METHODOLOGY

CHAPTER - IV

METHODOLOGY

4.1 INTRODUCTION

4.1.1 Content analysis as a Research Technique.

4.2 METHODOLOGY FOR OBJECTIVE - I

4.2.1 Tools for data collection.
4.2.2 Procedure of data collection.

4.3 METHODOLOGY FOR OBJECTIVE - II

4.3.1 Criteria for evaluation.
4.3.2 Sample
4.3.3 Tools for data collection.
4.3.4 Questionnaire for teachers.
4.3.5 Questionnaire for students.
4.3.6 Interview schedule for teachers.
4.3.7 Interview schedule for students.
4.3.8 Procedure of data collection.
4.3.9 Data analysis.

4.4 METHODOLOGY FOR OBJECTIVE - III

4.4.1 Criteria for evaluation.
4.4.2 Tools for data collection.
4.4.3 Procedure of data collection.

4.5 METHODOLOGY FOR OBJECTIVE - IV

4.5.1 Sample.
4.5.2 Tools.
4.5.3 Procedure of data collection.
4.5.4 Data analysis

4.6 METHODOLOGY FOR OBJECTIVE - V

4.6.1 Criteria for evaluation.
4.6.2 Tools for data collection.
4.6.3 Procedure of data collection.

4.7 METHODOLOGY TO STUDY EXPERTS OPINION

4.7.1 Sample.
4.7.2 Tools for data collection.
4.7.3 Procedure of data collection.
4.7.4 Data analysis.

CHAPTER - IV

METHODOLOGY

4.1 INTRODUCTION

In this study second and third chapters dealt with necessary background to shape the framework for the investigation in order to develop the needed methodology in addition to NCERT's guidelines for evaluation of textbooks, mainly studies carried out during the past two decades i.e. from 1971-95 were reviewed in finalising the methodologies for five objectives of this study.

In present study content analysis has been the main technique used, hence it is necessary to provide some sort of conceptual foundation for this important technique with special reference to this investigation. Questionnaire and interview tools have also been employed for collection of data in this study.

4.2 CONTENT ANALYSIS AS A RESEARCH TECHNIQUE

Any document has 'content in it, if it can be represented by an organised set of statements. These statements may include facts, definition generalizations and principles. In an educational set up the term 'content' is well known. The content of the textbook is suppose to be the content of the curriculum. The terms 'content' can be used not only in educational field, but can also be very broadly used in other forms of human communication system. In general communication is nothing but the exchange of normally well

organised symbols between a source and a recipient of information and the well organised symbols which may be oral or written, this forms a message, and this message is nothing but the actual content. In any communication process 'content' occupies the central position. It represents the means through which people communicate with each other, so it is very essential to describe communication research with high degree of accuracy. Analyses of curricular content can be done by analysing the communications in a textbook, and this is known as 'textbook analysis' which is very important in the evaluation of textbooks. According to Kerlinger (1964) content analysis is a method of observation, instead of observing peoples' behaviour directly, asking them to respond to scales or interviewing them, the investigator takes the communication that people have produced and ask questions of the communication. According to Fox (1969) content analysis is a procedure for the categorisation of verbal or behavioural data for the purpose of classification summarization and tabulation. Krippendorff(1980) defined content analysis as a research technique for making replicable and valid inferences from data to their context. Like all other research technique the purpose of content analysis is to provide knowledge, new insights, a representation of factsx and practical guide to action Educational research can be broadly classified in to three categories, Historical Research, Descriptive Research and Experimental Research. Content analysis is a technique within the Descriptive Research. This technique is basically for a

qualitative research. This does not mean that numerical measures are never used but alongwith it other means of description may also be emphasized.

The two major dimensions to be studied in content analyses are (A) Frequency (B) Intensity.

(A) FREQUENCY : Content analysis is carried out by counting number of times particular ideals or terms are presented, e.g. in Social Studies, textbook emphasis on 'democracy' can be measured by counting the number of times the terms 'democracy' and democratic are used. In case of mathematics text book it may be in other way by counting the number of times terms used.

(B) INTENSITY : It indicates the effective emphasis given to a particular aspects of communication, e.g. in the content analysis of newspaper, the size of the headline devoted to a particular topic or the number of words devoted to it or the number of effectively loaded words can be ascertained. In some analysis, depending on its nature, in addition to frequency measures and percentage terms like 'more' 'always' 'excess' 'increase' 'often' 'some what' 'positive' 'negative' can be used for coding the analysed observations. Through content analysis, one can find out the ratio between different types of words, compared style with specified criteria. Through the analyses it is possible to bring together terms under theoratically relevant categories and

variables and content analysis observations can also be analysed and interpreted using a serious inspection or concentrated attention.

Content analysis can be done at two levels, (a) Manifest level and (b) latent level. At manifest level content analysis of what the respondent said strictly bound by the response with nothing added to that or with nothing assumed about it, it is simply a direct trancription of the response in terms of some code. At latent level it is exactly contrast to the first one. At latent level researcher attempts to code the meaning of the response or the underlying dynamica motivating the behaviour described at this level, the researcher has to go beyond the transcription of what was said directly and secks to infer what was implied or meant. At manifest level, content analysis is more reliable and valid (Fox-1964) whereas at latent level one cannot be always sure.

In this study content analysis has been carried out at manifest as well as content level by keeping in mind certain sets of criteria for each objective. This criteria were developed based on the information available from previous works which were referred to in earlier chapters. Moreover the investigator's background and several years of experience in teaching mathematics at primary level by making use of different textbooks published in Gujarat was also useful in concretising certain criteria for the analysis at manifest

level as well as in carrying out the analysis at latent level.

4.2 METHODOLOGY FOR OBJECTIVE – I

To study academic aspects of the textbook with respect to :

1. Content
2. Organisation
3. Presentation
4. Language
5. Illustration.

The content of the textbooks under study was analysed to find out different treatments in different chapter. The investigator developed two different questionnaires for collecting opinion of students and teachers. A part from this different categories of inadequancies which were not covered by other tools of the study have been taken as evaluation criteria those were as follows :

1. Deficiency of the contents.
2. Defects in exercises.
3. Defects in illustration.
4. Content seems unnecessary.
5. Content seems difficult for pupils.
6. Terms used have not been explained.
7. Discontinuity in content organisation.
8. Ambiguous statements or concepts.

4.2.1 TOOLS FOR DATA COLLECTION

The main tool used for collection of data for objective-I was content analysis sheet and main sources of data were the complete textbooks, content analysis tool was used by Satyabrata (1986) and Rao (1993) for evaluative study of the textbooks. Investigator too felt content analysis sheet to be a better tool for collection of data for objective no.1. The content analysis sheet was developed by the investigator by keeping in mind the objectives and criteria set for the evaluation. Initially to determine the suitability of the developed tool the completed content analysis sheet was examined by the guide highly experienced teachers of Mathematics and few mathematics teachers of the university. In the beginning these were many columns in the content analysis sheet but later they were altered and modified according to the needs based on the experience gained during the process of initial content analysis and the discussions with the experts. In some cases certain criterias were to be added, cancelled or modified and accordingly changes were made in the rows and columns of the content analysis sheet. After altering and modifying the items, at last there were eight items left in the sheet. This content analysis sheet were compared with those suggested by NCERT and other researchers Satyabrata (1986) and Rao (1993) at M.S. University, Baroda. After finding the content analysis sheet satisfactory it was used for data collection.

4.2.2 PROCEDURE OF DATA COLLECTION

The main source of data were complete mathematics textbooks for standard V, VI, and VII published by Gujarat State Board of School Textbooks. The investigator herself went through the books several times page by page. While going through the textbook the necessary evidences were recorded simentaneously chapter-wise in the content analysis sheet.

4.3 METHODOLOGY FOR OBJECTIVE – II

To study the physical aspects of the textbooks with respect to :

(a) Typographic complexity

(b) Design

(c) Attraction

(d) Nature of material used.

(e) Size.

4.3.1 CRITERIA FOR EVALUATION

The set was mainly based on the standards specified by NCERT (1987) in their publication. "A study of the Evaluation of the textbook, these standards alongwith certain important information available from the articles and studies referred to in the preceding chapters of this study were interpreted and modified mainly based on the technical assistance obtained from an expert in printing technology.

Major criteria used in evaluating the physical aspects of the mathematics textbooks for standard V, VI and VII are as follows :

1) Standard type size for chapter number, lower capital 18 pointshold (1"=72 point 6 empucas 6 lines = 12 point, Pica is a printer's unit or the size of type) for Chapter Headings 12 point hold for sub section headings, 10 point hold for actual text, 10 point light for solved examples, 8 point for additional information, foot notes, end-of-chapters exercises etc.
2) Type face : Roman type face, but for matters printed with 8 point type size.
3) Size of textbook : Double crown 8 VO (or approximately 7.0" X 9.5" trimmed size).
4) Print area : approximately 34 Cms X 46 Cms.
5) Interline spacing 2 point.
6) Margins : Top 6 cms, bottom 7 cms, gutter 5 cms and fore edge 6 cms.
7) Paper for text : White, super calender (S.C) in 70 grams per square meter. Cover page pulp board of 250 grams per square metre.
8) Ink and colour for printing : Uniform use of ink, mainly black and other attractive colours, wherever necesary.
9) Strengthening of textual message using italics for important new terms using underlinings, boxes, circles, colours etc. for important formulac, theories laws,

thrilling facts etc. to produce isolation effects for better retention.

10) Attraction : Lamination and attractive coloured Photographs, pictures for cover pages, use of different colurs in the presentation of textual material with coloured photographs, diagrams etc. where needed.

11) Convenient bulk of textbook : On an average 1228-208 pages.

12) Binding : Section sewn with thread, cover creased and end paper pasted with full cloth on the spine and flush.

4.3.2 **SAMPLE**

There are 430 English medium primary schools in 19 districts of Gujarat State. There were 450 mathematics teachers engaged in teaching mathematics in class V, VI and VII. In some of the schools there were two teachers teaching in above three classes whereas in some schools there were three or four different teachers in different classes. Out of these 450 teachers 220 teachers were selected randomly as respondent. The expected number of teachers were 220 but the actual number of teachers who responded were 200 in all.

A purposive sample of 100 students of each class i.e. V-100, VI-100 and VII 100 (for each book) were chosen for obtaining students opinion about their respective mathematics textbook. These 300 students consisted of the bright students (girls and boys) whose achievement score in mathematics was more than 70%. They were from different districts of Gujarat.

4.3.3 TOOLS

1. A questionnaire for teachers.
2. A questionnaire for students.
3. The interview schedule for teachers
   (Semi structured interview)
4. The interview schedule for students.
   (Semi structured interview)

The tools mentioned above were employed to collect opinion on various aspects of the mathematics textbooks of standardV, VI, and VII of Gujarat State. The set was mainly based on the standards specified by NCERT (1987) in their publication. "A study of the Evaluation of Textbooks"/ and studies referred to in the preceding chapters of this study.

The main emphasis and rationale behind the present study have been to ascertain whether these textbooks are effective tools of learning mathematics in schools, where students and mathematics teachers are directly concerned with them. The main clientale of these textbooks are the students and teachers. Therefore they could give their valuable judgement for evaluating and suggestions for further improvement of the books. Keeping this in the mind tools were developed.

4.3.4 QUESTIONNAIRE FOR TEACHERS

A thorough search for the related literature in this area showed that there were several similar questionnaires

for realizing the similar objectives. Out of those the questionnaires developed by the National Council of Educational Research and Training (NCERT) and Research Training Centre. Ahmedabad cover the maximum criteria related to Mathematics textbooks. With careful examination of those criteria alongwith the criteria selec ted by the investigator for Mathematics textbooks a new questionnaire was developed for the teachers by the investigator. The questionnaire was mainly based on the NCERT questionnaire and questionnaire of Research Training Centre, Ahmedabad. In the beginning i.e. in the first draft of questionnaire there were fifty two items covering different aspects of the textbook. the tool drafted was sent to different individuals related to mathematics in one way or other, to mathematics teachers at school level, mathematics teachers at university level, subject experts and some of the researchers in order to obtain their views regarding the questionnaire - whether the questionnaire covered all aspects regarding evaluation of mathematics textbooks. - whether the items were clear correct and easy to follow.

- Whether items in the questionnaire were adequate or inadequate and about the mode of responses.

The experts to which the proposed questionnaire were sent was as follows :

SR. NO.	CATEGORIES OF PERSONNEL	NO. OF EXPERTS
1.	Individuals related to Mathematics	04
2.	Teachers having mathematics background.	05
3.	University teachers	05
4.	Research workers	02
5.	Language specialist	01
	Total	17

The opinion of the above experts were collected through their responses about the various items in the questionnaire. From the fifty two items in the questionnaire some of them were modified i.e. two questions were combined to one, some which were found repeated were removed and new questions were added. The refined questionnaire comprised of forty five items covering different aspects of the textbook planning of the textbook (4) Presentation of the content (7) Selection of the content (9) use of teaching learning aids (9) physical aspects of textbooks (4) Exercises in the textbook (4) other relevant information (miscelleneous items (7) and one was for suggestions by parents.

(II) It was finalised and used as a tool to evaluate the mathematics textbooks of standardV, VI and VII published by Gujarat State Board of School textbooks.

These forty five items were designed in such a way that it gave the quantitative and qualitative assesment of the textbooks in terms of strong and weak points. To measure this two point scale was adopted i.e. 'Yes' or 'No'. This questionnaire included some items consisted of open ended questions expecting noteworthy suggestions, comments and indication of errors in the content. Beside this an information sheet for knowing the background and general information of the respondent teacher was attached to the questionnaire. (Appendix - A)

4.3.5 **QUESTIONNAIRE FOR STUDENTS**

The tool mentioned above was employed to collect opinion on various aspects of the mathematics textbooks under study. The set was mainly based on the standards spe ified by NCERT (1987) and studies referred to in the preceding chapters. In the first draft of questionnaire for students there were twenty seven items covering different aspects of textbooks. The tool drafted was sent to different individuals related to mathematics one way or other, to mathematics teachers at school level, mathematics teachers at university level subject experts and some of the researches in order to obtain their view regarding the questionnaire. The final draft of the questionnaire comprised of twenty items. There were questions about the different aspects- the physical aspect (5) Academic aspect (7) The exercises given at the end of the chapter (4) other relevant information (4). It was

used as a tool for collecting data. These twenty items were designed in such a way that it gave the quantitative and qualitative assesment of the textbooks. to measure this two point scale was adopted i.e. 'Yes" or 'No"(Appendix-B).

4.3.6 INTERVIEW SCHEDULE FOR TEACHERS

The interview schedule was unstructured in the beginning but finally it took structured shape after discussion between the interviewer and the subject. The various aspects of the existing mathematics textbooks of standard V, VI, and VII were discussed with the teachers. Thus the interview schedule developed consisting of twenty items in the questionnaire for mathematics teachers. These items covered various aspects of the textbooks and school system such as (1) Syllabus (2) Curriculum (3) Price of the textbook (4) Textbook distribution system (5) Problems faced by them in teaching. The questions asked were very similar and linked to the questions in the questionnaire for teachers but they were asked slightly in dept. The content validity of this tool was established through experts' opinion. Appendix-C.

4.3.7 INTERVIEW SCHEDULE FOR STUDENTS

The various aspecvts of the existing mathematics textbooks of standard V, VI, and VII were discussed with the students. The interview schedule was unstructured in the beginning but finally it took structured shape after discussion between the interviewer and the subjects. The

questions asked covered the various aspects of the textbooks and teaching system in the schools. The questions asked were more or less similar to those in the questionnaire but they were in depth. The content validity of this tool was established through experts' opinion. Bright students whose achievement score in mathematics was more than 70% were interviewed for knowing their views about the mathematics textbooks in use from standard V, VI and VII. The information collected was recorded by the investigator (Appendix - D).

4.3.8 PROCEDURE OF DATA COLLECTION

A) All the packets containing the questionnaire for teachers and other enclosures (covering letter and self addressed envelope for reply) were addressed to the principals and dispatched under certificate of posting in the case of the schools in Gujarat away from Baroda as it was difficult to contact them personally. In the case of the schools in Gujarat which were in Baroda and near by Baroda, investigator personally contacted the principals and mathematics teachers. The questionnaires were distributed personally in these schools and data was collected. Out of 220 mathematics teachers of primary schools (English Medium) in Gujarat. Only 200 teachers responded after a few weeks. The questionnaires which were not received, in each case one more reminder was send. In some cases investigator visited personally after taking appointments on telephone. In some cases questionnaires were collected after making several telephone calls.

B) All the packets containing the questionnaire for students and other enclosures (covering letter and self addressed envelope for reply) were addressed to the principals and dispatched under 'certificate of posting' in the schools which were away from Baroda as it was difficult to contact them personally. In the case of the schools which were near by Baroda district the investigator personally contacted the students of standard V, VI and VII. Looking to the maturity of the students of standard V, VI, and VII, only standard VII were given the questionnaires and were asked to fill on their own whereas standard V, and VI students in their case the questions from the questionnaire were asked and with the help of mathematics teachers questionnaires were filled. 100 students of each class responded to the questionnaire. In some cases investigator sent reminder and then after taking appointments on telephone questionnaires were collected.

4.3.9 **DATA ANALYSIS**

A) First of all the information given about the students and teachers in the beginning of the questionnaire were examined and classified accordingly. The data available from teachers quesgtionnaire and students questionnaire of standard V, VI and VII was analysed by counting the talleys and hence the frequences for 'Yes" favourable

and 'NO" unfavourable and average rating scores were calculated for each item in both the questionnaires separately by rating 1, -1 and 0 respectively. In the case of teachers questionnaire in the certain item the code 'Y" (yes) represented unfavourable (Negative) and 'N" represented favourable (positive) responses. Similarly in students questionnaire for certain item the code 'Y' (yes) represented unfavourable (negative) and 'N' represented favourable (positive) responses.

B) Criteria for interpretation/Evaluation.

1) The value of average rating scores within the range of 0 to -1.00 were considered unfavourable for the different aspects of the textbooks.

2) The values of average rating scores within the range of .01 to 1.00 considered as favourable for the different aspects of the textbooks.

3) The values of the unattempted was put as Nil or '0' Based on the above criteria interpretation were made for each item as well as for group under the five different aspects of the textbooks i.e. regarding physical aspects, academic aspects language aspects end-of-chapter exercises and over all suitability of the textbooks.

4.4 METHODOLOGY FOR OBJECTIVE - III

To evaluate exercise at the end-of each chapter.

Analysis of end of the chapter exercises look like

Analysis of end of the chapter exercises look like mainly the solving of mathematical problems or deciding the expected outcome to other questions. But in this study the investigator made an attempt to go beyond that by trying to make use of content analysis as a teachnique for analysis of exercises at manifest as well as latent level.

As discussed before the major reference for analysis of end-of-chapters exercises should be the taxonomy of educational objectives developed by Bloom at el(1956) This texonomy is expected to shape the structure and nature for end-of-chapter exercises.

4.4.1 CRITERIA FOR EVALUATION

The set was mainly based on the standards specified by NCERT (1987) in their publication "A study of the Evaluation of the textbooks", Satyabrata (1986) and Rao (1993) also made the use of analysis sheet based on Bloom et al taxonomies (1956). Investigator too felt that content analysis sheet was more convenient and proper so investigator used this criteria. The end-of-chapter exercises in the three textbooks should satisfy following criteria.

1. End-of-Chapter exercises must help the learners in self evaluation in terms of reviewing and recapitulating all the main textual matter in the chapters and they should be directly and indirectly related to the content in its chapter or previous chapters.

2. The exercises should be structered based on different types by focussing the nature and structure of mathematics. There should be activity oritnted questions. There should be various forms of questions - problems, true/false, matching, multiple choice etc. depending on the nature of the instructional objectives to be tested.

3. The given exercises should test knowledge comprehension application and other higher objectives (Bloom et al 1956) If problems need 'recall' and recognition of the content such as facts, terminology, symbols, classification, theories, laws structures etc. Such questions were considered as, at knowledge level, if they require mental operations such as 'seek relationship, cit examples, discriminate etc. Such questions problems were considered as at comprehension level, if they need operations like 'reason, hypothesize predict analyses, synthesize, evaluate etc. Such questions problems were considered at application level. The above three major levels are hierarchical in nature.

4. Exercise should be in simple precise and unambiguous language and all new terms used should be well explained.

5. Exercise should provide sufficient data and expected answers should be given to all of them at the end of the textbook (in post text pages).

6. Exercises should be presented in a graded form in starting from simple to complex as far as possible and at the same time they are expected to reflect the development of the content of the chapter.

4.4.2 TOOLS

Based on the above criteria analysis sheet was framed in a tabular form. The three level classification of cognitive objectives has been developed by NCERT based on that the investigator also used it in the present study. They were classified as per cognitive level of educational objectives in three categories i.e. knowledge, comprehension and application.

4.4.3 PROCEDURE

The exercises at the end of each chapter were studied carefully by the investigator and they were classified as per cognitive level of educational objectives in three categories i.e. knowledge, comprehension and application. Moreover the subject being mathematics there were no essay type questions. The questions were short in nature. Questions were classified on the basis of Bloomet a/ as follows :

KNOWLEDGE : Exmples depending on recalls and recognises the contents.

COMPREHENSION : Examples which requiremental operation like discriminates, classifies , varifies, interprets, seek relationship and generalises.

APPLICATION : Application of the concepts to solve the problems in new situation.

Wherever there was any confusion the investigator decided the proper category with the help of the guide and other experts in the field of eveluation beside this investigator has gone through each and every example at the end of each chapter. The investigator varified and analysed different irrelevancies like examples not clear, printing mistakes etc.

4.5 METHODOLOGY FOR OBJECTIVE IV

To study the students and teachers opinion regarding the suitability of mathematics textbook under study.

All the schools taken for study were from the state of Gujarat and using mathematics textbooks prescribed by Gujarat State Board of school textbooks. There were 430 English medium primary schools in 19 districts of Gujarat and 450 Mathematics teachers were engaged in teaching mathematics in primary classes.

4.5.1 SAMPLE

Regarding the schools chosen for the sample out of 430 primary English Medium schools there were schools from Baroda, Anand, Nadiad, Mehsana, Ahmedabad, Khaira, Rajkot, Surrendranagar, Porbandar, Jamnagar, Junagadh, Bhavnagar, Valsad, Surat, Broach, Amreli by and large they were in urban areas and most of them were co-educational schools. There

were few convent schools which were only girls schools or boys' schools. There were sutdents from cross section of different regions of the country. Out of 450 mathematics teachers teaching in primary schools 220 teachers were selected randomly as respondent of the questionnaire. In most of the schools it was found that there were two mathematics teachers for 3 classes and in some schools there were 3 to 4 teachers in three clases (different teachers in different divisions) some of the additional copies were also sent to the school principals.

A purposive sample of 100 students of each class i.e. V-100, VI-100 and VII-100 (for each book) were chosen for obtaining students opinion about their respective mathematics textbook. These 300 students consisted of the bright students (girls and boys) whose achievement score in mathematics was more than 70%. All these students belong to different districts of Gujarat.

4.5.2 TOOLS

Tools used were same as tools used for objective-II of the study.

4.5.3 PROCEDURE OF DATA COLLECTION

Procedure of data collection was as same as for objective-II of this study.

4.5.4 DATA ANALYSIS

Data analysed was also same as for objective-II of this study.

4.6 METHODOLOGY FOR OBJECTIVE – V

To asses the textboks on basis of the prescribed syllabus of Gujarat State with respect to

a) Listing the contents and their logical sequences.

b) Introduction to each chapter.

c) Inadequacy of content.

d) Illustrations.

e) Printing mistake in the illustrations and exercises.

The mathematics textbooks under study were published in 1989 (V and VI) and 1990 (VII) the investigator made the syllabus available from the office of Gujarat State Board of School textbooks. These syllabus were printed before the textbooks were purlished. Since then there is no change in the syllabus for this objective the investigator first made a study of the prescribed syllabus of Gujarat State for mathematics textbooks for standard V, VI and VII and then all the copies of mathematics syllabus were analysed to relate them to the present mathematics textbooks under study.

4.6.1 CRITERIA FOR EVALUATION

The set was mainly based on the standards specified by NCERT (1987)_ in their publication "A study of Evoluation of the Textbook". These standards alongwith certain important

information available from the articles and studies referred to in the preceding chapters were intrepreted and slightly modified.

1. The content of the textbook should be systematic eleboration of the content of the prescribed syllabus.
2. The textbook should not repeat the contents from the preceding classes but systematically enable the learner to recall and integrate the major concepts learnt earlier.
3. The textbook should cover all the units, chapters, sections and sub section (topics) given in the syllabus.
4. The textbooks should reflect proper delineation of the prescribed syllabus in accordance with the mental maturity of the learners.
5. There should be proper co-ordination in the content presentation in mathematics in the textbooks of preceding and succeding classes.
6. Textbooks must provide a visual image of an idea pertaining to the text.
7. The text book should help the users of the book to develop imagination by giving more information.
8. The text book should motivate the users by providing attractive and interesting examples.
9. The textbook should help the teaching and learning process.
10. The textbook must present a clear picture of the unfamiliar examples or figures which are abstract.

4.6.2 TOOLS FOR DATA COLLECTION

A thorough search for the related literature in this area showed that there were several similar questionnaires content analyses sheet for realizing the similar objective. the content analyses sheet developed by Satyabrata (1986) and Rao (1993) was suppose to be very convenient for this type of objective.

In the first phase the content analyses sheet was framed in a tabular form. There were twenty columns. this content analyses sheet was given to five mathematics experts. After getting the suggestions the rows and columns were altered and modified according to the needs based on the discussion with experts.

In the second phase the content analysis sheet was framed in a tabular form. The rows and colums were altered. This content analyses sheet was compared with that suggested by NCERT, Satyabrata (1986) Rao (1993) Appendix-E).

4.6.3 PROCEDURE FOR DATA COLLECTION

The main source of data were complete mathematics textbooks for standard V, VI and VII published by Gujarat State Board of School textbooks. The investigator herself went through the textbooks the necessary evidence has been recorded simultaneously chapterwise in the content analyses sheet. The investigator while going through the book observed whether the textbook fulfilled the requirement of the content as laid down by prescribed syllabus.

4.7 METHODOLOGY TO STUDY EXPERTS OPINION

This was not the objective of the study but in order to analyse content of the book there arose a need to study experts' opinion regarding mathematics textbooks of standard V, VI and VII. The textbook under study were for standard V, VI and VII in the State of Gujarat (English Medium) where the syllabus is quite high nowadays, compared to those of decade ago, at time one would notice that whatever was taught in standard VII Seven - eight years ago appear now in VI and VII mathematics textbooks, perhaps this is bound to be trend in all countries, as the amount of knowledge in mathematics is increasing in high proportions everytime thourgh the research and development activities through out the world. So it was decided that opinion of some experts who are very much active in teaching as well as research activities especially in mathematics at school should be consulted.

4.7.1 SAMPLE

The sample of five experts consisted of three university teachers, one school teacher and one textbook expert working with research centre-Ahmedabad an active research worker was chosen because of doctoral research work in textbooks. The inestigator also consulted at least one author and reviewer of the each textbook under study.

4.7.2 TOOLS

A draft consisting of twenty questions was constructed in the first phase. All these questions were directly or

indirectly based on the objectives of the study to enable the investigator to compared the results of content analysis. Later on some of the questions were delated some modified and a final draft of ten questions was constructed.

Most of the items of opinionnaire were linked with the items of the questionnaires for teachers and students. All the questions in the opinionnaire were non restricted open response type. In this tool the respondents were personally requested to state any other specific comments not covered by ten questions. This was done in informal way. While interviewing (informal discussion) the experts the investigator concentrated more on academic and physical aspects of the textbooks.

4.7.3 PROCEDURE OF DATA COLLECTION

First of all the chosen experts were contacted by the investigator to get their consent to respond to the opinionnaire. Though all the chosed experts were busy people some how they agreed to co-operate with the acedemic professional spirit. They were supplied with opinionaire attached with sheets of paper for written responses and some of them those who did not have copies of the textbooks were supplied with the same.

As and when the written responses were ready, depending on the date and time of appointment available with the experts, somewhat informal but academically related responses

were collected. The investigator could collect a lot of information regarding the mathematics textbooks under study.

4.7.4 DATA ANALYSIS

The data analysis were done questionwise and presented in the statement form in chapter V of this study. Among the large number of detailed responses made by the experts during the interviews the important and relevant responses were classified in to two categories i.e. positive aspects and inadequaces of the mathematics textbooks of standard V, VI and VII accordingly and have been presented in chapter V.