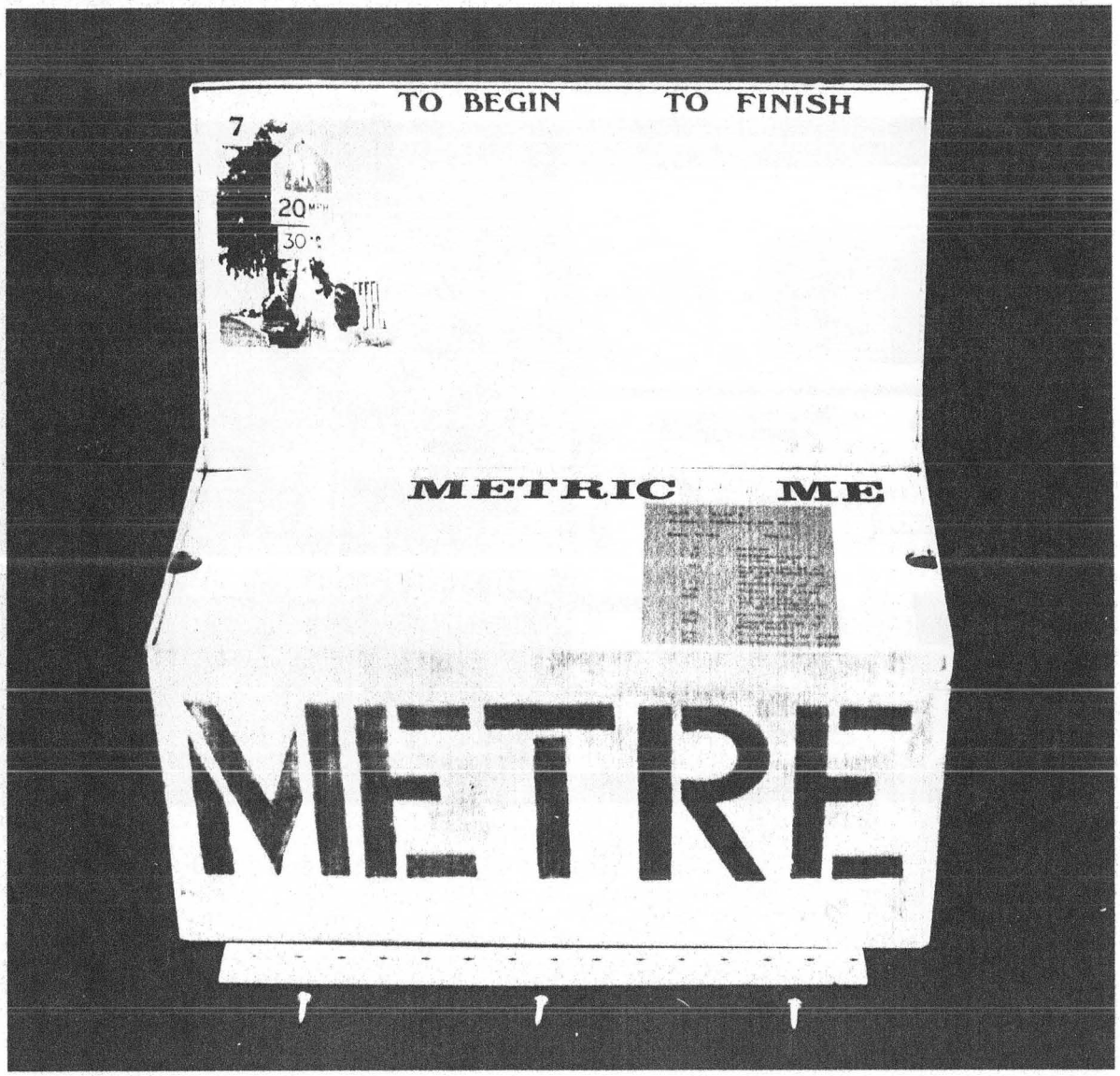

Plate 2. The Package with Lid Open.

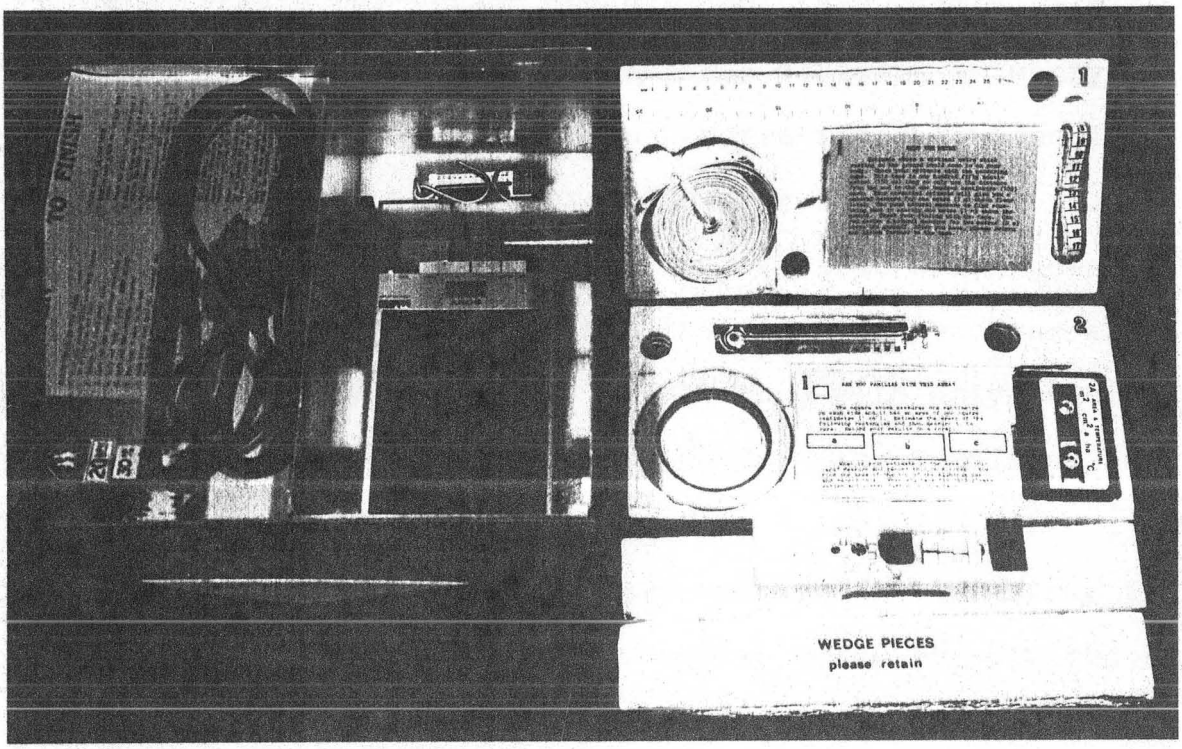

Plate 3. Contents of the Package.

no loose parts to rattle. The tape recorder has received special attention and is suspended within the box on foam plastic.

The materials for lesson one are contained within tray one and the cassette recorder. This tray contains a twenty-five centimetre vinyl ruler, a one hundred and fifty centimetre measuring tape, a ten metre measuring tape, seven photos and four laminated activity cards. The cassette which goes with lesson one comes prepackaged within the cassette recorder and may be used instantly. The tray is returned with only the ten metre tape, photographs and activity cards. The remainder is retained by the teacher.

The materials for lesson two are contained within tray two which holds a cassette tape, a thermometer which is retained by the student, three laminated activity cards and four photographs. A roll of centimetre conversion tape is also included in this tray.

The box itself contains the materials for lesson three. These materials are a cassette tape, brass weights of one and ten grams, a measuring beaker, a clear plastic box, assorted wooden and plastic cubes, an example of a litre made from card and a pocket spring balance. The balance and the beaker are retained by the teacher for use in the classroom.

The entire package weighs four kilos and is easily carried with both hands or one hand if equipped with a handle.

1. THE LEARNER SHOULD BE AN ACTIVE LISTENER OR VIEWER RATHER THAN A PASSIVE LISTENER OR VIEWER

Most authorities cite "learning by doing" as superior to learning by listening or watching so throughout the prototype there is opportunity for the user to engage in activities that will aid understanding and provide practice for the classroom. The user is required to make measurements in metric units and is encouraged to utilize metric measure throughout the day. It is impossible to complete this package in a passive manner.

2. REPETITIVE PRACTICE MUST BE PROVIDED TO ENSURE OVERLEARNING AND TO GUARANTEE RETENTION

Each lesson contains a review of the previous hour's work and in each lesson the new concepts and facts are used again and again in order to facilitate learning. The package is an ideal vehicle for application of this criterion as so much of the material is easily repeatable in varied contexts. (see the next criterion)

3. PRACTICE MUST BE DONE IN VARIED CONTEXTS SO THE LEARNING WILL BE APPROPRIATE TO A WIDE RANGE OF STIMULI

In the package there are many problems to be solved yet they involve only a few concepts. In order to ensure learning and yet avoid boredom these problems have been varied as to subject area and also data usage. This variety of problem detail hopefully results in a greater ability to use metric measure everywhere rather than just within the classroom and it

should increase the practice factor and thus aid retention.

4. REINFORCEMENT SHOULD BE MAINLY POSITIVE AND SHOULD OCCUR AT IRREGULAR INTERVALS

Throughout the tapes verbal encouragement and praise for work accomplished correctly is provided. As well as these verbal rewards there are "actual" rewards consisting of pieces of metric equipment used in the activities which are retained by the learner. These incentives keep the interest at a high level and encourage mastery of the concepts used.

5. THE LEARNER MUST WANT TO LEARN THE MATERIAL

The package was sent to potential users only at their request and as it is an individual learning task the user will choose the time he or she is ready to learn. This criterion was met if the user was honest in his or her quest for metric proficiency. Moreover, in actual practice it would be sent only to those who showed enough motivation to request it.

6. CORRECT ANSWERS TO REQUIRED RESPONSES SHOULD BE READILY AVAILABLE TO THE LEARNER

The answers to the problems and activities are immediately available by listening to the tape. In some instances the learner is asked to find natural measures by using his or her person and in these cases a correct range of responses is given.

7. IT SHOULD BE POSSIBLE FOR THE LEARNER TO BY-PASS ACTIVITIES ALREADY MASTERED

The tapes are clearly indexed so a user may run it past unneeded material to arrive at an appropriate starting point for their particular level of knowledge. The index is printed upon a card that is uppermost in the package. The index is detailed enough to allow a user to select a specific unit of measure and find a discussion of that particular unit with great accuracy.

8. THE LEARNER SHOULD BE PERMITTED TO REPEAT AN ACTIVITY UNTIL MASTERY IS ACHIEVED

Using the tapes, photographs and print materials over an adequate period of time, a teacher will be able to repeat any or all segments of the program at will. Indeed the tape never gets "tired" of repeating itself and the visual materials may be used and reused. The tapes suggest other activities that require approaches identical to those already learned in order to find the correct solution. These extra activities are varied in subject matter so as to enable users to practice without boredom or previous knowledge of the outcome.

9. LEARNING MUST BE THROUGH UNDERSTANDING RATHER THAN BY ROTE LEARNING OR LEARNING BY FORMULA

Throughout the package there is an attempt to relate each metric unit to an already familiar base. The metric system is very well integrated within itself and is much more coherent

than the present British Engineering System. This, in itself, aids in understanding and rote learning tasks are not present except for a few prefixes which must be learned by rote as well as through an understanding of their meaning.

10. LEARNING SHOULD PROCEED FROM SIMPLE "WHOLES" THROUGH TO MORE COMPLEX "WHOLES"

The metric system began with a measurement of a portion of the earth. This "whole" was subdivided to produce the first metre. From this simple beginning larger and smaller units of length, units of area and volume were established. The units of mass resulted from careful weighing of a specific volume of water and the Celsius temperature scale is also based upon the physical properties of water. To learn the metric system with understanding one must rediscover and recreate the units in much the same way as they were first produced. This progression from simple to more complex is a very easy one given the metric system as subject matter.

11. LEARNING SHOULD BE AT A LOW ANXIETY LEVEL WITH CONSTANT COMMENT UPON THE PROGRESS OF THE LEARNER

The user should find using this package a stressless learning situation unless he or she is under pressure to finish or master the contents. The learner is really his own supervisor. There are no outside examiners save the user's own pupils. Comments upon the progress of the user occur throughout the sequence of the tapes and help to dispel any frustrations

or anxieties that the user may have.

12. IN-SERVICE EDUCATION MUST BE OF A PRACTICAL NATURE AND SPECIFIC IN FOCUS

Canada is moving quickly to a metric way of life. Celsius temperatures have already arrived and road signs, packaging in stores and sizes of materials are due to change over within two or three years. With the children in school today graduating into a metric Canada the subject of this package is very timely and will be very practical. The specificity of the subject matter is self evident. In British Columbia the most recent (1974) curriculum guides for elementary school require the teaching of metric measures only, an area very few teachers are familiar or comfortable with. This package deals with teaching in the metric system and after listening to instruction and performing activities the teacher is invited to turn the tape over to gain access to ideas useful in the classoom--a practical approach to a specific need.

13. IN-SERVICE EDUCATION SHOULD TAKE PLACE CLOSE TO HOME OR SCHOOL

This package may be used in the home or school or anywhere else the teacher may deem appropriate. It is mailed directly to the teacher and is portable and flexible enough to be carried and used anywhere.

14. IN-SERVICE EDUCATION SHOULD TAKE PLACE IN SCHOOL TIME OR IN THE EARLY EVENING

This criterion reflects the wishes of a majority of prospective in-service attendees and was easily met in the package. A teacher can use the package at any time during the day or night and as the individual lessons within the package are designed to be completed within one hour the package may be studied during lunch hour or a spare period.

15. IN-SERVICE EDUCATION SHOULD BE AT THE HANDS OF OTHER TEACHERS WHEREVER POSSIBLE

This criterion reflects a large credibility gap which exists between non-practising teachers and practising teachers. This gap is smaller or even non-existent when teachers talk to one another or teach one another. The package was designed and prepared by the author, a practising teacher, and deals with activities that have been performed by the author in classrooms. This criterion has been met if the users realize who and what the author is and to this end and introductory comment deals with a resume of the author and his teaching experience.

16. THE COMPONENTS OF THE LEARNING PACKAGE MUST BE AS FREE FROM BREAKDOWN AS POSSIBLE AND MUST BE RUGGED ENOUGH TO WITHSTAND USE BY NOVICES AS WELL AS ABUSE IN THE POSTAL SHIPPING PROCESS

As long as machines are fallible this criterion will never be met completely. The author has used a tape recorder

which he has found to be acceptably indestructible and has designed the package so as to lessen the effects of rough handling. Styrofoam packing and other industrial cushioning materials have been used and a metal container helps to ensure arrival on site in a useable condition. To assist novices in avoiding mechanical errors remarks are devoted to correct usage of the package components.

17. THE COMPLETE PACKAGE MUST BE CAPABLE OF BEING SENT THROUGH THE PUBLIC POSTAL SYSTEM

A parcel is acceptable to the Canadian Post Office if it weighs less than fifteen kilos, is suitably wrapped, and its combined length and girth do not exceed one hundred and eighty centimetres.

This prototype package weighs four kilos, is wrapped in an aluminum box and cushioned well with industrial packing to avoid rattles or damage from rough handling and its combined length and girth is one hundred and ten centimetres.

18. THE PACKAGE MUST BE CAPABLE OF BEING OPERATED BY A LEARNER WHO HAS HAD LITTLE OR NO TRAINING OR EXPERIENCE IN THE OPERATION OF AUDIO-VISUAL EQUIPMENT

This package has components that are used by children in elementary schools as well as technologically naive adults. The equipment is present in most schools and the preparation section of the first lesson explains how to correctly operate all pieces of equipment if there are any difficulties.

19. THE PACKAGE MUST BE FLEXIBLE ENOUGH TO PERMIT MANY KINDS OF CONTENT AREAS TO BE HANDLED BY THE BASIC COMPONENTS

The basic components of this package are audio tape, colored photographs and print. These three media are freely used in all curricular areas at present so there is much room for expansion of the concept into other content areas.

20. THE MATERIALS MUST NOT BE PROHIBITIVELY EXPENSIVE AND MUST NOT COST MORE THAN THE MAXIMUM INSURABLE LIMIT SET BY THE PUBLIC POSTAL SYSTEM

The materials of the package are listed below with their replacement cost beside them. Materials to be retained by the user are starred.

* 150 cm measuring tape	$ .30
* 25 cm plastic rule	.25
10 m tape	3.00
photographs (20)	7.00
laminated cards (20)	5.00
cassettes (3)	6.00
* thermometer	.60
conversion tape	2.00
* beaker, 100 ml	.30
125 cm^3 clear plastic box	1.00
1 cm wooden cubes (9)	.50
2 cm plastic cube	.10
* spring balance	1.50
1 g brass weight	.95
10 g brass weight	.50
* print material	1.00
cassette recorder	100.00
aluminum box	30.00
Total	$160.00

The maximum insurable limit as set by the Canadian Post Office is two hundred dollars. To obtain this amount of insurance the parcel must be registered at the point of mailing and

for this a seventy-five cent charge is levied. The contents of this package fall well within this limit.

21. THE PACKAGE MUST BE CAPABLE OF OPERATION IN THE AVERAGE HOME OR SCHOOL

The package may be battery operated and as such it may be used anywhere. Certainly a home or school would be a superior setting but the package may be used in a tent if necessary.

22. THE COMPONENTS OF THE PACKAGE MUST BE ATTRACTIVE AND OF HIGH QUALITY

This criterion requires a very subjective and personal evaluation and as such is difficult to measure with certainty. All efforts have been made to insure the high quality of the components but the attractiveness of the package remains the opinion of the user. It must be borne in mind that the package is "home made" by an amateur and reflects this in a lack of "professional polish".

Obviously this annotation of the foregoing criteria does not constitute a full description of their use in the package. It does provide a listing of their general applications within the framework of the prototype. The author hopes that this chapter can be easily extrapolated from to service many other learning packages and that it is a jumping off place for further research in this area.

Chapter 4

A RATING OF AND COMMENTARY UPON THE EMBODIMENT OF THE CRITERIA IN THE PROTOTYPE PACKAGE

This chapter describes the comments made by three users of the package. They were given the package to employ as they wished, much as a teacher would receive the kit in the mail. After going through the package they were asked to use the form provided (Appendix V) to rate whether or not they felt the criteria that arose from Chapter 2 had been met.

The raters were all female elementary school teachers with experience in the classroom ranging from fifteen to four years. No one of these teachers had actually taught using the metric system although two of the raters had had previous in-service experience in this area. A summary of their ratings is found in Table III.

The raters were then asked to elaborate upon their comments. The following are the statements made to the raters and the subjective comments they made to amplify or explain their ratings.

1. "I was active rather than passive."

Two raters agreed with this statement while a third was undecided. Her comments suggested that she had done similar activities in the past and she felt that her position of a rater, rather than a learner, need not involve the activities. She agreed that as a naive learner she would have been much

TABLE III

Summary of Raters' Responses

Statement	SA	A	U	D	SD
1. "I was active rather than passive."	1	1	1		
2. "I had enough practice to guarantee retention."	1	1		1	
3. "I practiced in varied ways so my learning will be appropriate to a wide range of stimuli."	2	1			
4. "My reinforcement was mainly positive and occurred at irregular intervals."	2	1			
5. "I wanted to learn the material."		1	1		1
6. "Correct answers were readily available to me."	1	2			
7. "I could by-pass activities I had already mastered."	1	2			
8. "I could repeat any activity until I had mastered it."	1	2			
9. "I learned through understanding rather than by rote learning or learning by formula."	2	1			
10. "My learning proceeded from the simple to the more complex."	2	1			
11. "The learning was at a low anxiety level."	1	2			
12. "I found this package of a practical nature and specific in focus."	2	1			
13. "I could operate this package during normal school hours if I wanted."		1	1	1	
14. "I could operate the package any time I wished."	1	2			

TABLE III(continued)

Statement	SA	A	U	D	SD
15. "I felt this package had been prepared by a teacher."	3				
16. "The components of this package were free from breakdown."	1	2			
17. "The package is mailable."	1	2			
18. "The package is capable of being operated by a learner who has had little or no training or experience in the operation of audio-visual equipment."	2	1			
19. "The idea of the package is flexible enough to allow many kinds of content areas to be handled by the basic components."	1	2			
20. "The materials in the package do not cost more than $200."		1	2		
21. "The package is capable of being operated in the average home or school."	3				
22. "The components of the package were attractive and of high quality."	1	2			
23. "I enjoyed learning in this way."	2	1			

more active.

2. "I had enough practice to guarantee retention."

Two raters agreed with this statement while a third disagreed. The basis for the disagreement was the use of the word "guarantee" which the rater felt was too strong and as a result she had to disagree with the statement.

3. "I practiced in varied ways so my learning will be appropriate to a wide range of stimuli."

All the raters agreed with this statement and felt there was a rich variety of measuring activities both to do and to think about.

4. "My reinforcement was mainly positive and occurred at irregular intervals."

All raters agreed with this statement and they felt that the act of giving some of the package materials to the participants would ensure useage in the classroom by the teacher. The verbal reinforcements in the tapes were mentioned as helping to maintain attention and assisted in a feeling of acceptance and empathy with the author. The tapes included explanations of the difficulties the author had in doing the various activities and this was seen as reinforcement by one rater as she had had similar difficulties and was somewhat "cheered" to commiserate with someone else.

5. "I wanted to learn the material."

This statement had an evenly mixed response of one rater in agreement, another in disagreement and one rater was undecided. The subjective comments brought out the fact that the raters who were undecided and in disagreement had themselves put substantial effort into learning the metric system. Some of this time had been at the hands of the author in face-to-face discussions and they felt they were rating the kit as a favor and not as a self-initiated learning project. The third rater wanted to learn this material but had found no acceptable method of satisfying this desire before she was asked to rate the package. She asked to have more time with the package to review and reinforce some of her learning.

6. "Correct answers were readily available to me."

All the raters were in agreement with this statement and two raters felt there were too many answers supplied for a given question. An example of this would be answers to the question: how tall are you? The answers given reflect the wish of the author to acknowledge different answers so the tapescript would answer the question as follows. "I don't know how tall you are but I am one hundred sixty-three centimetres or one point six three metres or even one thousand six hundred thirty millimetres tall."

7. "I could by-pass activities I had already mastered."

All the raters were in agreement with this statement but none commented upon it as they were not selective because of their task as raters of the complete package.

8. "I could repeat any activity until I had mastered it."

All the raters agreed with this statement and all had used the review capacity of the tape recorder to clarify and master certain portions of the package.

9. "I learned through understanding rather than by rote learning or learning by formula."

The raters agreed with this statement and two were strongly supportive in their comments. They felt that there was good explanation and enough activity to ensure understanding. One rater was surprised to find that the metric system was as "simple" as it was as she had never had the inter-relationships explained to her before but rather had been forced to memorize.

10. "My learning proceeded from the simple to the more complex."

All the raters agreed with this although there were no comments made that dealt with this statement specifically. The author feels that the comments made about the previous statement apply here also.

11. "The learning was at a low anxiety level."

Each rater agreed with this statement and the single comment made was one of, "Who would ever know whether I did it or not?".

12. "I found this package of a practical nature and specific in focus."

This statement had the full agreement of the raters and the comments made were strongly supportive of the practical nature of the materials and the feeling that a teacher could "get started" on the metric system right away.

13. "I could operate this package during normal school hours if I wanted."

This statement had a mixed response of one agreement, one undecided, and one disagreement. The comments revealed that the disagreement came from one rater's lack of unstructured time during her school day. There were no "spares" or planning periods to utilize the package in so the option was not open to that rater without taking time away from their duties as a classroom teacher. The raters did not see the lunch hour as useable for in-service learning.

14. "I could operate the package any time I wished."

All the raters were in agreement with this statement but expressed some reservations based upon the previous question. They were asked to interpret the question as meaning "any time outside of normal school hours". With this information they then rated the statement.

15. "I felt this package had been prepared by a teacher."

The raters all knew the author and felt that the introductory comments and activities assured them that the package

had indeed been prepared by a teacher. They stated that the clarifying and introductory statements would reveal the preparation and background of the author to teachers to whom he was unknown.

16. "The components of this package were free from breakdown."

All three raters agreed upon this statement and in discussion with them they felt that the components were sturdy, dependable and would not cause any difficulties in this area. There had been no breakdowns in the trial usages.

17. "The package is mailable."

All the raters agreed with this statement as they had been told by the author that it was a prototype of a package that would be mailed to teachers who requested it and they felt that this would have been ensured by the author.

18. "The package is capable of being operated by a learner who has had little or no training or experience in the operation of audio-visual equipment."

The raters all agreed upon this statement and one commented upon the simplicity of the components and the ease she had in following the instructions.

19. "The idea of the package is flexible enough to allow many kinds of content areas to be handled by the basic components. (box, cassette tapes and recorder, photographs, materials, print)

The raters all agreed with this statement but offered no comments regarding other uses or subject areas that could be taught in this fashion.

20. "The materials in the package do not cost more than $200."

Two raters were undecided on this question and one was in agreement. In discussion the "undecided" raters said they did not know what the values of the various components were but they suspected that the statement was true. They also felt that this question was not capable of being answered by a casual rater who was not involved with the production of such packages.

21. "The package is capable of being operated in the average home or school."

All the raters strongly agreed with this statement and they did use the package at home or at school.

22. "The components of the package were attractive and of high quality."

The three raters were in agreement with this statement but two comments were made regarding a grammatical error in one of the tapes. The comments were not to condemn this error out of hand but were made to suggest a certain feeling of empathy and identification with the author. "It made me feel I was in a conversation with someone and not listening to a lecture being read." "I think the odd mistake and stumble over words established an informal tone that made me feel comfortable listening to you."

23. "I enjoyed learning in this way."

The raters all agreed with this statement which was not a reflection of one of the criteria derived from Chapter 2 but

was an addition made by the author to ascertain whether the learning was a pleasant task or an onerous one.

From the foregoing it would seem the majority of the criteria have been met. There have been suggestions made for improvement and comments offered upon the package as a whole. A discussion of these results forms a major part of Chapter 5.

Chapter 5

DISCUSSION AND CONCLUSIONS OF THIS STUDY

This chapter will discuss the apparent advantages and disadvantages as seen by the raters as well as the author. The raters' suggestions for modification and improvement of the package are expanded upon and added to and some ideas for further study are included. Conclusions are made based upon the raters' comments and this study is discussed in relation to its position in the literature. The chapter concludes with a summarizing statement.

The apparent advantages of this mode of learning are ease of distribution, individualization of approach and a saving of time and money spent on travel and accommodation.

Once in use the package may be obtained by any teacher in western Canada within one week of the arrival of the request, subject to supply limitations. This means that immediate needs may be met as they arise.

The individualization of the approach is a mixed blessing as the author realizes there are no panaceas for every situation. Most certainly a live instructor, face-to-face, has the potential to individualize learning to a far greater degree than a package but in a situation where some twenty-three thousand teachers must learn new concepts and change habits quickly the package represents a far superior learning situation to the mass in-service session involving mainly talk. Some mention must be made of the term "individualization" as this package has the capability of individualizing rate and to a very

limited extent, content. This stems from a lack of immediate feedback from the teacher-user and the inability of the package content to adapt to different users. The question of feedback is one that plagues all mediated learning packages as the learner has usually completed using the material before his or her comments can be acted upon. Of necessity, a basic set of assumptions must be made about the learner and in this instance the teacher-user was seen to be an elementary teacher who had little or no foreknowledge of the metric system. This area is further discussed in the section dealing with improvements and modifications.

The saving of money spent on travel and accommodation is twofold. In-service education in rural areas usually means that the participants as well as the instructors must travel to and be accommodated at the area where the instruction is being held. For more remote areas a package of this nature could make in-service education much more available and palatable.

To improve upon the prototype package would not be too difficult given the raters' comments and the hindsight gained from constructing the first package. The modifications would be mainly structural but there are a few conceptual areas that could be altered.

The structural improvements would include a carrying handle for the box. This would have to be capable of being stowed but would greatly assist the teachers in carrying the box to and from their place of mail delivery. A lighter tape

recorder would certainly decrease the weight of the package and a less-sturdy power cord would pack up much more easily. The trays could be lightly reinforced and professionally moulded. The tapes should be edited for mechanical noise and some attractive art work, much beyond the scope of this author, would materially add to the visual impact of the package and its components.

Conceptually the package could be broken up into sub-units that could be sent out serially or on demand. This might assist in the individualization of content for certain learners and could even involve modules prepared at different levels of sophistication. The prototype was seen as a whole package and this is reflected in its design. Provision for user feedback could include an empty cassette which could be used by the teacher to send back comments or questions or requests for a different approach. Pretests might be included to assist the teacher in choosing a route through the components that would be of most benefit to him or her. Some explanations could be made simpler and more material could be added to the "Ideas" portion of each tape. These modifications would all be subjects for further investigation and although some are apparently sound others are more suspect.

Some other points were raised by the comments of the raters and two of these need special attention as to their possible inclusion, after careful study, in a subsequent list of criteria. These two points are the effect of the inclusion

of humour in the package and the use of a non-professional voice in the making of the tapes.

The author feels that the inclusion of humour is an essential part of most learning experiences and provides a reward for paying close attention. It would be interesting and valuable to assess the role humour plays in learning situations by its inclusion in or removal from identical learning situations. This package could form a vehicle for assessing this element. From personal experience and communication of a variety of in-service educational situations it would seem that learning with a laugh is far superior to a more serious mode if the option is open to either. The author can find no data on the effect of the use or non-use of humour in a learning situation.

The other point is the use of a non-professional voice in the production of the tapes. It would seem from discussions with colleagues and the raters' comments that trained voices tend to become soporific and lead to a lack of identification with the instructor. From our youth we have been bombarded with trained voices in the audio and visual media field imploring us to buy, or use, or learn, or listen to, or vote for, or ... We learn to tune them out and when faced with a learning situation involving such a voice we must use extra attention to get past that attitudinal barrier. This would form a basis for some fruitful investigation and again a package of this type could form an ideal vehicle to carry the voices chosen to the

sample.

From the ratings given and comments made by the three teachers who were asked to look at the package critically it would seem that there is general agreement that eighteen of the criteria were met by the sample package. There was no criterion which at least one rater did not agree had been met. From this it would appear that of the twenty-two criteria derived from the literature, eighteen are capable of being applied to a self-learning package to be used by teachers for in-service education.

Of the four criteria that provided areas of disagreement by the raters, one is clearly a case of semantics and the use of an absolute -- "guarantee" in statement 2. With a re-phrasing of the question this problem could be resolved.

The next criterion that was not met was that of a desire to learn the material. The raters did not represent typical users in that the author asked them to review the package and his bias was such that the package was presented to two teachers who had had previous contact with the metric system in in-service education programs. Indeed, the sample was clearly inadequate to assess this criterion and only by a further sample could this question be better resolved.

The next criterion that was not met was that of the package being capable of being operated during normal school hours. This criterion seems unrealistic for present elementary school teachers as they have a demanding job to

do which offers no "spare" periods suitable for working on a package of this nature and complexity.

The last criterion which was not agreed upon by the raters was that of the cost of the package being under $200. This criterion is clearly met by the prototype but this was not known by the teachers. This amount is not inclusive of the labour to produce such a package from raw materials by an amateur craftsman but the author feels that were this kit to be manufactured the cost would definitely be under $200.

With the foregoing explanations taken into consideration it would seem that the only criterion not satisfactorily met by the prototype package was that of a capability of being operated during normal school hours. It is the author's opinion that this criterion may not be met at present due to the work-load of the elementary teachers but it can possibly be met when the high school teacher is the subject of the package.

The sample of teachers who rated the prototype was very small and albeit atypical in some respects. As this is a prototype of a learning package the author felt that the sample need not be larger.

Indeed, the task of the raters was that of assessing whether or not the criteria had been applied and they were not to evaluate the learning package itself. After a suitable revision of the package based upon the subjective comments made by the raters a larger sample could be asked to assess the package and this would give much pertinent data as to use-

ability and actual performance.

This study fits into the literature as a summarizing set of criteria for the production of self-learning packages for the in-service education of teachers or any other group. Kirchner's study based upon construction of a package for naive learners broke the ground for this work and the two studies may be used together to design and produce self-learning packages for most applications. The selection of the criteria from a loose body of literature paves the way for more detailed studies that should take place if this mode of learning is to be heavily utilized. It must be borne in mind that self-learning packages are increasing in demand and to this date they have not been based upon sound educational principles but rather upon whims of the production staff. The fact that the package format is an ideal research tool is an incidental but highly important dimension and offers much to the educational researcher.

This study shows that a learning package can be produced from the criteria derived, can embody those criteria, and can be a tool for independent learning. This learning can be rapid, at a low anxiety level and pleasant to undertake. It shows that learning can be at the disposal of the learner who can determine time and place of learning with considerably more freedom than with other modes of instruction. The author firmly believes that the prototype package format is capable of much wider application and is but one of the first steps of a long journey.

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Appendix I. Letter from the Minister of Education.

BRITISH COLUMBIA TEACHERS' FEDERATION

General Secretary R. M. Buzza 105-2235 BURRARD STREET, VANCOUVER 180, B.C. TELEPHONE 731-8121

MEMORANDUM

TO: Teacher Education Committee, Professional Development and Curriculum Committee

FROM: W.V. Allester

DATE: July 10, 1974

RE: In-Service Education

The following letter from the Minister of Education to the Chairperson of the Joint Board of Teacher Education was considered at the June 21 meeting of the joint board. It will provide a major topic for the September 27 meeting of the joint board. In the meantime members of the BCTF staff will discuss some possible alternatives for the Teacher Education and Professional Development Committees to study at their first meetings in September.

It may be that a subcommittee should be established to do some work on this with staff. This possibility will be reviewed with Terry Mullen and Ross Regan.

The letter from the Minister follows.

> The Government of B.C. is concerned about the general problem of providing an adequate program of in-service training for teachers. In my opinion, present levels of in-service training are inadequate and poorly organized. They seem to be developed on an "ad hoc" basis through the many school districts of the province.
>
> By this letter I am requesting that the Joint Board of Teacher Education consider this problem and make recommendations as it sees necessary as to the following:
>
> 1. The types of in-service most urgently needed throughout

the public school system.

2. The numbers of teachers who require the types of in-service suggested.

3. Suggestions as to the types of programs to be mounted, the staffing of such programs, the timetable for such programs and the approximate costs involved.

I would urge you to work directly with the committee which organized the Teacher Education Conference at Richmond, particularly since a number of citizens' groups were there represented who must, in my view, be consulted in the whole question of teacher in-service education.

There will undoubtedly be some expenses to the joint board for the necessary secretarial and office assistance and, perhaps, some travel throughout the province to determine the requirements. The Department of Education will assume the costs of this effort. Procedures in this matter should be discussed with I. Valen, Acting Superintendent - Financial Services.

At your earliest convenience, I would appreciate receiving an estimate as to when the overall program of in-service can be completed and presented to me for the consideration of the Government.

Distribution - Professional Development and Curriculum Committee; Teacher Education Committee; PSA Council Executive; Executive Committee - 1974-75 (for information); Administrative Staff.

WVA/bf
PD74-566a
July 10, 1974

Appendix II

Significant Generalizations from Travers (1967), pp. 509-514.

POSITIVE REINFORCEMENT

1. A reinforcer is a condition that follows a response and results in an increase in the strength of that response. Good planning of reinforcing contingencies is one of the most effective ways of shaping behavior.

2. Reinforcements are most likely to be effective if they follow performance immediately. However, under suitable conditions they may be delayed and still effective, provided the subject reinforced maintains an orientation toward the task.

3. Most reinforcers, but not all, that operate on human behavior have acquired their reinforcing properties through learning. Since learning experiences differ from child to child, the conditions that reinforce also vary from child to child.

4. Individuals differ in the events that are reinforcing, and teaching should be arranged to provide those reinforcing contingencies that are most effective for particular pupils.

5. Well-established habits are best maintained through the use of a schedule of reinforcement that is less than 100 per cent. Reinforcements for maintaining such habits should not be at regular intervals or after fixed amounts of work; they will be more effective if distributed at random.

6. Any novel or unusual event may function as a reinforcer.

7. The successful completion of a task or the discovery of the solution to a problem may be reinforcing for those behaviors that led up to these events.

8. Many reinforcers are conditions that satisfy needs. For this reason, effective learning commonly takes place when the task involved is related to the satisfaction of a need.

9. The magnitude of the reinforcement provided is not necessarily related to the amount of learning produced. In education, a safe rule, probably, is to use small reinforcements. However, there are advantages in setting the reinforcement so that it is related to the quality of the response reinforced.

10. The magnitude of a reinforcement is likely to be of much less significance than the fact that a reinforcement will or will not occur.

11. Experience without active participation and without reinforcement can conceivably produce learning, but the learning process involved is inefficient compared with that which occurs when performance is directly reinforced.

12. Reinforcement may involve the transmission of information, or change in affect. In human learning, the informational aspects of reinforcement appear to be of paramount importance. (The information provided by reinforcing events is commonly called feedback.)

13. Reinforcement is commonly given in the form of information. In some learning situations, this information may be given prior to a response and be as effective as when it is given after a response.

NEGATIVE REINFORCEMENT AND PUNISHMENT

14. The punishment of incorrect responses may increase the rate at which learning occurs. However, the use of punishment is not recommended because it may have other harmful effects, such as the development of an aversion for the entire learning situation.

15. Punishment and threat operate by producing inhibitions. These inhibitions may generalize to other stimuli and responses. Severe punishment may produce inhibitions of responses that have considerable permanence. Hence, if punishment is used, it should be mild and directed primarily at the inhibition of responses that are incompatible with the response to be learned.

16. Failure depresses those intellectual activities closely associated with school learning. Failure experiences are likely to result in relatively inefficient learning in the period that follows them.

GENERALIZATION, INHIBITION, AND TRANSFER

17. Stimulus generalization represents one of the most important means whereby the skills learned can be applied to new and similar situations.

18. Most learning involves the learning of inhibitions. The learning of inhibitions with respect to social behavior is of particular importance. Inhibitions may be learned by various means, such as punishment or preventing a response in a situation in which the individual is motivated to so respond.

19. Extinction is one effective way of eliminating an unwanted behavior if it is possible to arrange for the manifestation of the behavior without reinforcement. Often this cannot be accomplished, because the reinforcer may be internal to the learner or caused by conditions that cannot be controlled.

20. Negative transfer is most likely to occur in those situations in which the stimuli are the same as those previously encountered but the responses required are different.

21. Transfer of training is most likely to occur with well-practiced skills rather than with those in which a lesser level of skill has been acquired.

22. Since the learner is an active organism who naturally emits large amounts of behavior, restlessness is to be expected in children. Extreme restlessness and distractibility is, however, a part of the brain-damage syndrome.

PERCEPTION AND COGNITIVE LEARNING

23. The perceptual system is a system with a limited capacity for handling information. Mechanisms exist that limit the amount of information received by the system.

24. Information reaching the receptors is compressed during the process of transmission to the higher centers.

25. The perceptual system, when working to capacity, handles information from only one source.

26. Knowledge as it exists in books and other documents reflects many structures; knowledge as it is stored in the individual also reflects structure. This internal organization of knowledge is referred to as a cognitive structure.

27. Individuals are characterized by a large number of different abilities, but only some of these abilities appear to serve a useful function in a civilized community.

28. Gains in intelligence-test scores are partly a function of the social and educational conditions to which a child is exposed.

29. The structure of aptitudes is such that pupils grouped in terms of scores on one aptitude will not be well-grouped with respect to other aptitudes.

30. The aptitudes involved in learning a task may differ at different levels of achievement with respect to the task.

31. Time devoted to the learning of principles may provide superior possibilities for the transfer of what has been learned to new situations--more so than the same amount of time devoted to the learning of facts.

32. Certain skills may be taught that have extensive applicability to the solution of new problems. The learning of these skills is referred to as "the acquisition of learning sets."

33. Bodies of content that have general value for developing problem-solving ability have not been developed.

34. Meaningful material is more easily learned than meaningless material, because it represents material that has already been partly learned.

35. Information is better retained if it is consistent with the learner's own values than if it is inconsistent.

36. Concepts represent classifications of experiences. Such classifications are formed through opportunities to classify exemplars under conditions that provide the learner with information concerning the acceptability of his classification.

37. The learning of concepts involves the identification of the defining attributes of the class of phenomena included in the concept. Learning a concept may be shortened by providing cues concerning the nature of the defining attributes.

38. Sudden insight into the solution of a problem occurs in those situations in which the learner has had extensive previous experience with related problems and with transferring what he has learned to new, but related, problems.

LEARNING AND RETENTION

39. The characteristics of the learning curve depend partly on the conditions under which learning occurs and the amount and nature of previous learning. In the acquisition of highly novel learnings in which previous experience can play little part, an S-shaped learning curve is commonly found.

40. Learning from printed material is improved by practicing recall as a part of the learning process.

41. Overlearned skills are better retained than skills learned to a lesser degree.

42. Periodical review and reinforcement are necessary for permanent retention. Reviews should be at increasing intervals of time.

43. Forgetting is largely a result of the interference of other learning activities with what is to be retained.

44. The typical curve for the retention of a skill shows a relatively sharp initial decline and then a gradually less rapid decline.

45. Reminiscence is probably not a genuine phenomenon in the case of verbal learning, but the result of an experimental artifact. However, genuine reminiscence appears to occur in the learning of motor skills.

46. Individuals fail to make proper use of information that is inconsistent with the position they themselves hold.

MOTIVATION

47. Needs are aroused by deprivation and also by stimuli related to their satisfaction.

48. Failure to provide sufficient stimuli impinging on the organism may produce a deterioration of intellectual skills as well as emotional disturbances.

49. A person's level of aspiration is related to his history of experiences of success and failure.

50. The self-selection of the means of satisfying needs does not necessarily lead to a healthy life. A person may learn through self-selection to satisfy needs in ways antithetical to his own well-being.

51. Measured interests bear little relation to achievement. So far there is little evidence to show that interests, as they are commonly measured, reflect important motives.

52. Achievement motivation develops during the school years, and its development is related particularly to the characteristics of the home. Particularly important are the attitudes of the parents with respect to the child being independent.

53. Positive and negative affect and changes in affect may have influence on the level of motivation. However, one cannot say that men are motivated by pleasure seeking and pain avoidance alone.

54. Rate of learning is related to the arousal level of the individual. Learning may be inefficient because the arousal level is either too high or too low. The arousal level may be changed by changing the amount of stimulation provided by the environment.

55. Learning situations involving approach-avoidance conflicts should be avoided since they are typically met with vacillating and ineffective behavior.

SOCIAL CONDITIONS OF LEARNING AND ATTITUDES

56. The activity and productivity of a group depends upon the characteristics of the leadership provided. However, there is no clear superiority of one kind of leadership over another for all purposes. The main advantage of a leadership in which pupils participate in setting their own goals is that it encourages the continuation of activity when the designated leader is absent.

57. Group work involving the interaction of group members may provide sources of reinforcement that would not otherwise exist.

58. Human subjects tend to be more productive when they work in group situations than when they work in isolation, even when there is no interaction between the members of the group.

59. The tendency to imitate appears to be learned through reinforcement, and hence there may be differences among children in the ability to learn through imitation.

60. A strong case can be made for the position that permanent and enduring changes in attitudes require changes in the underlying need system that they satisfy.

61. Attitudes expressed in the form of opinions may be changed by the use of reinforcement. However, such changes are primarily related to the cognitive component of attitudes, and may not change related action systems.

DEVELOPMENT

62. Only to a limited degree does human development manifest a regular and well-identified pattern. Studies that attempt to identify such a uniform pattern have not generally been reproduced under other cultural conditions.

63. Evidence is accumulating that learning occurs in two stages. Early learning is slow and involves the acquisition of basic discriminations. Late learning builds rapidly on the foundation of early learning.

64. Failure to learn at a particular age may be the result of the fact that the nervous system did not develop to the point where such learning is possible; an alternative reason may be lack of early learning (as described by Hebb).

65. The ability to learn increases up to the early adult years.

66. Ability to learn at any particular stage of development is a product of the individual's inherited characteristics and the previous learning situations to which he has been exposed.

Appendix III

Some "principles" potentially useful in practice
From Hilgard and Bower, 1966, pp. 562-564.

A. Principles emphasized within S-R theory

1. The learner should be active, rather than a passive listener or viewer. The S-R theory emphasizes the significance of the learner's responses, and "learning by doing" is still an acceptable slogan.

2. Frequency of repetition is still important in acquiring skill, and in bringing enough overlearning to guarantee retention. One does not learn to type, or to play the piano, or to speak a foreign language, without some repetitive practice.

3. Reinforcement is important; that is, repetition should be under arrangements in which desirable or correct responses are rewarded. While there are some lingering questions over details, it is generally found that positive reinforcements (rewards, successes) are to be preferred to negative reinforcements (punishments, failures).

4. Generalization and discrimination suggest the importance of practice in varied contexts, so that learning will become (or remain) appropriate to a wider (or more restricted) range of stimuli.

5. Novelty in behavior can be enhanced through imitation of models, through cueing, through "shaping," and is not inconsistent with a liberalized S-R approach to learning.

6. Drive conditions are important in learning, but all personal-social motives do not conform to the drive-reduction principles based on food-deprivation experiments. Issues concerning drives exist within S-R theory; at a practical level it may be taken for granted that motivational conditions are important.

7. Conflicts and frustrations arise inevitably in the process of learning difficult discriminations and in social situations in which irrelevant motives may be aroused. Hence these have to be recognised and their resolution or accommodation provided for.

B. Principles emphasized within cognitive theory.

1. The perceptual features according to which the problem is displayed to the learner are important conditions of learning (figure-ground relations, directional signs, "what-leads-to-what," organic interrelatedness). Hence a learning problem should be so structured and presented that the essential features are open to the inspection of the learner.

2. The organization of knowledge should be an essential concern of the teacher or educational planner. Thus the direction from simple to complex is not from arbitrary, meaningless parts to meaningful wholes, but instead from simplified wholes to more complex wholes. The part-whole problem is therefore an organizational problem, and cannot be dealt with apart from a theory of how complexity is patterned.

3. Learning with understanding is more permanent and more transferable than rote learning or learning by formula. Expressed in this form the statement belongs in cognitive theory, but S-R theories make a related emphasis upon the importance of meaningfulness in learning and retention.

4. Cognitive feedback confirms correct knowledge and corrects faulty learning. The notion is that the learner tries something provisionally and then accepts or rejects what he does on the basis of its consequences. This is of course the cognitive equivalent of reinforcement in S-R theory but cognitive theory tends to place more emphasis upon a kind of hypothesis-testing through feedback.

5. Goal-setting by the learner is important as motivation for learning and his successes and failures are determiners of how he sets future goals.

6. Divergent thinking, which leads to inventive solutions of problems or to the creation of novel and valued products, is to be nurtured along with convergent thinking, which leads to logically correct answers. Such divergent thinking requires the subject to perceive himself as potentially creative through appropriate support (feedback) for his tentative efforts at originality.

C. Principles from motivation and personality theory.

1. The learner's abilities are important, and provisions have to be made for slower and more rapid learners, as well as for those with specialized abilities.

2. Postnatal development may be as important as hereditary and congenital determiners of ability and interest. Hence the learner must be understood in terms of the influences that have shaped his development.

3. Learning is culturally relative, and both the wider culture and the subculture to which the learner belongs may affect his learning.

4. Anxiety level of the individual learner may determine the beneficial or detrimental effects of certain kind of encouragements to learn. The generalization appears justified that with some kinds of tasks high-anxiety learners perform better if not reminded of how well (or poorly) they are doing, while low-anxiety learners do better if they are interrupted with comments on their progress.

5. The same objective situation may tap appropriate motives for one learner and not for another, as for example, in the contrast between those motivated by affiliation and those motivated by achievement.

6. The organization of motives and values within the individual is relevant. Some long-range goals affect short-range activities. Thus college students of equal ability may do better in courses perceived as relevant to their majors than in those perceived as irrelevant.

7. The group atmosphere of learning (competition vs cooperation, authoritarianism vs democracy, individual isolation vs group identification) will affect satisfaction in learning as well as the products of learning.

Appendix IV

Final Criteria for Program Design
from Kirchner, 1973, pp. 81-82.

In order that a consensus of items be established for use in the development of the self-learning program, items which indicated the experts strongly agreed, or agreed with the questionnaire statement, was accepted as program criteria. Any items with a total of less than 75%, or 20 out of 27, responses in the category of "Very Important" and "Important" were eliminated from the final list of program and kit criteria. Item No. 7, which had 44% or 12 out of 27 of the total responses in the "Very Important" and "Important" categories, was eliminated as a criterion for inclusion in the design of the self-learning program. To summarize there was substantial consensus amongst the experts even with the preliminary criteria. The final criteria used in designing the self-learning program were as follows:

1. Instructions to the learner should be clear, simple and meaningful.

2. The learning and instructional materials should be attractive in format.

3. The learner should have frequent opportunity to check his progress and to determine how well he is doing.

4. The materials should require the learner to respond in a variety of ways including written and/or manipulative tasks.

5. The materials should provide for varied activity (listening, reading, performing) on the part of the learner.

6. The various media (print, picture, diagram, sound, etc.) used by the learner should be of good quality.

7. Units of study within the program should assist the learner to make generalizations, draw conclusions and make applications.

8. The content and activities of the program should be interesting to the learner.

9. The learner should be permitted to repeat an activity until mastery is achieved.

10. It should be possible for the learner to receive immediate reinforcement in the form or verification of adequacy of his performance.

11. It should be possible for the learner to by-pass activities he has already mastered.

12. The content and activities in the program should provide a basis for future learning in a given area.

13. Correct answers to required responses should be readily available to the learner.

14. The learner should have access to teacher assistance should unforeseen difficulties arise.

15. The program should provide the learner with manipulative or "hands on" application of theory.

16. For efficiency of learning, the program should be appropriate to the basic skills level of the learner (reading, mathematics, etc.).

Appendix V

Self Learning Kit Questionnaire

Thank you for participating in this project. In order to assess whether the design criteria were met I would ask you to rate the following statements by circling your choice of "Strongly Agree", "Agree", "Undecided", "Disagree", or "Strongly Disagree".

1. I was active rather than passive.

   SA A U D SD

2. I had enough practice to guarantee retention.

   SA A U D SD

3. I practiced in varied ways so my learning will be appropriate to a wide range of stimuli.

   SA A U D SD

4. My reinforcement was mainly positive and occurred at irregular intervals.

   SA A U D SD

5. I wanted to learn the material.

   SA A U D SD

6. Correct answers were readily available to me.

   SA A U D SD

7. I could by-pass activities I had already mastered if I wished.

   SA A U D SD

8. I could repeat any activity until I had mastered it.

   SA A U D SD

9. I learned through understanding rather than by rote learning or learning by formula.

   SA A U D SD

Appendix V (continued)

10. My learning proceeded from the simple to the more complex.

SA A U D SD

11. The learning was at a low anxiety level.

SA A U D SD

12. I found this package of a practical nature and specific in focus.

SA A U D SD

13. I could operate this package during normal school hours if I desired.

SA A U D SD

14. I could operate this package any time I wished.

SA A U D SD

15. I felt this package had been prepared by a teacher.

SA A U D SD

16. The components of this package were free from breakdown.

SA A U D SD

17. The package is mailable.

SA A U D SD

18. The package is capable of being operated by a learner who has had little or no training or experience in the operation of audio-visual equipment.

SA A U D SD

19. The idea of the package is flexible enough to allow many kinds of content areas to be handled by the basic components. (box, cassette tapes and recorder, photographs, materials, print)

SA A U D SD

Appendix V (continued)

20. The materials in the package do not cost more than $200.

SA A U D SD

21. The package is capable of being operated in the average home or school.

SA A U D SD

22. The components of the package were attractive and of high quality.

SA A U D SD

23. I enjoyed learning in this way.

SA A U D SD