

CHAPTER VII

SUMMARY AND CONCLUSIONS

The preceding six chapters were intended to give in details the complete account of the present investigation. After describing the main features of the study, including the developmental procedure of the three instructional strategies, the conduct of the experiment, data analysis and the results, it would be worthwhile to review the process in its totality. In this Chapter, the review is followed by educational implications and the suggestions for further research.

The entire thesis was divided into seven chapters, each of which has a specific contribution towards the total reporting of the investigation.

The first chapter contains the introductory information about, how the awareness is being created among students in the field of 'Nutrition' through various related subjects in the Home-Science College in Baroda. It also discusses the importance of 'Nutrition-Education' and the various programmes implementing the same in various States of India. Since the investigator's main interest was to teach the subject of nutrition effectively, a few issues in teaching of the same subject which are responsible for ineffective learning are also discussed at length.

The second chapter includes a review of the past researches related to the study of various media and methods in the instructional process in the field of Education. It also presents a few selected studies pertaining to the field of Nutrition with a special emphasis on the methods of teaching the subject of 'Nutrition' at school level. Some of the related studies in the same field are also reviewed with a view to gathering useful information about the studies and investigations done abroad and in India to stress the fact that knowledge of nutrition is also necessary at the community level.

The literature reviewed in this chapter contains a list of interesting text books available recently, which serve as guides for teachers and learners both, in teaching and acquiring the knowledge of nutrition and health at primary level. The same chapter also bears a small list of on going doctoral researches concerning strategy development at CASE, the M.S. University of Baroda. A point worth noting here is that although many studies pertaining to strategy development for several subjects at school level, have been completed at CASE; developing strategies and comparing the same for their relative effectiveness has yet remained a field in its infancy; being recently undertaken by a very few researchers. The present study being one of the same kind.

The third chapter states the problem which reads as under:

"A COMPARATIVE STUDY OF DIFFERENT STRATEGIES TO
TEACH NUTRITION TO THE HOME SCIENCE COLLEGE STUDENTS OF
VARYING INTELLIGENCE".

The three instructional strategies under comparison
were:

- (i) PLM + Laboratory Demonstration + Discussion (Strategy S_1).
- (ii) Structured lectures with blackboard work + laboratory demonstrations + Library reference work (Strategy S_2).
- (iii) Taped commentary with charts and worksheets + Laboratory demonstration + Discussion (Strategy S_3).

Each instructional strategy was evaluated as a whole
to study the effectiveness of all the components in an
integrated fashion as one system of instruction.

The content of teaching was selected from the course
on "Elementary Foods and Nutrition". The three units taught
were "Proteins" (unit U_1), "Carbohydrates" (unit U_2) and
"Fats" (unit U_3).

Along with the problem, three strategies and the
selected units of content, the chapter also states the
objectives with which the study was undertaken.

The three objectives which were fulfilled are:

1. To prepare (a) programmed learning material with the
response sheets, (b) structured lectures, and (c) the

taped teaching material with charts and work-sheets containing sets of questions - all in English language on three units viz. 1) proteins, 2) carbohydrates, and 3) fats; for the students of II year class of Faculty of Home Science of the M.S. University, Baroda.

2. To find out the relative effectiveness of the three instructional strategies viz. strategy one (S_1), strategy two (S_2), and strategy three (S_3), in terms of the achievement of the instructional objectives in case of all the students together.
3. To find the differences in the effective use of the three instructional strategies viz. strategy one (S_1), strategy (S_2), and strategy three (S_3) as judged in terms of the achievement of the instructional objectives, by the students of the three levels of intelligence separately i.e. high level, average level and low level of intelligence.

This chapter further discusses the scope and limitations of the present investigation with the definitions of the terms used in the statement of the problem. As mentioned earlier the present investigation concerns itself with the development and comparison of the three instructional strategies. This indeed demands a systematic and scientific analysis of teaching-learning process. Gage (1968), Mitra (1972) and others have focussed the attention of educational researchers to this aspect thereby producing a change in the direction of

research. In this age of technology we are presented with innumerable opportunities which if siezed, can enrich the class-room climate. According to Mark (1966), technology gives man, the capability of discovering, producing, processing and utilizing materials of our environment with increasing efficiency. It is the duty of every practising teacher to see that education technology enters the class-rooms to make the instructional process effective and efficient. In fact, this was the main goal of the present investigation.

The fourth chapter gives a detailed account of the developmental procedure of the three strategies compared in the present investigation. Content outline along with the task analysis for the same, are presented in this chapter in the form of flow charts. Specific statements regarding entering behaviours and terminal behaviours are listed together with the description of the pre-tests and the criterion tests in the same chapter.

This chapter also discusses how the initial draft of the programmed learning material was prepared and tried out, followed by the subsequent draft with due modifications, prepared for field testing. Description of the techniques used in designing different components included in the three strategies, also form the part of this chapter. The chapter ends with the discussion of the results of the try-out study (field study) for which criterion tests were used as the tools

of data collection. Necessary changes and modifications in the final draft of the criterion tests items, programmed learning material, structured lectures and the material to be tape-recorded are also discussed at length.

The fifth chapter deals with the conduct of the experiment. It reports the methodology and procedure followed for the purpose of the present investigation. It begins with the several issues considered before finalizing the experimental designs for the study. It proceeds to give details regarding (i) the formulation of hypotheses, (ii) selection of the sample, (iii) classification of variables, and (iv) the procedure of the experiment along with (v) the tools used, which are all stated below in brief.

(i) Formulation of the hypotheses:

The three main null hypotheses which have been formulated for the purpose of the present study are as follows:

1. There will be no significant differences among the three instructional strategies viz. strategy one (S_1), strategy two (S_2) and strategy three (S_3), in their effectiveness in terms of the achievement of the instructional objectives.
2. There will be no significant differences in the achievement of the instructional objectives amongst the students, belonging to the three levels of intelligence, viz. high level, average level and low level of intelligence when

taught through any of the three instructional strategies viz. strategy one (S_1), or strategy two (S_2) or strategy three (S_3).

OR

3. There will be no significant differences in the effective use of the three instructional strategies viz. strategy one (S_1), strategy two (S_2) and strategy three (S_3) by the students of any of the three levels of intelligence namely high level, average level, or low level, as judged from their scores on criterion tests.

These three main null hypotheses can further be specified as nine hypotheses to be tested, which are as follows:

- 1a. There will be no significant difference between the strategy one (S_1) and strategy two (S_2) in their effectiveness in terms of the achievement of the instructional objectives, (in case of all the students together).
- 1b. There will be no significant difference between the strategy two (S_2) and strategy three (S_3) in their effectiveness in terms of the achievement of the instructional objectives, (in case of all the students together).
- 1c. There will be no significant difference between the strategy one (S_1) and strategy three (S_3) in their effectiveness, in terms of the achievement of the instructional objectives, (in case of all the students together).

- 2a. There will be no significant difference in the achievement of the instructional objectives amongst the students of high level of intelligence when taught through either strategy one (S_1) and strategy two (S_2), or strategy two (S_2) and strategy three (S_3), or strategy one (S_1) and strategy three (S_3).
- 2b. There will be no significant differences in the achievement of the instructional objectives amongst the students of average level of intelligence when taught through either strategy one (S_1) and strategy two (S_2), or strategy two (S_2) and strategy three (S_3), or strategy one (S_1) and strategy three (S_3).
- 2c. There will be no significant difference in the achievement of the instructional objectives amongst the students of low level of intelligence when taught through either strategy one (S_1) and strategy two (S_2), or strategy two (S_2) and strategy three (S_3) or strategy one (S_1) and strategy three (S_3).

OR

- 3a. There will be no significant difference in the achievement of the instructional objectives between the students of high and average level of intelligence, or average and low level of intelligence or high and low level of intelligence when taught through strategy one (S_1).

3b. There will be no significant difference in the achievement of the instructional objectives between the students of high and average level of intelligence or average and low level of intelligence or high and low level of intelligence when taught through strategy two (S_2).

3c. There will be no significant difference in the achievement of the instructional objectives between the students of high and average level of intelligence or average and low level of intelligence or high and low level of intelligence when taught through strategy three (S_3).

(ii) Selection of the Sample:

The experiment necessitated sampling of the teachers and the students.

Teacher:

It was decided to involve only one teacher in the whole experiment to avoid teacher variance. It was necessary to have the teacher who had a good knowledge of the content to teach, who could be programmed, and who could decide and change the patterns of teaching as required by the design. The investigator who could satisfy all the above conditions acted as the teacher during the conduct of whole experiment. It may be noted here that investigator herself developed the content matter and all the software materials to be used in all the three strategies. Besides this, investigator alone carried out the individual try out for the PLM development

and also the try-out study for all the three instructional strategies, to test the working of each component in each strategy.

Students:

The sample of the students comprised the second year class, Home Science girls of the Faculty of Home Science of the M.S. University of Baroda city. The average age of the girls was 18 years. English medium college girls were selected, considering the language in which the software materials were prepared. As the analysis of the design required equal number of students in each cell, the whole class was randomly divided into three groups each having thirty five students. Thus the total sample of students formed to be one hundred and five. The entire class population was studied to arrive at the valid conclusions.

(iii) Classification of variables:

The study involved three types of variables, namely independent variable, dependent variable and an intervening controlled variable. The three instructional strategies or the treatments served as the independent variable, whereas students' learning scores on the criterion tests served as the dependent variable and intelligence as the controlled intervening variable, respectively.

(iv) Procedure of the Experiment:

The entire experiment involved the use of two designs,

(i) Latin Square Design, and (ii) Randomized Group Design. Latin square design was used to achieve the objective 2 and Randomized group design was used for the fulfilment of the objective 3. Investigator was mainly interested in examining the relative effectiveness of the three instructional strategies while learning the three selected units from the course on "Elementary Foods and Nutrition". In all 105 Second Year Home Science Girl Students, were divided randomly into three equal groups of 35 each, served as the subject. Thus there were three instructional strategies and to fit these into the design, the three groups of students and the three teaching units of the content were taken up; and the design turned out to be a 3×3 Latin Square design, having 9 cells in all. Each cell had 35 replicates in it equivalent to 35 subjects in each treatment cell (refer table : 3 - Ch. V).

It may be noted that the measure of students' intelligence was obtained by administering to them, the Ravan's Standard Progressive Matrices before the commencement of the experiment, as one of the objectives of the present investigation was to identify a suitable instructional strategy for the students of particular level of intelligence. This was followed by the administration of the written and oral pre-tests with a prior announcement about the administering of these tests. The three randomly selected groups were then subjected to the treatment as per the design. To be

specific all the three groups were exposed to all the three units taught through all the three instructional strategies. The teaching was followed by the administration of the corresponding criterion test with prior intimation to the students. The entire experiment was extended to a period of nine weeks as only one teacher i.e. the investigator alone was in charge of the experiment. This helped in introducing a sufficient time interval of two weeks between the two consecutive treatments in a group which in turn aided in minimizing the carryover effects. A schematic representation of the procedure followed is given in the Table 4 which is included in Chapter V. Detailed analysis involving the Latin square design is included in Chapter VI.

Further in order to find out which strategy is useful for the students of which particular level of intelligence, the randomized group design was preferred. As stated before, the measure of students' intelligence was obtained by administering to them, the Ravan's Standard Progressive Matrices. The scores obtained by the students were translated into percentiles. Thus there were 31, 47 and 27 students belonging to the high level, average level and low level of intelligence respectively. Later the marks obtained in the criterion tests by the students of each level of intelligence in each strategy were recorded separately. This data was then analysed by applying analysis of variance in randomized group

design. Analysis in details, involving the same design is presented in Chapter VI.

It may be noted that besides the two designs, i.e. (i) Latin square design and (ii) Randomized group design, even the third design namely Randomized Block design was also employed to confirm the same results. But the calculations and tables pertaining to the same design are not presented in the VI chapter as the results were the same. The reason for not being able to analyse the same data with factorial design, is stated in the Chapter VI.

(v) Tools Used:

The tools used for the data collection, for the present investigation are as follows:

- (i) Criterion test on 'proteins' for Unit 1.
- (ii) Criterion test on 'carbohydrates' for Unit 2.
- (iii) Criterion test on 'fats' for Unit 3.
- (iv) Intelligence test of Raven's Standard Progressive matrices.

The first three tests were prepared by the investigator as there were no standardized tests available for the three units selected, to be taught for the present study.

The sixth chapter concerns itself with the analysis and interpretation of the data on criterion tests and the intelligence test. The analysis and the interpretation of the

data are presented with the help of complete computations followed by the related tables giving statistical information. It may be noted here that testing of hypotheses 1a, 1b and 1c involved Latin square design while testing of hypotheses 2a, 2b, 2c; and 3a, 3b, 3c involved Randomized group design. This is followed by the statement of findings which is as under.

FINDINGS

As a result of the experiment the following findings were arrived at.

1. There is significant difference between the instructional strategy one (S_1) and strategy two (S_2) in their effectiveness in terms of the achievement of the instructional objectives. To be specific strategy one (S_1) is found to be better than strategy two (S_2) only in case of learning unit one and not in case of learning unit two and three.
2. There is no significant difference between the instructional strategy two (S_2) and three (S_3) in their effectiveness in terms of the achievement of the instructional objectives.
3. There is no significant difference between the instructional strategy one (S_1) and three (S_3) in their effectiveness in terms of the achievement of the instructional objectives.

4. There is no significant difference in the achievement of instructional objectives by the students of high, or average or low level of intelligence when each was separately taught through either strategy one (S_1) and strategy (S_2) or strategy two (S_2) and strategy three (S_3) or strategy one (S_1) and strategy three (S_3).
5. There is no significant difference in achievement of the instructional objectives between the students of high and average level of intelligence or average and low level of intelligence, or high and low level of intelligence when taught through strategy one (S_1).
6. There are significant differences in the achievement of instructional objectives among the students belonging to different levels of intelligence when taught through strategy (S_2). To be specific the students of high level of intelligence gained maximum whereas the students of low level of intelligence gained the least when taught through strategy two (S_2).
7. There is no significant difference in the achievement of the instructional objectives between the students of high and average level of intelligence, average and low level of intelligence, or high and low level of intelligence when taught through strategy three (S_3).

In short, strategy one (S_1) including PLM + Laboratory demonstrations + Discussion was found to be better in learning

only unit one on 'proteins' and not in case of learning other two units namely 'carbohydrates' and 'fats' i.e. all strategies are equally effective in teaching the selected content matter. Further strategy two (S_2) was found to be more effective only with the high intelligence group; with other two strategies, level of intelligence played no significant role.

The chapter ends with the discussion of the findings (results).

The present chapter, besides stating the summary of the six chapters, also narrates the educational implications and a few suggestions for further research. The chapter ends with some general concluding remarks on the present investigation and its contribution to the field of educational technology.

As the investigation was undertaken to find out the relative effectiveness of the three instructional strategies while teaching proximate principles of Nutrition, the nature of the study undoubtedly becomes comparative, which is made very clear through the title of the study itself. Practising teachers, interested in teaching the subject of nutrition would naturally feel concerned with the results of such a comparison among three strategies, to choose one of their interest to bring in novelty in their job of teaching. As the results reveal any strategy out of the three compared can be fruitfully used for the benefit of the learners.

The Educational implications of the study are enumerated as below.

EDUCATIONAL IMPLICATIONS

The study in its attempt to fulfil certain research gaps has thrown open more avenues for research. The software materials prepared are in accordance with a pool of well defined instructional objectives in terms the expected terminal behaviour of the students. Therefore, these could be made use of as the possible alternative input for any instructional situation having the same objectives. These input alternatives can be believed to bring about predictable behavioural changes in the students. They are suitable for instruction of the topics of Nutrition, viz. (1) Proteins (2) Carbohydrates (3) Fats to any class at undergraduate level.

The cluster of findings that have been arrived at, as an outcome of the experiment gives empirical and valid predictions regarding the effectiveness of the three strategies with regard to the achievement of the instructional objectives and their suitability for the students belonging to different levels of intelligence.

However, to be specific the experiment has proved that there was no significant difference between strategy one (S_1) and strategy three (S_3); as well as between strategy one (S_1) and strategy three (S_3); and that only strategy one (S_1)

significantly differed from strategy two (S_2) in its effectiveness, only in case of learning unit one (U_1) on 'proteins' and not in case of other two units viz. unit two (U_2) on 'carbohydrates' and unit three (U_3) on 'fats'. Even a close look, at the mean scores of the three strategies (Table 8 in Chapter VI) reveals that all the three strategies are more or less equally effective in terms of achievement of the instructional objectives.

In situations where a single teacher has to manage teaching the same subject to different divisions of the same class, the above findings provide sufficient scope for choosing any instructional strategy for any instructional system, keeping in view the interest of the teacher. Monotony in the teaching method, on part of the teachers thus can be curtailed; making the process of teaching more effective.

The above findings concerning the equivalence in the effectiveness of the three strategies each formed of different components; makes investigator believe that if enough pains are taken to provide similar learning environment through careful combination of suitable components to form each strategy, keeping in view the maximum participation of the learner. The strategies with different components may also prove to be equally effective. Researchers may find scope for intensive research in this area with improved designs and more sophisticated statistical techniques.

SUGGESTIONS FOR FURTHER RESEARCH

Based on the present study some suggestions for further research are made below:

1. The study may be repeated with a longer exposure of the treatment.
2. The study may be repeated with criterion tests including purely essay-type questions.
3. The study may be repeated with a larger sample.
4. The study may be repeated involving other units of nutrition.
5. The study may be repeated with the same three instructional strategies in other subject matter.

These would give more valid and generalisable findings regarding their relative effectiveness.

CONCLUSIONS

The findings of the present study reveal that learning is effective when students are taught through a strategy composed of several components. In other words the results support a view that presentation of content matter through a strategy is a key towards mastery level learning, as it maximises the fulfilment of all the functions of an instructional process. The present study however does not reach the mastery level in its totality. The factors responsible may be the language problem which might have restricted

comprehension to an extent, on part of the learners while studying independently through programmed learning material or through the taped material, or must have made notes taking a difficult task, while listening to the lectures. Another factor which might have come in the way of effective learning may be the study through library reference work. Students, even at the college level, are not at all used to doing the book reference work but were made to do the same for the sake of present experiment. In this case boredom might have played its role. However components like laboratory demonstrations, discussion were incorporated in the strategies as per the need where students were motivated to clear doubts if they had any. Infact interaction within the group and with the teacher was allowed to encourage students' participation in the learning process. In fact, after accomplishing this piece of research, the investigator feels that if the process of learning is made environment based wherein the students are allowed or made to participate maximum, rewarding results cannot be doubted. In developing country like India, where problem of nutrition is ever existing and where shortage of skilled teachers is always felt for teaching an important subject like nutrition, the strategies developed in this study, would prove to be the effective tools in the hands of educational practitioners and a blessing in disguise for the young learners, the future home makers endeavouring to acquire useful knowledge in nutrition which in turn will help to

tackle the nutritional problems from the point of view of individual, the family, the community and the nation at large. Therefore it is the need of the day that such research findings should not be shelved in university libraries but should be used in the classrooms to make its environment a healthy one, in the sense that actual findings are incorporated in the teaching practices and procedures which would ultimately lead to the development of higher cognitive and affective attributes on the part of the learners, participating in the teaching learning process to the best of their abilities. This, undoubtedly, would ensure better treatment to the instructional process at all levels of learning and precisely at the institutions of higher learning where even in the midst of the opportunities provided by the age of science and technology the teaching procedure by and large tends to be more of the conventional type leaving little scope for better interaction between the teacher and the taught. Scientific and systemic approach would therefore invariably lead to better standards in education in general and richer human life and endeavours in particular.

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