CHAPTER IV

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****** **** DEVELOPMENT AND VALIDATION OF PLM

4.1 Introduction

The present investigation is an attempt to study the suitability of PLM for promoting Home Science Education both as a self-study method as well as an aid to study conventional method of study. Researches in the area of Home Economics concerning PLM have indicated that programmed learning materials in the various areas of Home Economics can be developed. However PLM was mainly found to have been developed in the area of Clothing, Food and Nutrition and Consumer Education. The major criticism against development and utilization of PLM in general is that it can be developed to promote cognitive behaviour, mainly the low level cognitive behaviour concerning recall and recognition of facts. But

studies carried out in U.S.A. and reported in the area of Home Economics have ruled out this criticism to some extent. One of the unique contributions of these researches aiming at establishing the suitability of PLM in Home Economics Education is developing programme for transfer of skill.

Since no programme in the area of Home Science was found to have been developed in India at the time when this study was undertaken, the investigator first developed the PLM in Home Science and then tested its suitability for the selected adolescent girls. In order to do this the following steps were followed :

1. Selection of topic and generalisations and concepts concerning it from authentic source.

2. Development and validation of frames in a selected form of PLM by means of individual and group testing.

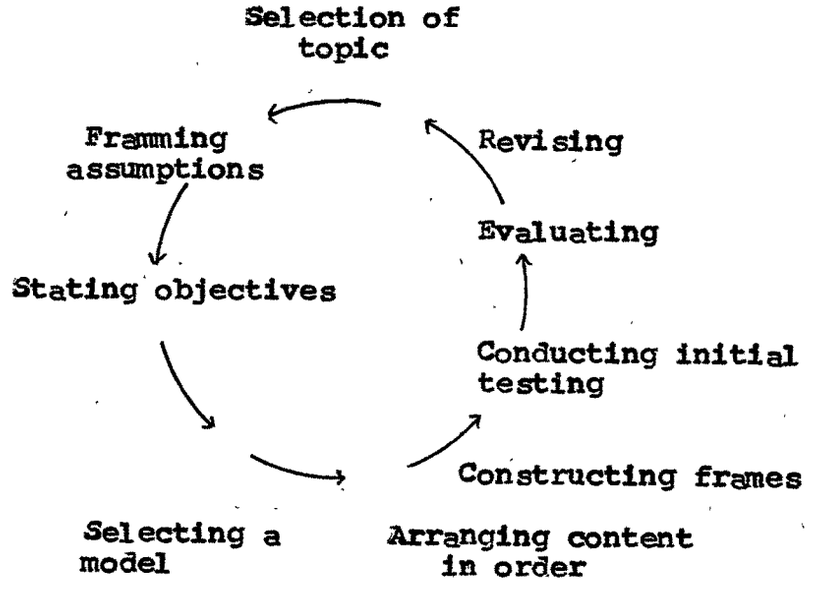
3. Establishing suitability of so developed PLM as an auto - instructional method and as an aid for promoting desired learning in the selected adolescent girls from Baroda, and

4. Establishing the effectiveness of PLM over selected conventional method of teaching independently in relation to the selected input variables.

In the present chapter the procedure adopted to develop and validate the PLM in Home Science for adolescent girls are reported.

4.2 Development and Validation of PLM

In the first place developing a programme learning material calls for following certain steps. It is only through these steps that a programme can be developed and validated for use as a method of study. These important steps can be stated in the following manner :



4.2.1 Selection of Topic

This depends on various factors. Analysis of available researches and the review of literature revealed

that the most popular topics on which programmes have been developed are those dealing with mathematical or scientific theories, followed by those arriving in order to promote learning of rules, principles, concepts and generalizations in the area of psychology and economics. Study of the literature related to these revealed that development of PLM in these areas called for subject matter which dealt with statement of facts and principles leading to development of certain concepts and generalization.

Studies mainly in clothing and textile area of Home Economics aimed at promoting understanding of procedures for construction of a blouse pattern (Lewis, 1968) as well as in organization of content dealing with analysis of construction procedures into component skills for construction of a blouse (Moebes, 1966). Both of these programmes were developed for promoting higher level of learning through PLM i.e. transfer of skill. Johnson, Clowson and Shoifner (1960) too, conducted a field experiment using programmed instruction to teach a skill for transfer. Special objectives of their study was to develop self instructional programme in the area of clothing construction for teaching a skill at the level of learning which will guide the students to an understanding of the process involved which prepares the students to transfer learning of a new task.

Besides these studies the others developed in Food, Nutrition, Consumer and Home Making education were mainly to present purposes (Banovich, 1968) of leavening agents in making of a bread and for developing objectives and generalizations concerning selection and use of blouse pattern for industry students (Lewis, 1968).

One can, therefore, conclude that studies in Home Economics concerning PLM were dealing with developing programme materials for elementary levels of learning as well as for higher levels of learning. In the present investigation the programme is developed mainly to promote understanding of various saving schemes through presentation of facts concerning the purposes, reason, functions, procedures, values and limitations of various saving schemes and the types under each of them.

Literature concerning development and use of PLMs leads one to conclude that they were mainly developed to study their effectiveness for self-study (Parish, 1968, Murphy, 1968; Wissink, 1968 ;) as well as when compared to the conventional method of study (Johnson, Clowson and Shoffner, 1960 ; Banowich, 1968, Everette, 1968) Wissink (1968) conducted a study to establish suitability of PLM as an aid to conventional teaching and also over the

conventional method of teaching. Berham and Reach (1971) on the other hand conducted a study at college level on self instructional programmed course in Basic clothing through use of the hybrid form of programme.

It can be therefore concluded that in U.S.A. studies in Home Economics are conducted not only to establish suitability of PLM as a self study method but they are also conducted to study its suitability over conventional method of study and also as an aid to conventional method in linear and branching form as well as in hybrid form.

In the present investigation the PLM developed is used for self-study purpose, as well as an aid to the conventional method. The study also aims at establishing its suitability over the conventional method of study when compared according to its use as self - instructional method and an aid, as well as when compared with the selected input variables. In most of the studies mentioned above achievement on the basis of methods of treatment are compared with selected input variables such as IQ (Banovich, 1968), Time taken (Wissink, 1968), and preparation on the basis of pre - test (Berham and Reach 1971), Banowich 1968 and Kanjanasthiti, 1968). Most of these studies indicate that an attempt was made to establish effectiveness

of PLM for immediate as well as delayed retention. However, no details regarding these were available to the investigator as these were only reported in abstract forms.

In all these studies selection of topic had been a crucial aspect. Review concerning the studies regarding selection of the topic show that the subject matter for developing any form of PLM was selected by getting responses of teachers on an opinionaire and or questionnaire (Lewis, and Parish), through interview of the subject matter teachers, referring to the published materials and consultation with an accepted authority (Moebs) as well as consultation with the students (Parish).

In the present investigation since the PLM developed was to be tested on the adolescent girls from one of the schools offering Home Science, it was felt that the topic should be one for the prescribed syllabi for the high school. Therefore the first source tapped for selection of the topic was the printed syllabus and the prescribed textbook. At the time when the experiment was planned the syllabus and the textbook were undergoing revision on the basis of revised programme of study at the secondary school level. Hence, the textbook writers and the school teachers, too, were consulted. On the basis of their reaction it was revealed that only one

area of the syllabus for IXth grade Home Science student was not undergoing change. The same was, therefore, decided upon. The content under this included certain basic facts regarding purposes, reasons, functions, procedures to be adopted as well as values and limitations of various forms of saving schemes namely Bank, Insurance, National Saving Schemes and Private Saving Schemes. Hence the personnel from Bank, L.I.C., Post-Office and the office of the Government Saving Schemes were also interviewed for the validation and selection of content.

The major consideration for selection of content under the subject matter on management of resources was the experimental nature of study. Initially only limited time on the basis of class periods utilized in teaching theory by regular subject matter teacher was allotted to the investigator. However, later on the permission was granted to the investigator to utilize the time generally allotted for conducting the practicals in Home Science also. Therefore in all about 480 minutes were available to conduct the experiment. Hence, content in form of concepts and generalization which could be learnt only during this time conventionally as well as that through the experimental conditions was selected. The amount of time required to cover the selected unit was arrived at through individual

and group testing of PLM in the course of validation process: The amount of time needed was also decided upon on the basis of the instructional objectives set for promotion of understanding of the meaning, purposes, functions, reasons, procedures, values and limitations of various saving schemes and the types under each of them.

4.2.2 Framming Assumptions

It was assumed that the programme will be developed for IXth grade students. This assumption was based upon the syllabi prescribed for VIIIth, IXth and XIth grade at the secondary school level. The assumptions regarding the content to be covered were based on the topics covered in the same year namely budgeting as well as those covered in the previous years viz., management of resources.

A pre-test to find out the knowledge possessed by the students was constructed in consultation with the teachers. It included evaluating items pertaining to various areas of management i.e. resources both human and non-human as well as budgeting. Certain basic questions pertaining to the content to be taught were also included to find out the extent of knowledge possessed regarding savings by the

students under study.

As the programme was to be developed in Gujarati and was to be tested on the Gujarati section of the IXth grade, it was assumed that students responding to the PLM know Gujarati well enough to read and comprehend from the PLM so prepared.

4.2.3 Stating of Objectives

Development of PLM calls for statement of objectives in terms of identifiable or observable behaviour to judge the desired outcome. The following procedure was adopted for selecting appropriate objectives for developing the PLM on the topic 'Savings'.

general

In the beginning as well as the specific objectives were stated by the investigator in consultation with the three course teachers from two schools where Home Science was offered. After this a list of statement of objectives in terms of specific observable identifiable behaviour was developed. These were included in the checklist to be provided to the experts for selecting the objectives. The total number of objectives included in checklist were seventeen.

Twelve respondents comprising of the experts from the Home Management and Home Science Education Department of the Faculty of Home Science, Teacher Educators from the Faculty of Education and Psychology as well as teachers teaching Home Science at the two schools offering Home Science at the secondary school level at Baroda, namely the Maharani High School for girls and the Alembic Vidyalaya and the authors of the textbook in Home Science went through the checklist. These responses were taken into consideration for selecting the objectives. The following objectives on the basis of agreement of 75 % of respondents were then retained.

On completion of the PLM in Home Science the students will be able to :

1. identify the meaning of savings ;
2. recognize the importance of savings in general ;
3. identify the factors affecting individual's pattern of savings ;
4. identify the factors affecting family's pattern of savings ;
5. pick out factors affecting patterns of savings of the individual and the family ;
6. recognize the general aims of savings,
7. name various schemes of savings ;

8. identify various types offered under each of the saving schemes ;

9. identify the advantages of various saving schemes ;

10. identify the advantages of the types offered under each of the saving schemes ;

11. explain through writing the procedures involved in operating various saving schemes ;

12. explain through writing the procedures involved in operating various kinds of savings under different saving schemes ;

13. recognize the characteristic value of determining the different types under various saving schemes through their merits ;

14. select specific saving scheme to meet a given objective, and

15. selecting appropriate saving schemes for individual as well as family on the basis of their expressed needs and purposes.

On selection of these objectives appropriate generalizations and concepts were selected from the list under finance management suggested by American Home Economics (1967) at the workshop to evolve the same. In all, sixteen statements of each, the generalizations and concepts related to savings were selected by the investigator to prepare a checklist. The same twelve experts responded to the checklist for the selection of

the concepts and generalizations. Agreement of 75% of the respondents was considered for final retention of concepts and generalizations. However, care was taken to check that all the important concepts and generalizations prescribed as per the syllabus were included while developing the PLM in 'Savings' after the final selection of the same experts.

The following generalizations were selected on the basis of the opinions of the experts and reference to the syllabi for Home Science by the Secondary School Education Board :

1. Individuals and families have responsibility to provide for their own welfare beyond the basic expectations of and protection provided by the society.
2. Individual and family choices regarding types of savings are affected to the extent they know about it.
3. Individuals and families facilitate management of income through knowledge of different forms of savings.
4. The perception of returns through various forms of savings enhances or limits its use.
5. The assessment of various kinds of savings in terms of return, goal satisfaction and procedures to be followed in utilizing it, clarifies its contribution in management of family income.
6. The availability of resources for various kinds of savings affects the range of choice.

7. The risk of utilizing different forms of savings determines the extent to which they can be used.

8. Families differ in resources available to meet economic needs and risks of its members. These affect the pattern of savings.

9. Family standards, patterns of living and family values influence the choice regarding kinds of saving schemes to be utilized.

10. Different forms and combination of forms of savings determine the extent to which they can be used.

11. Management by individuals and families reflects differences in values, goals and standards. Thus they affect the ways of savings.

12. The decisions of individuals and families regarding choice of different ways of savings reflect the perception of goals and goal achievements through them.

13. The implementation plans for savings involves reappraisal and adjustments of procedures to meet changing conditions.

The concepts selected on the basis of the expert opinions were as follows :

1. Saving is a part of money management.
2. Savings are important for various reasons.
3. There are various factors which affect the pattern of saving of the individual and the family.

4. There are general aims for which the individual and the family try to save.

5. There are various savings schemes.

6. In some saving schemes there are various types of savings one can undertake.

7. Each saving scheme has specific aims which can be satisfied through it.

8. The various types under various saving schemes have definite purposes too.

9. There are various proceedures involved in operating various saving schemes.

10. Each form of saving has certain advantages as well as limitations.

11. Intelligent planning of individual and family savings can be done through knowledge of various saving schemes.

12. The individual as well as the family can contribute towards national development and income through different ways of savings.

4.2.4 Selecting a Model

Programme Learning Materials can be developed in two styles namely the linear and the branching. Each of these styles has its own values and limitations. They are used to teach different groups of students and different kinds of materials in form of subject matter.

A linear style is generally used for mastering the content which can be arranged in an hierarchical order. It is more suitable where there is a homogeneous group of students. However its use is not strictly confined to the homogeneous group or hierarchical information only. This form of PLM is comparatively more easy to prepare than that in the branching type.

Branching style of PLM is used to promote concepts with multitudinal aspects which call for interrelating or connecting of the same. It is often used for heterogeneous group which might take more time to arrive at a correct response and need more explanation to arrive at the desired behavioural outcome.

As so far no programmed learning material in the area of Home Science is developed in India, it was decided that a linear form of programme in saving should be

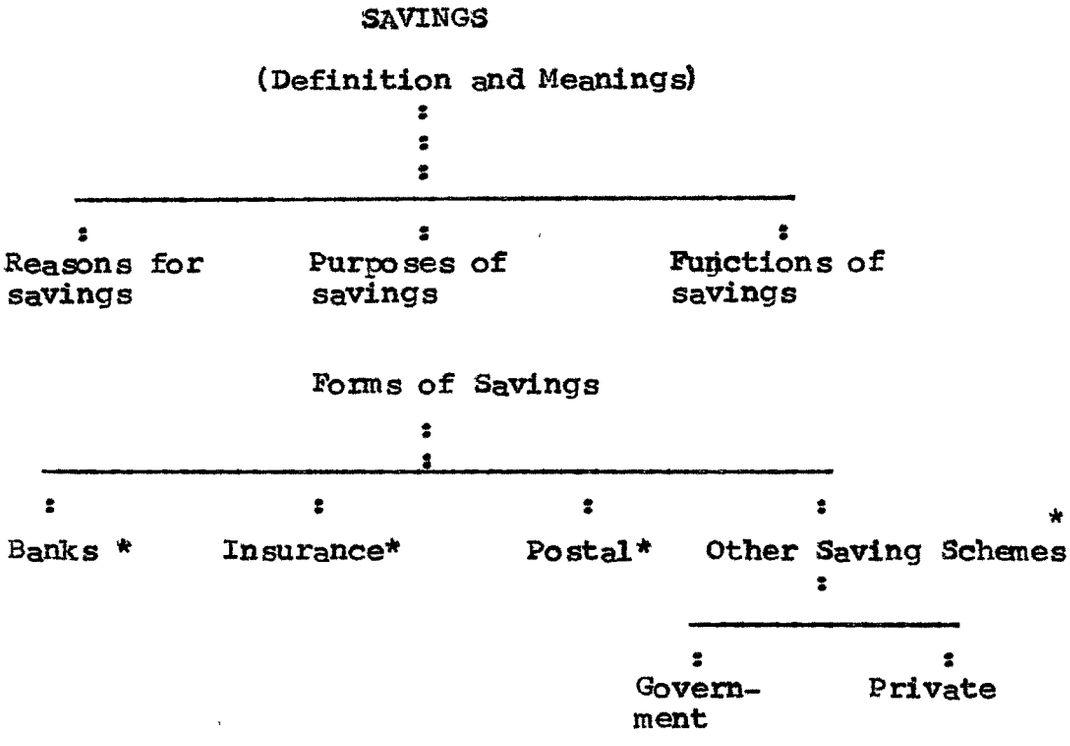
developed. The school where the experiment was to be conducted had a homogeneous group of students - socio-economically as well as intellectually. It consisted of majority of the students belonging to the average category rather than to the two extreme categories.

The content to be taught under the topic 'savings' was also in a hierarchical order starting from meaning purposes, reasons, functions and resources leading to types, procedures to be followed in managing them, their values as well as limitations. It was thought that such a content progressing from simple to complex form of information will facilitate progressive ordering of the sequence which will be suitable to the linear form of programme

4.2.5 Arranging Content in Order

The content for any programme learning material needs to be organized in an orderly form so that the learner proceeds from simple to complex tasks in an orderly manner by following one step after another. This permits progressive learning of a given concept. There are four ways in which the content can be orderly presented namely in the Ruleg, Egrul, sub-units and flow-chart methods.

In the present study the investigator has used the flow chart or gradual approximation procedure to organize the content in an orderly manner. This was done as the subject matter content was such which allowed for gradual approximation.



* 1. Purposes, served by each of these forms of saving schemes.

2. Procedures to be followed in these savings schemes.

3. Various types under each of these saving schemes.

4. Purposes served by each of the types under the major forms of savings ; and

5. Values and limitations of each form of savings in general and specifically.

The gradual approximation of the content on the topic 'Savings' thus will lead to mastering of the selected concepts and generalizations by attaining the desired objectives through the three experimental conditions.

4.2.4 Construction of Frames

The actual writing of programme starts with the construction of frames. In a linear style of programme the size of the frame is usually small. It represents one idea in mostly one sentence. The student is expected to make a response to the following statement. The student is then provided with the knowledge of the correct response. This provides reinforcement to the learning achieved. After getting the feedback, the student is given direction to follow the next frame. The size of the frame however, depends on various factors viz., ability to comprehend, newness of the content, the nature of the concept to be learnt, etc.

In the present investigation the students' ability to comprehend the content presented in a given frame was considered the prime basis for deciding the size of the frame. No formal test to judge their ability to comprehend was given. Instead the following steps were followed in the construction of the frames.

1. Referring of constructed frames to the school teachers

Number of frames were constructed in each of the independent sub-units. They were given to the three subject matter teachers teaching Home Science in two schools namely Maharani High School for Girls and Alembic Vidyalaya, offering Home Science. The aim in doing so was to judge the language used in the frame and the representation of the subject matter.

After necessary revisions concerning sentence formations and presentation of the subject matter the frames were referred to the experts in programmed learning.

2. Referring the constructed frames to the experts

Three experts from the Faculty of Education and Psychology, Baroda were consulted to give their opinions regarding construction of the frames.

Initial recommendations of the experts were considered to revise the frames in terms of their suitability in the PLM.

It was pointed out by the three experts that the initial frames were too big in size. They consisted of too long compound sentences giving complete information. Hence, the same were re-written to explain one logically related concept in simple sentences.

4.2.7.1 Individual Testing

The frames so prepared were then given to a student of IX grade studying in another school where Home Science was offered. This student was selected on the basis of certain considerations. The first was that she belonged to the school where Home Science was offered and she had opted for that subject. She was available to the investigator as she stayed on the same campus where the investigator stayed. Intelligence and pre-test, given to the group of students in Alembic Vidyalaya where she was studying, revealed that this student belonged to 'above average' category according to her IQ score and was 'well-prepared' to enter into the experimental situation on the basis of her pretest score. The school

population in general represented the middle socio-income group. The student thus, selected was asked to go through the frame independently. The student was asked to write the time when she started going through the frames as well as at the terminal point that is on completion of the sub-unit. Initially only frames on the meaning, purposes, functions and reasons for savings were prepared.

Personal talk by the investigator with the student revealed that the frames constructed were too small giving too little an information. In the second trial the logically related information on saving was grouped together and the same respondent went through it. The size of the frame was thus, decided upon for information to be given to form every concept on the basis of her suggestions.

Similar procedure was found to have been followed by Mayor, Clans and Lumsdaine (1960) who made cumulative revision of frames on PLM based on small number of cases which allowed step by step revision of programme learning material leading to the final development of PLM. In their study the effectiveness of PLM was studied in relation to the criterion test. In the present investigation also the field experiment was conducted to

establish the effectiveness of PLM so developed on the basis of the scores earned on a criteriantest prepared by the investigator herself. The average time taken to go through the frames developed was worked out both through individual as well as group testing. The individual student who was given the first unit initially took seventy minutes to complete the same. However, as the familiarity with the procedures to be followed increased the time taken to go through the frames decreased to almost half that is 35 minutes.

4.2.7.2 Group Testing

After the initial development of frames in one unit through individual testing, frames in the rest of the four sub-units, too, were prepared following the same procedure. The complete PLM in saving was then administered on a group-matched on three variables namely intelligence, entering behaviours and socio-economic status of 21 students opting for Home Science in another school namely the Alembic School where Home Science was offered. Responses of this group of students were then checked for immediate responses on the criterion frames of PLM as well as on the retention test. On an average this group of students took 150 minutes to go through the complete PLM on savings.

Certain frames which students found difficult to understand in terms of responding to the criterion frames were revised till the students could understand them well enough to respond to the criterion frames. The frames which were so revised were found difficult by at least 11 students out of the 21 who responded.

A test prepared by the investigator to arrive at the immediate retention score was given at the end of each sub unit. In order to retain a frame it was decided that seventy five percent of the students should score at least seventy five percent of the total marks allotted to the immediate retention test for a given sub-unit.

Holland (1960) studied responses of large group of students to an already completed programme. His study provided extensive data for overall assessment and evaluation of the product. This provided for programme evaluation as well as programme revision. The programme revision was limited to the students' responses to the programme only. In the present investigation the programme revision was done on the basis of the students' responses to the programme as well as to the IRT on a given unit.

The frames so developed fell in various categories viz., teaching frames, copy or practising frames, reviewing frames and criterion frames. In the present investigation each of these types of frames was developed to promote desired learning in 'savings'.

The general format of the PLM consisted of a teaching frame -> practice frame -> copy frame -> criterion frame. The blending of these frames was done on the basis of the concept to be learnt as well as on the basis of previous learning.

4.2.8 Use of Prompts in Construction of Frames

Generally in PLM in every frame at the initial stage a prompt is provided to elicit the desired response. The prompt is therefore referred to as one that directs the respondents to take a correct response. Mayors (1960) defines prompts as a technique employed to make emergence of a correct answer more likely. Prompts are generally divided into two broad categories viz., the thematic prompts dealing with the theme of learning and the visual prompts which are ones which are obvious due to visual impressions created by them. In the present PLM generally

the thematic prompts calling for sentence completion on the basis of directive sentences or those calling for completion of a word on the basis of a given alphabet were used. The visual prompts too were liberally used.

4.2.9 Evaluation

The completed programme learning material consisted of 139 frames leading to learning of selected concepts and generalizations. It was then administered on the IX grade students of the Maharani Girls High School where Home Science was offered as a subject.

The PLM was administered over a period of four weeks. It was divided into five units. The first two units were offered at one time and the third, fourth and fifth units were offered in the following three weeks. An immediate retention test on each of these units was prepared by the investigator in consultation with the class teacher. The same was administered individually as well as in group according to the experimental conditions.

The IRT scores were arrived at by administration of the following procedure. In all four IR tests were given

on completion of each sub-unit. For the first and second sub-unit one combined test was given for testing immediate retention. For the following three sub-units three independent tests were given for testing immediate retention. The total scores received on the four IRTs were then added together. A percentage equivalent for the same was calculated. This score was taken as the immediate retention score for purposes of statistical analysis

On completion of the planned learning, two weeks were allowed to pass. Then a delayed retention test prepared by the investigator in consultation with the school teachers in Home Science was administered.

Keys for both the IRTs as well as DRT were prepared for all objective items. Model answers for subjective items, too, were prepared and kept ready. The IRTs and DRT were scored by the investigator with the help of the keys and the model answers. The mean and standard deviations for both the tests under each of the experimental methods of treatment were calculated independently as well as in combination with the divisions or levels of each of selected input variables viz., IQ, class achievement, achievement in Home Science, extent of preparations, adjustment to school, SES and time taken.

In-built provision was made to record time at the beginning and at the end of each unit on the printed PLM. For the slow learners who could not complete the whole unit in a given period of time oral instructions were given to write down the time when the class period ended. They were allowed to continue with the same unit in the next class period. An IRT was then given on completion of the unit after which a test was given and the student was allowed to go through the PLM on the next unit.

4.2.10 Conclusion

The procedures followed for development and validation of PLM in the present study were in the line with those followed in the earlier studies in general. However, certain procedures mainly utilized for selecting objectives, generalizationsand concepts were in accordance with the few related studies found in the area of Home Economics.

As this is a first attempt to develop a PLM as well as study its suitability in promoting Home Science Education in the limited amount of time at the disposal of the researcher and the administrative considerations

for conducting the experiment, the results of the analysis of data will be limited to these conditions and therefore will be more general in nature.