



**THE ASSESSMENT OF INSTRUCTIONAL OBJECTIVES
IN SECONDARY EXAMINATIONS**

**AN ANALYSIS OF QUESTION PAPERS OF
THE KARNATAKA SECONDARY EDUCATION AND EXAMINATION BOARD**

ANNEXURES

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INTRODUCTION

Background and Statement of the Problem:

The Government has made substantial efforts to widen access, ensure enrolment and improve attendance in schools in its quest to achieve U.E.E. However, its efforts to improve the quality of education have significantly lagged behind. This is evident not only from the poor achievement levels of students, but also from the poor quality of learning taking place in schools. Learning is neither all encompassive nor does it facilitate the all round development of the child's personality (MHRD 1993; Dave 1969; Y.Aggarwal 2000; Sinha 2003). In fact, the primary function of education is to develop the cognitive, affective and psychomotor domains of the students' personal growth. As outlined in the National Curriculum Framework 2000, "School curriculum has to aim at enabling learners to acquire knowledge, develop understanding and inculcate skills, positive attitudes, values and habits conducive to the all round development of their personality" (NCERT 2000).

In our country, however, schools have by and large, stressed only on the development of scholastic traits i.e., the acquisition of cognitive skills and knowledge. The evaluation system too has focused only on cognitive outcomes, while ignoring the non-cognitive aspects of the personality. At the secondary stage of education, which is critical in a student's career path, the assessment is largely summative and the board examination focuses on the attainment of competence only in the scholastic areas.

While one of the basic purposes of the secondary examinations is to help in finding out whether the preset educational objectives outlined in the syllabus had been attained by the students and if so to what extent (Srivastava 1999), a number of research studies in the past 30 years have painted a different scenario. According to them, a major shortcoming is that, within the cognitive domain, exams have mainly tested the recall of memorized information, largely overlooking the assessment of higher order objectives such as understanding and application, with associated competencies such as reasoning, analysis and critical thinking (Srivastava 1979; Dave 1969 ; MHRD 1933 ; NCERT 1999). This flaw of our examination system is noted even in the National Curriculum Framework 2000, which states that "The first and foremost shortcoming of the evaluation system is it focuses only on cognitive learning outcomes even in cognitive areas, it

lays too much emphasis on memorization and little on abilities and skills that require higher mental operations like problem solving, creative thinking, summarizing, inferring, arguing etc." (NCERT, 2000).

The resultant effects of an examination system which demands the recall of memorized information ignoring higher order skills have now become quite evident:

- (i) Learning is stunted and ceases to be encompassive, as the higher order aims and objectives of education such as understanding and application are neglected. The over emphasis on memorization adversely affects the overall cognitive development of children (Dave 1969). The Yashpal Committee Report elucidates how a child may pass almost any exam by merely memorizing information, and without having understood any concept so that "while much is taught, very little is actually learnt and understood" (MHRD 1993).
- (ii) Such an examination system would consequently influence learning for tests and exams taken in earlier classes which would in turn negatively impact the teaching - learning processes in the classrooms, leading to a low quality of learning in schools. Conversely, reforms in the examination system have the potential to lead to reforms in the teaching - learning process.
- (iii) The examinations tend to induce inordinate levels of stress and anxiety among children. As exams demand vast amounts of information to be retrieved at instant recall, the syllabi and textbooks are necessarily loaded with large amounts of facts and information that all children should know and learn by heart. Thus, all the knowledge in the text book is turned into a load to be borne by the child's memory (MHRD 1993).
- (iv) An assessment system of this type is producing educated youth whose cognitive abilities are limited and who are thus unsuitable to the requirements of the modern day knowledge economy of the 21st century, with its need for innovative problem solvers (Report, Focus Group on Exam Reforms 2005).

Reforms in the area of assessment and examination system must therefore be initiated so that these can have a salutary cascading effect on the teaching - learning process as a whole. This would go a long way in improving the quality of learning in schools and in producing well educated manpower possessing higher order cognitive skills, relevant for the present day requirements.

Due to the gravity of the issue and reasons cited above, it has become pertinent to take a deeper look into these lacunae of the public examination system. This can be achieved by

- (i) taking a brief look at the historical back-ground of this phenomenon, to understand as to how it came about; and
- (ii) estimating the nature and extent of this problem through empirical research.

Historical Roots and a Review of Research in the area:

Modern education came to India with the advent of the British, but knowledge was restricted to the upper castes and classes. The traditional view held that school education during the colonial era, was structured to produce middle level clerical and administrative personnel and hence the curriculum stressed on language, accounting skills and general knowledge, as against the learning of science which was largely ignored. The questioning attitude was discouraged and the teachers' words were all important (Holsinger and Cowell 2000; Report, Focus Group on Examination Reforms 2005). The colonial system of education brought in the textbook centered curriculum where the prescribed textbook became the central focus of the teacher and the students, the latter being asked to copy and memorize facts from it. Hence, the skill of reproducing the text from memory was emphasized and this became a pre-requisite for passing the examinations (Kumar 2005b). Kumar also elucidates in the 'Political Agenda of Education', how the fear of failure in the examinations and the stress and how the anxiety it produced was part of the lore of childhood and adolescence at that time and the surest way to avoid tragedy of failure was to memorize relevant chapters of the prescribed textbook (Kumar 2005b). In that context, the development of higher order skills was regarded as superfluous and inappropriate.

Thus, the stress on testing memorized facts in examinations is a product of the colonial era which is perpetuated even today, even after more than five decades of independence. This system becomes inappropriate in today's context and requires urgent reforms.

Having gained an insight into the roots of this major problem that has beset our examination system, it would also be worthwhile to get an overview of the findings of the major research works already conducted in this field.

The problem of testing mainly recall of information, in public examinations, is a long standing one and attempts towards reforming exams from this perspective had been initiated since

1964. The Kothari Commission in 1964 recommended that question papers had to be oriented to higher order objectives and place less emphasis on memorization.

R.H.Dave, in 1969, elaborated on the need for objective - based testing in different curricular areas, to overcome this problem. He found that a critical analysis of hundreds of question papers of school and public exams revealed that more than 90% of the questions were just information questions. He stressed on making a conscious effort to keep instructional objectives in mind as the basis for constructing items (questions) in different forms and subjects (Dave 1969).

H.S. Srivastava, in 1979, elucidated the measures that would help to improve the validity of question papers which were to test the examinees for the attainment of preset instructional objectives, rather than only for rote memorization of facts. The steps involved in setting such question papers included (i) identification and definition of instructional objectives for the subject in question; (ii) giving proportionate weightage (marks) to each of these objectives for framing questions that would test attainment of these objectives; and (iii) framing questions that would test the abilities associated with these particular objectives (Srivastava, 1979).

In 1991, the National Advisory Committee was appointed by the MHRD to advise on improving the quality of learning, while reducing the burden on school children. Its report entitled 'Learning Without Burden' was presented in 1993 by Prof. Yashpal, which analyzed the problem and came up with recommendations. Its central theme was that the major flaw of our system of education is one of non-comprehension by the students. The burden placed by the curriculum and textbooks results in 'a lot being taught, but little being learnt or understood'. The examination system is memory based one focusing only on the child's ability to recall facts from prescribed textbooks. Observation and exploration are discouraged; syllabus and textbooks are packed with facts and information that burdens the child, making learning with understanding impossible. The teacher's role too is mainly to cover the content of the textbook, so that what is taught in the class-room is totally removed from the child's real life experience and learning becomes 'burdensome and ritualistic' (MHRD 1993).

In order to overcome the problem of load on school children, the Committee made a series of recommendations, chief among them being (i) involvement of large number of teachers in the process of curricular framing and textbook preparation; (ii) treating text books as school property, so that the children are not faced with the burden of carrying heavy bags; (iii) changing the nature of homework to be made more non-textual; (iv) changing the norm of teacher - pupil ratio from

1 : 40 to 1 : 30; and (v) most importantly, re-designing public exams taken at the end of Class 10 and 12, so that questions test not just memory and information, but the understanding and application of concepts (MHRD 1993).

More recently, the NCERT undertook an analysis of Question Papers of Class XII Boards Examinations of the year 1999 in the States of Himachal Pradesh, Maharashtra, Tripura and Tamil Nadu. The main objective of this study was to assess the strength and weaknesses of the question papers, so as to improve the quality of assessment in public exams. The major conclusions of the analysis were that in all the core subjects, it was mainly knowledge based questions testing simple recall of information which were asked. Questions testing the understanding and application objectives were relatively few. In the *Physics*, in the question papers of the Tamil Nadu and Maharashtra Board, almost nil % application based questions were asked as against the recommended 20% reserved to test this objective. In the *Maths* question paper of Himachal Pradesh Board, questions testing higher order application objectives were worth only 12% marks and were hence inadequate. The analysis of the *Biology* question papers of Maharashtra Board revealed that questions assessing the lower level knowledge objective was predominant constituting almost 30% marks in the paper and the higher order objectives of understanding and application were consequently under estimated. The analysis of papers of Tripura and Tamil Nadu Boards also revealed that questions testing the application objective carried a mere 5% marks and had to be increased if the question papers were to be balanced (NCERT 1999).

As a part of the endeavour to formulate a revised National Curriculum Framework, the National Focus Group on Examination Reforms presented a position paper in March 2005 which examines the major shortcomings of the public examinations in our country. It refers to a detailed study of Question Papers of the recent 10th and 12th grade Board Exams. Several serious lacunae have been discovered in them by the Committee. Chief amongst these were that they were designed to test detailed knowledge of the textbook, rather than the broad curricular objectives of the cognitive domain and that the questions required inordinately lengthy answers allowing little time for the thinking process. The conclusions reached by the Focus Group after the analysis were (i) the cause of the poor quality question papers set by paper setters requiring only mechanical rote learning from textbooks appears to lie in the strict secretive conditions in which they are set and

paper setting required drastic reform and setting Multiple Choice Questions could go a long way in testing the conceptual understanding of students; and (ii) the paper setters seemed unaware of the role of exams in evaluating the attainment of competencies and objectives and it appeared that they wanted to test merely factual knowledge possessed by students.

Some of the key recommendations of the Focus Group on Exam Reforms are: (i) the 10th Grade Board Exams should be made optional forthwith; (ii) the examiners should be paid better; (iii) paper setting needs drastic reforms, so that focus should shift to question setting rather than paper setting; (iv) the skills of analyzing and evaluating information can be tested through well designed MCQs, instead of the short answer questions, which mainly test recall and the skill of presenting findings in the form of an argument can be best done through Essay responses in Social Sciences; and (v) the system of internal assessment should go hand in hand with the external examination (Report, Focus Group on Examination Reforms, 2005).

The above account summarizes the findings of research studies undertaken so far which have all reached a similar conclusion that the basic flaw of public examination system in India is that they continue to test recall of textual knowledge instead of attempting to achieve higher order objectives and competencies.

The relevance and significance of this issue in the present context has ignited the interest of the Azim Premji Foundation to work towards reforms in the area of assessment. As part of this interest, it proposed to conduct research on secondary examinations in Karnataka, from the perspective of the assessment of instructional objectives. This research is unique in that (i) no such study has been conducted in this State so far; and (ii) It attempts to quantifiably evaluate the extent to which the different instructional objectives outlined in the syllabus are being assessed in the secondary examinations in Karnataka.

Objective of the Study:

The research entitled '*The Assessment of Instructional Objectives in Secondary Examinations*' is being attempted through an analysis of the past 3 years' question papers of the KSEEB.

The main objective of this research project is to find out if the secondary examinations in Karnataka truly assess all the important instructional objectives and desired competencies outlined

in the syllabus or whether they only judge the child's capacity to memorize facts. Further, the research also attempts to elicit as to what extent these (instructional objectives) are actually being assessed.

More specifically, this objective is broken down into the following tasks:

- (i) To examine the general aims and objectives of secondary education outlined in the NPE and National Curriculum Framework, and the subject specific instructional objectives and competencies outlined in the syllabus of the State Board;
- (ii) To identify the weightages (percentage of marks) allotted to these objectives in the design prepared by the Board, which reflect the proportion in which these objectives are to be assessed;
- (iii) To estimate the extent to which the objectives have actually been assessed and thereby to gauge the extent to which these comply with the weightages stipulated in the design;
- (iv) To analyse the questions along other important parameters such as language clarity, appropriateness of marks allotted, content validity etc; and
- (v) To elicit suggestions from the experts, undertaking the analysis of the question papers, on how the questions can be reframed so that higher order skills and objectives can be assessed.

The expected outcomes of such a research study are (i) estimating the relative weightage assigned to the different instructional objectives in the question papers viz-a-viz that stipulated in the design; (ii) listing out the suggestions of the experts for improving the quality of test items of the papers; and (iii) potentially prompting policy changes and supplementing the on-going efforts in the area of assessment reforms in Karnataka State.

Conceptual and Theoretical Perspective:

The preceding sections clearly elucidate the fact that board examinations in India have so far been tests of memory, rather than assessment of the broader instructional objectives in the cognitive domain. Before examining this hypothesis in the context of Karnataka, it is necessary to provide a conceptual perspective on the issue of assessment of instructional objectives in examinations.

1. **Objectives and Specifications:** As stated earlier, the prime aim of education is the all round development of individuals aimed to bring about behavioural changes in a desired direction. The school is the formal institution where education is imparted and the educational objectives (desired changes) are sought to be attained through the educational programmes. The school also evaluates the attainment of these objectives through examinations.

Educational objectives can thus be defined as a desired change in the behaviour of individuals to be brought about through education (NCERT 2004). These are targets which are set to be realized through the content and process of education (Srivastava 1999). They are broad global statements, which can be narrowed down stage-wise and subject-wise and made more specific and achievable through a programme of instruction.

Instructional objectives then are statements that describe a proposed change in the learners' behaviour, to be brought about at the end of an instructional programme (NCERT 2004; Aggarwal 1997). They are also called intended learning outcomes as they reflect the end results of learning to which pupils progress (Gronlund). These instructional objectives need to be kept in focus while teaching and testing.

Each curricular area has a set of instructional objectives. These instructional objectives are general and not observable. They can be further stated in observable behavioural terms called *specifications*. They refer to the abilities or competencies that a pupil will be able to demonstrate when he has achieved the objective. Each objective has a list of specifications under it which is a sample of different behaviours displaying the attainment of that objective.

2. **Bloom's Taxonomy:** The set of instructional objectives sought to be attained at the end of secondary stage of education have been developed by the NCERT keeping the Indian context in view. The objectives are drawn from the well known Taxonomy of Educational Objectives, namely Bloom's Taxonomy in the Cognitive Domain; Krathwal's in the Affective Domain; and Dave's in the Psychomotor Domain. These correspond to the 3 primary aspects of a pupil's growth in the cognitive, affective and psychomotor domains. The objectives in the above mentioned taxonomies have not been incorporated in totality, but have been adapted, depending on their suitability to the Indian national environment, and made into a workable model.

The NCERT model of classification of objectives is based primarily on Bloom's Taxonomy, as cognitive learning and outcomes form the central concern of education in our society. Hence, it is necessary to briefly elucidate the aspects of this taxonomy so that the set of objectives in the NCERT Model may be well appreciated.

Bloom advocated a method of categorizing objectives in a hierarchical order of cognitive complexity. This taxonomy delineates 6 levels of cognitive abilities ranging from knowledge (simplest) to Evaluation (most complex). Each of these objectives is elucidated below and the specific abilities which display the attainment of each objective are also stated.

(i) **Knowledge** - is the lowest level objective and refers to remembering previously learned material such as definitions, concepts, principles and formulas. It can be roughly equated with rote memory, where the student memorizes and retains information. The specifications displaying the knowledge objectives are '*recalls*' and '*recognizes*'. The objective can be exemplified by the question - 'What are the stages of cell division?'

(ii) **Comprehension / Understanding** - refers to understanding or grasping the meaning of learned material. This objective can be demonstrated by explaining the learned material in one's own words. Some of the specifications displaying the attainment of this objective include 'compares', 'explains phenomena', 'translates', 'identifies', 'illustrates with examples' etc. It can be exemplified by the question - 'Explain the process of Cell division?'

(iii) **Application** - is a higher order objective. Here the individual uses previously learned material in a new context to solve a problem, to answer a question or to perform another task. The information used may be principles, formulas, theories etc. The specific abilities displaying this objective could be - 'selects relevant data', 'applies abstractions to concrete situations', and 'generalizes principles'. A typical question testing this objective is "how does the law of supply and demand explain the rise in vegetable prices?"

(iv) **Analysis** - is a step above application and involves comprehending learned material in terms of its constituent parts. It is demonstrated by being able to breakdown information into its constituent elements and to explain the relationship between these parts. Analysis is an important element of critical thinking. The specific abilities displaying this objective would be 'analyses relationships and processes', 'separates complex ideas into its constituents' etc. A typical test item would be "What factors in the Economy are affecting current price of Steel?"

(v) **Synthesis** - This objective refers to putting together parts, elements or ideas to form a new whole pattern or structure. This requires original and creative thinking. The specific abilities demonstrating the synthesis objective would be 'constructs ideas from multiple source into a new complex idea', 'develops a new hypothesis, or law' etc. A question testing this objective is "How would you proceed if you were to do an experiment on caloric intake?"

(vi) **Evaluation** - is the highest order objective that calls for complex mental processes such as using a set of criteria or standards to arrive at a reasoned judgement. Specific abilities displaying the objective are 'judges in terms of internal, external, objective and subjective criteria'. A question testing this objective would be "How well does the G.M. Diet meet the criteria for an ideal weight reduction plan?" (NCERT 2004; Kubiszyn and Borisch 2003; Gronlund; Instructional Development [Internet Paper]).

In an effort to formulate the model of objectives for the Indian context, attempts were made to ascertain whether the objectives outlined in the 3 domains - cognitive, affective and psychomotor- were realizable by all students, keeping in mind the socio-economic conditions of the country.

3. **The Indian Model:** After many deliberations, it was felt that the higher order objectives of the cognitive domain of Bloom's Taxonomy had limited applicability at the school stage, as learners from all sections of society including first generation learners were present in schools. The competencies of the teachers were also taken into account as it was felt that the average teacher may not be able to distinguish between higher order objectives. In view of the above mentioned reasons, the first three objectives of Bloom's Taxonomy i.e., Knowledge, Understanding and Application were retained from the *Cognitive Domain*. The remaining three viz., Analysis, Synthesis and Evaluation were grouped under the "Application objective" due to their limited applicability as explained above. The fourth objective which formed a part of the set of objectives to be achieved was *Skill*, which was taken from the *Psychomotor Domain* as this forms an important component of written exams. It refers to the translation of verbal information into graphics i.e., in the form of maps, graphs, diagrams etc. The model also contained three objectives of the *Affective Domain* namely attitudes, interests and appreciation, which were more observable than measurable and hence were not assessed through written exams (NCERT 2004).

The NCERT model thus comprises of four objectives to be attained in the core subjects of Science, Maths and Social Science, at the end of the secondary stage of education, which can be evaluated through the written examinations. These are *Knowledge, Understanding, Application and Skill*. Though the four instructional objectives are commonly assessed in all the three subjects, the relative weightage assigned to each of these objectives differs from subject to subject. This depends on the nature and structure of the subjects, which emphasizes the development of different abilities and skills. For example, Maths as a subject has more scope for the understanding, application and skill level testing and hence less importance is given to the knowledge objective. In Science, and especially Social Science, the knowledge objective has a wide scope to be assessed.

The above account provides us with some conceptual clarity on the nature of the instructional objectives that need to be assessed through board exams. The trend, as stated earlier, has been to assess students for their ability to memorize factual information. In other words, the lowest level in the hierarchy of objectives - the knowledge objective has been tested predominantly. Thus the important challenge in the field of secondary education is to introduce reforms in the examination system so that higher order objectives and skills are also assessed and youth possessing higher order skills come out of our schools. Reforms in examinations can also percolate downwards to the teaching - learning process, so that the quality of learning in our schools may see a significant improvement.

Scope and Research Methodology:

In this section, an attempt is made to delineate the scope of the study, and describe the research methodology adopted to conduct the research.

i) **Scope:** The question papers of the past 3 years of the 10th Standard Board Examinations of Karnataka State have been chosen for the analysis. This includes the question paper of the 2005 examination which is based on the New Syllabus, as well as question papers of the previous two years examinations, based on the old syllabus. The analysis of 3 years' papers would help us make comparisons of the status of assessment over the 3 years time span as well as a comparison between 2 years' papers of the old syllabus and 1 year's papers of the new syllabus.

In this research, we have focused on the analysis of question papers of only the 4 core subjects i.e., Science - I, Science - II, Maths and Social Science, to understand the competencies being assessed therein. The study is limited in this respect, for it does not examine the development of competencies in the language subjects, and this has been left out of the scope of this study, to be taken up at a later stage.

ii) **Experts:** A major stage of the research was to select the panel of subject matter experts who would undertake the question paper analysis. The papers of each subject were to be examined by a group of 3 experts who were professionals in their own field - a classroom teacher, a paper setter and a teacher educator. Thus, in all, 12 experts would analyse the question papers of the four core subjects. By conducting the analysis from these three different angles, we hoped to gain insights on the status of assessment in secondary examinations. Moreover, since experts from all the three important spheres were involved, this was expected to make the study comprehensive.

iii) **Criteria for Selection:** A uniform set of criteria were chosen for the selection of experts taking up the analysis. The experts were required to possess a deep knowledge of the subject, have long standing experience in their respective fields as well as have some degree of awareness in the area of educational testing.

The formation of the panel of experts was done after a number of discussions were held with prominent educationists as well important functionaries of the Board of Secondary Education, who suggested possible names of experts suitable for this task. The names were approved by the advisor to this project the late Dr.T.K.Jayalakshmi. A panel of 12 experts was thus formed to study the 3 years' papers in each of the 4 subjects. Most of the experts had over 15 - 20 years experience in his / her profession. Hence, they were familiar with the syllabus, textbooks, paper setting and teaching learning processes within the classroom. An orientation workshop was held prior to the analysis to which all the 12 experts were invited. The nature of the research project and the research tool to be used for the analysis were explained to them in detail. This was followed by an orientation talk given by late Dr. T.K.Jayalakshmi, and two other experts - Dr.Shivananda and Dr. Basavaraj, who co-chaired the session. The three advisors, who were authorities in their subjects of specialization, gave valuable guidelines to the twelve experts on how to categorize test items under different objectives, exemplifying the same with useful examples. The experts were also requested to undertake the task in a fair and objective manner, without extraneous considerations influencing the analysis.

The identity of the experts has been kept confidential so that the analysis could proceed in a free and fair manner. In an effort to maintain objectivity in research, the experts were directed to undertake the analysis in the office of the Azim Premji Foundation itself. A time period of 3 - 7 days was allotted to complete the task. The analysis was to be done individually and no consultations were permitted amongst the experts.

iv) **Research Tool:** The study required the experts to analyse the Question Papers in their respective subjects by filling up a booklet comprising questionnaire forms. Hence the research tool employed was the questionnaire form consisting of both close-ended and open-ended responses. The close-ended items required structured responses - such as the Yes / No type whereas open-ended items required free responses, to be completed in a sentence or two.

The questionnaire form had been developed by the research co-ordinator under the guidance of the advisor to the project late Dr. T.K.Jayalakshmi. This tool was formulated after a reading of basic books and others published material in the area of educational assessment.

The questionnaire form comprised of 4 proformas:

Part I sought basic factual information on the background of the experts, the subject question paper, year of examination etc.

Part II was a Question Wise Analysis of the paper (Micro Analysis) where each question had to be analysed along certain parameters. Most importantly, the experts had to at first identify the pre-determined objective which the question tested and also locate the associated competency called for by the question. This form also required the experts to analyse the merits of each question on various dimensions, which would reflect the qualities of a good question. These pertained to the content area being tested, forms of question chosen delimiting the scope of answer, language clarity difficulty level, appropriateness of marks allotted etc. This proforma also contained two open-ended items. The first one invited comments and observations on the questions, with special reference to the validity of the questions. The second one called for suggestions for modifications of the question in case any inadequacies were found. They were given the opportunity to reframe questions so that the higher order objectives could be effectively tested.

Part III Once this detailed analysis for each question was completed, the experts were required to prepare a blue print of the question paper, where the marks allotted to each question on the objective tested, the content area covered and the form of questions chosen, were

represented in a three dimensional form. In the event of a question testing more than one objective, the marks were split up by the expert, if required.

Part IV was the Macro Analysis of the paper, where experts calculated the total marks allotted to all the questions in terms of the weightages to different objectives, different content areas, form of questions and the difficulty level. These totals would enable us to get a comparative picture, vis-à-vis those stipulated in the design, so that the extent of compliance of the question paper to the design could be estimated. This section also permitted the experts to present their observations and comments on the question paper, with reference to parameters such as time sufficiency, language clarity etc.

Though the prime focus of the research has been to identify the objectives being tested by each question and thereby determine the weightages allocated to particular objective in the paper, the questionnaire, nevertheless, also elicited the experts views' on a host of other parameters for each question. This would provide a comprehensive understanding of the nature of the questions in the paper. It also helped us to locate the inadequacies pertaining to each question as well as in the entire paper and how these could be overcome. Suggestions on reframing questions to test higher order objectives, have given us useful clues on how the questions could be upgraded.

v) **Checking and Tabulation of data:** The analysis by the experts provided us with a fairly exhaustive amount of data which had to be tabulated before the findings could be elicited. The data in the 36 booklets included responses of three experts in each of the four subjects, to approximately 35 questions, for 3 years papers which had to be analysed along approximately ten parameters. A number of days were spent coding the data after which the coded data was rechecked by 2 to 3 persons to eliminate errors. The data was then entered into the computer. The results that the data generated made it possible to delineate a number of patterns within each subject such as variance in views of experts by their back-ground, variance between papers of old syllabus Vs the new syllabus, variances over the time span of three years etc. Through such an exercise, a number of conclusions and generalizations could be arrived at.

After elucidating the scope and method of conducting the research, the outlay of the report and the inherent limitations are discussed before presenting the findings of the research in the following chapters.

Outlay of the Report:

To reiterate, the prime concern of this research has been to empirically establish if the secondary examinations in Karnataka State are merely tests of memorized facts or whether they truly assess all the instructional objectives to be achieved to the required extent. The objective of this research is sought to be attained through an analysis of the Question Papers set by the KSEEB in the 4 core subjects - Science - I, Science - II, Maths and Social Science. The findings of this study are presented in this report.

The first chapter is the Introduction wherein the problem of this research study is explicated, and its importance in the current context is highlighted. To gain a deeper understanding of the issue, the historical roots of the problem are explored, and a conceptual and theoretical perspective on the topic is provided. The scope of the research project and the methodology used to conduct the research are also outlined in this chapter. The outlay of the report is presented followed by a section, which cautions the reader on the limitations of this research.

The second chapter presents the results of the study tabling the findings for each subject separately. This analysis is a quantitative assessment of the objectives tested in each paper. The weightages allotted to assess different objectives in the paper by the experts are presented and an analysis of these figures, in terms of what they portray, is attempted. Also a comparative exercise is taken up to study the allocated weightages vis-a-vis objectives in the design, so that the extent of compliance of the question papers to the design can be assessed.

The third chapter puts forth the results of the qualitative assessment of the question papers undertaken by the experts. It analyses the experts views on the shortcomings found in the question paper. More importantly it brings to the fore, suggestions on how questions could be reframed so that higher order skills may be effectively assessed. It also assesses the overall quality of the question papers.

It is hoped that both the quantitative and qualitative analysis of the question papers, would provide us with a comprehensive and complete picture of the assessment patterns in secondary examinations.

The final chapter is the Conclusion, which summarizes the findings of the study, highlights the important observations and questions this study has thrown up and calls for taking an urgent look at initiating reforms in the area of assessment.

Limitations of the Research:

The research study which is concerned with an analysis of question papers with the aim of assessing the instructional objectives being tested through written exams is beset with a few limitations regarding which the reader needs to be cautioned.

Scholars have found that the taxonomy of objectives is primarily useful for classifying the levels of mental abilities to be developed in students, and is less suitable for classifying test items. This point may be exemplified by stating that a question which on the surface appears to test a higher order objective (application) may actually be a measure of only recall of information, if it has been part of the process of instruction in the classroom or referred in the textbook or guide (Ebel and Frisbie 1991). Hence, the major limitation of the methodology adopted for the research is that the task of identifying the objectives that the questions assesses, may not always be accurate due to the varying learning experiences of the student. This shortcoming is sought to be overcome to some extent by ensuring that experts selected had long standing experience in the fields of paper setting and class room teaching, which would result in a high level of accuracy in their analysis.

By selecting a sample of 3 experts to analyse each subject paper (a class room teacher, a paper setter and a teacher educator), we hoped to get a comprehensive perspective on the instructional objectives being tested in the written exams. However, we are aware that the analysis by the 3 experts could vary due to the element of subjectivity, because of the background of experts (For instance, the research revealed differing perceptions by 3 experts on the difficulty level of an item, which was largely influenced by their background). We tried to overcome this limitation by (i) addressing the issue of variance in responses and identifying those questions on which there was complete unanimity and complete variance; and (ii) keeping the factor of variance in responses in mind so that only unanimous views or a consensus of the 3 views were taken into account while drawing conclusions and generalizations.

The third shortcoming is that the study may appear to be incomplete or limited in the scope as it does not analyse the skills being developed in the Language subject. However, as this was the first study of its kind, it was decided to focus on the objectives and competencies being assessed only in the core subjects - Science, Maths and the Social Sciences, leaving the languages as a subject to be studied at a later date.

Another shortcoming pertained to the selection of the sample of experts undertaking the analysis. The 12 experts, who were to study the question papers of the 3 core subjects, were chosen on the basis of the prominent positions occupied by them and their long standing experience in their subject area. It could thus be presumed that they possessed a high level of knowledge of the *content* (subject matter) as well as of the *technique* (the method of classifying questions based on the Taxonomy of objectives). While most of the experts met these pre-requisites, one of them with over 30 years of experience as a class room teacher could not satisfy this condition. His understanding of the instructional objectives was not in consonance with what the objectives actually meant in the taxonomy. For this reason, this expert's views could not be taken into account. It needs to be clarified here that this occurred in spite of the efforts made by the Foundation (a) to ensure the formation of an appropriate panel approved by the Advisor to the project; and (b) to ensure an accurate analysis by holding an orientation workshop to guide and prepare the experts for this task.

While keeping all the inherent as well as unforeseen shortcomings of this research in mind, an attempt has been made to arrive at some reasonable generalizations and conclusions on the instructional objectives being assessed in secondary examinations in Karnataka State.

THE QUANTITATIVE ANALYSIS

As stated earlier, the prime focus of this research study has been:

- i) To identify the objectives and abilities that are sought to be assessed through the question papers at stage of secondary examinations; and
- ii) To gauge the extent to which the weightages allotted to testing these objectives in the question papers comply with those that have been stipulated in the design.

The above mentioned tasks have been attempted through an analysis of the past 3 years question papers by experts in each of the four core subjects i.e., Science I and II, Maths and Social Science.

In this chapter, a quantitative analysis of the instructional objectives assessed in the question papers of all the core subjects is attempted. This involves -

- i) a presentation of the weightages that have been allocated to the instructional objectives in the each year's question papers by the experts;
- ii) an analysis of what these figures portray; and
- iii) a comparison of the allocated weightages vis-a-vis those stipulated in the design.

An effort has been made to put forward the findings of this quantitative analysis in the following way:

1. The first section discusses the instructional objectives and abilities that are sought to be attained by children in each curricular area, at the end of the secondary stage of education. These general objectives of teaching a particular subject have been outlined both in the National Curriculum Framework as well as in the concerned State syllabus.
2. The next section exhibits how these instructional objectives have been allotted certain weightages in the design, by the State Board, for the purpose of assessment. This weightage (percentage of marks) reflects the proportion in which the objectives must be assessed. The design is an instrument of social policy, and its preparation is influenced by the prevailing socio-economic conditions. Hence, the stipulated weightages allotted to the objectives in the design depend on (1) the nature of the subject concerned; and (ii) socio-

economic factors. The specific weightages to the objectives in the design set out by the Board, in each subject area are, thus elucidated herein.

3. The third section depicts the findings of the 3 year question paper analysis. It demonstrates the actual weightages that have been allotted to the different objectives in the question paper by the 3 experts. This enables us to understand which objectives are being predominantly assessed. Variance in the experts' views is also noted. Once stated, the actual weightages are compared to those stipulated in the design, to ascertain the extent of compliance to the same. The specific abilities, associated with the objectives, which the question attempt to test are also brought to the fore. An effort is made to ascertain whether the prominent abilities sought to be developed are in actuality being assessed, through the papers.
4. The next section highlights the findings of the question paper analysis with reference to the remaining elements of the design, which comprise of form, content and difficulty level. It compares the weightages allotted to these elements by the experts with the weightages recommended in the design.
5. The findings of the three years question paper analysis is followed up by an overview of the patterns and trends that have emerged in the assessment of each curricular area.

SCIENCE – I

1. General Objectives of Teaching Science:

The National Curriculum Framework clearly states that the learning of Science in schools is primarily to augment the spirit of enquiry, creativity and objectivity. It aims to develop well-defined abilities of knowing, doing and being. It also nurtures the ability to explore and seek solutions of problems related to the environment and daily life.

At the secondary stage, learning of science would focus on understanding of concepts and applications in the areas of matter, energy, relation to various processes and the technological applications of principles of science. Critical, creative and generative thinking will have to be developed in children at this stage, which would become the foundation for further growth.

(NCERT 2000).

At the State level, the general objectives of teaching Science have been clearly outlined in the syllabus of 2003-04. The objectives of teaching science at the secondary level are to enable the pupil to -

- (i) acquire understanding of scientific concepts to principles and laws;
- (ii) develop instrumental communication and problem solving skills;
- (iii) develop scientific temper, attitudes and values such as open-mindedness, intellectual honesty, suspended judgement etc.;
- iv) appreciate the contribution of scientists and develop sensitivity to possible uses and misuses of science; and
- v) develop concern for a clean environment and preservation of the eco system.

(High School New Practice Papers 1992 - 93)

The abilities / competencies that are sought to be attained at the end of the secondary stage in Science have not been clearly outlined in the syllabus.

2. Stipulated Weightage to Objectives in the Design:

The design formulated by the Board specifies the distribution of weightages (marks) to the four objectives - Knowledge, Understanding, Application and Skill. This is formulated "on the basis of the existing position of instructional pattern without sacrificing the need of the society. The design helps the ordinary child to take pass percentage, it is not a cake walk for an intelligent child aspiring for a high percentage of score. The difficulty level of the paper is also so maintained as to help the average child to pass and the intelligent child to take it as a challenge" (Revised Syllabus for SSLC Exams - Model Question Papers - 1994-95). The question paper is supposed to be set in a manner that can differentiate between the average, above average and gifted children.

Thus, the socio-economic conditions as well as the competencies to be attained in the science subject have been kept in mind while allocating the weightages to different objectives. It is clearly stated that "as the science subject is knowledge oriented, the percentage of marks for knowledge and understanding together are kept as high as 68% while application and skill questions are given due importance" (Revised Syllabus for SSLC Exams - 1994-95). The break up of the stipulated weightage to the four objectives in Science I and II are as follows:

Objective	Science – I Marks	Science - II Marks	Approximate %
Knowledge	26	14	40%
Understanding	17	11	25% - 28%
Application	13	07	20%
Skill	9	3	12% - 15%
Total	65	35	100%

(Revised Syllabus for SSLC Exams - 1994-95)

SCIENCE - I – 2003

1. Weightage to Objectives - Question Paper Vs Design:

All the three experts have concurred with each other in the analysis that a greater weightage has been accorded to the *knowledge* objective in the paper. Two of the three experts estimated the marks allotted to it at 51% and 52% respectively, which were 10-12% higher than the stipulated 40% marks. The third expert assessed this at 44.6%. Though there was an 8% variation between his response and that of the remaining two experts, he found the allocation to be marginally higher.

Two of the three experts allotted 35% and 38% of marks to the *understanding* objective, which was higher than the recommended 25% in the design by 10% to 13%. The third expert put this down to 21.5%.

The *skill* objective was assessed uniformly by all the experts and the questions testing it constituted 12% to 13% as against the stipulated 15%, indicating near total compliance to the design.

The higher weightage to the knowledge and understanding objectives have been at the cost of testing the higher objective of *application* in the paper, which was exhibited by an inadequacy of application based questions. Two of the three experts found 0% to 4% marks allotted to it, which was very low in comparison to the 20% marks reserved to test this higher objective in the paper. The third expert found 13% marks allocated to this objective.

In the Science I subject, the 2003 paper focused to a great extent on testing the recall and recognize competency. The marks testing it were (52%; 50% and 44.6%). To demonstrate the achievement of the understanding objective, the abilities which were predominantly tested were Explains (20%), Gives reasons (25%; 7% marks) and identifies (9% marks). The skill objective called for the ability to draw and label diagrams (12.3%; 12.3%; 16% marks). The testing of abilities displaying the application objective, such as reasons out, solves, analyses and establishes relationships, infers and verifies were almost non-existent, being assessed only sparingly in the 2003 paper.

The analysis of the data reveals that variations in the responses of the experts did exist and often pertained to identification of questions testing the knowledge and understanding objectives. A study of the extent of variance in responses shows that for 14 of the 31 questions of the 2003 Science - I paper, all the experts unanimously agreed regarding the particular objective it tested. For another 15 of the 31 questions, 2 of the 3 experts concurred on the identification of the objectives the questions assessed. It was only for 2 questions (Q.10 and 11) that the experts expressed divergent views on the objectives being tested.

2. Weightage to Content, Form, Difficulty Level - Question Paper Vs Design:

The experts also studied the question papers regarding the form, content and difficulty level, which make up other essential elements of the design.

The experts were of the view that the chapter on Carbon compounds and Non-metals had been over emphasized in the question paper, while less importance was placed on the chapters such as Energy crisis and Energy forms.

The weightage allotted to different forms of questions was satisfactory and matched the marks allotted by the Board. In the view of the experts, a variety of questions can be framed to test the higher abilities such as those calling for classification; comparison and arranging in order and these were missing in the paper.

There was a great deal of individual variations in the way questions were assessed as average, easy and difficult by the experts. The percentage of marks allotted to difficult questions ranged from 6% by the first to 15% by the second and 20% by the third expert, against the stipulated 15%. Maximum marks were allotted to average questions ranging from 41% to 80%, and

for easy questions, these ranged from 13% to 40%. The wide variations between the experts on the difficulty level of questions could possibly be due to their differing perceptions resulting from their different backgrounds.

One pattern that emerged was that all the experts agreed that the paper catered primarily to average / below average students with a greater weightage to average and easy questions.

The overall view of the experts of the 2003 paper was that the proportion of knowledge level questions were more and hence it tested only the lower level competencies which catered to the below average students. There were nil or very few questions testing the application objective, which needed to be increased, by which it would become a balanced and standard paper to be attempted by all the students.

SCIENCE - I – 2004

The question paper of 2004 was based on the same syllabus as the previous year. Its outlined objectives remained the same. The distribution of weightages in the design was as what has been previously discussed.

1. Weightage to Objectives - Question Paper Analysis Vs Design:

There was a general agreement amongst the experts that a much higher weightage had been accorded for testing the knowledge objective. Two of the three experts found the allocation to be disproportionately high, allotting 58.4% and 63% marks to it, compared to the 40% in the design. The third expert allotted 44.6% marks to it. Thus even the lowest weightage in the range was higher than the stipulated 40%.

Two of the three experts found the allotment of marks to the understanding objective to be fairly close to the design at 23% to 24%, in comparison to the 25% set aside in the design. The third expert found this to be high at 40%.

As in the 2003 paper, the experts concurred on the allotment of marks to the skill objective allotting 14% to 15% marks to it, which complied with the design.

There was also consonance in the views of all the three experts on questions testing the application objective, which found almost no place in the analysis of the 2004 paper. Its allocation

ranged from 0% to 3%, as against the 20% required by the Board. This leads us to conclude that there has been an overemphasis on the knowledge and understanding objectives to the detriment of the application objective.

The concomitant competencies called for by questions testing the various objectives were chiefly the recall competency displaying knowledge, assessed for 63%, 55% and 47.6% marks. The understanding objective was demonstrated by competencies such as explains concepts (10.7%; 24.6%); give reasons (20%); differentiates (15%); and compares (9%). The abilities associated with the application objective were thus not taken into account, for assessing the students in the science subject.

The analysis goes to exhibit that the greatest variance from the design took place for the application objective and the least for the skill objective. There was also little, if any, disagreement amongst the experts on marks allotted to the application and skill objectives. While they all agreed that the knowledge objective received the greatest attention, there were differences in the identification of questions testing knowledge and understanding, which was evident from the great variations in their responses. A deeper look at the issue of variance revealed that for 22 of the 31 questions, all the 3 experts consistently agreed on the objectives they tested. For 8 other questions, 2 of the 3 experts concurred on the objective being assessed. Only for 1 question (Q. 12) did the 3 experts have varying perceptions on the issue. Thus, the conclusions drawn from this analysis are convincing, as they are based on the views of the majority of the experts

2. Weightage to Content, Form, Difficulty level - Question Paper Vs Design:

The experts found that greater emphasis had been given to some chapters such as Water, Carbon and Compounds, Stars and Galaxies in the question paper while few other chapters such as Energy Crisis, and Nuclear Energy could have been tested for a larger number of marks.

The weightage to the form of questions was as per the norms prescribed by the Board and were hence satisfactory.

There was great variation in the way experts categorized questions as average, easy and difficult. 2 of the 3 experts found difficult questions worth a mere 9% to 10% compared to 15% of the design. Average questions were graded for 46% to 56% by 2 of the 3 experts while the third expert found 73% marks for such questions. Easy questions carried 32% and 44% marks, while

the teacher educator found only 3% marks allotted to easy questions. These figures indicate that the bulk of questions were categorized as average or easy and distinguishing between them appeared to be determined to a large extent by differences in individual perceptions. However, there appeared to be greater concurrence on identifying difficult questions, than the average or easy ones.

The overall view of the experts for the 2004 paper was that it was a knowledge oriented paper in which application based questions were totally lacking. According to one expert, by testing only the knowledge objective, only the surface level knowledge was being gauged. Science is a subject requiring a lot of reasoning questions calling for analysis, establishing causes and effect relations and drawing conclusions and verifications. By framing such questions, the paper could be upgraded. At least 15% marks should test the application ability of children. This could help distinguish between the intelligent and average students. Consequently, the difficulty level of the paper could also increase to the required 15% marks.

SCIENCE - I – 2005

1. General Objectives of Teaching Science:

The 2005 paper was based on the new syllabus introduced to teach science at the secondary level. "The syllabus envisages meaningful learning of science rather than learning by heart the definitions and formula" (High School Revised Syllabus 1999-2000). This reflects a departure from the approach outlined in the old design which argued that science was a knowledge oriented subject and the paper was meant to cater to all categories of children. The newly outlined general Objectives of teaching General Science focussed on the attainment of all four important instructional objectives and the development of critical higher order abilities.

The teaching of General Science according to the 2005 syllabus would enable children to -

1. acquire knowledge of basic concepts, principles, theories;
2. understand basic concepts of science related to life;
3. acquire ability to apply concepts, principles and laws of science to life;
4. acquire problem solving abilities to solve problems related to life situations; and
5. develop the skill of drawing sketches etc.

(High School Revised Syllabus - 1999-2000).

The syllabus also outlined the expected learning outcomes / competencies that children should be able to demonstrate after the course of teaching. They should be able to (i) explain the concepts; (ii) differentiate; (iii) solve simple problems; (iv) reason out; (iv) identify; (vi) infer; (vii) verify; (viii) generalize the laws; (ix) develop observation skills; and (x) able to draw a conclusions.

(High School Revised Syllabus 1999 - 2000).

2. Stipulated Weightage to Objectives in Design:

The new syllabus was also accompanied by a new design formulated by the Board which contained minor alterations in the allocation of weightages to different objectives. The weightage to the higher objective of application has been reduced from 20% to 15% demonstrating a mismatch between the newly outlined objectives and the allotted weightages to objectives.

Knowledge	40%
Understanding	30%
Application	15%
Skill	15%

(Revised Syllabus SSLC Question Papers 2004-2005).

3. Weightage to Objectives : Question Paper Analysis Vs Design:

As in the past two years papers, what was even more starkly evident in the question paper of 2005 is the disproportionate weightage accorded to the knowledge objective, as reflected in the analysis of the three experts. Two of the three experts estimated the marks at 47.7% and 50.7% while the third expert allotted up to 64.6% for the knowledge objective. These percentages when compared to the recommended 40% revealed that even the lower end of this range was much higher than the stipulated weightage accorded to assess this objective.

Two of the three experts felt that the understanding objective was assessed for 23% to 24% marks, which was far lower than the 30% allocated to it in the design. The third expert rated this at 36%. There is hence evidence of variations in the way experts have categorized questions as those testing the knowledge and those testing the understanding objectives.

The experts however concurred to a great extent on the assessment of the skill objective to which they allotted marks ranging from 12% to 17% compared to the 15% recommended by the Board. This was hence in consonance with the design.

Most importantly the analysis revealed that the application objective once again escaped the attention of the paper setter. Two of the three experts found nil percent marks testing application while the third estimated it at 10% which is also short of the stipulated 15% in the design. Majority of experts agreed on the near absence of questions evaluating this higher order objective. Their overall view was that the knowledge objective has been unduly overstressed, while higher order objectives of understanding and especially application have been neglected in the 2005 question paper.

In keeping with the 4 broad objectives, identified by experts, the associated competencies were found to be assessed proportionately. The recall competency signifying the knowledge objective was predominantly assessed (64.6%; 50.7%; 47.7%). The competencies which displayed the attainment of understanding objective were Gives reasons (15%), Identifies (13.8%), Differentiates or Distinguishes (6.15%; 6.15%; 7.69%) Explains concepts (12%; 6%). Abilities associated with the higher application objective such as Solves problems, Infers, Analyses, Verifies and Generalizes were overlooked and not evaluated in the question paper according to the majority of experts.

A closer look at the variance in the responses of experts on the objectives being tested reveals that this factor did not come in the way of our drawing reasonable conclusions from the findings. In fact, for 15 of the 31 questions, all the experts held the same view on the objectives the questions tested. For another 14 of the 31 questions, 2 of the 3 experts concurred in their analysis. Only for 2 questions (No. 18 and No. 31), did the 3 experts' views have different view-points on the objectives being assessed. Thus, on 29 of the 31 questions, the consensus of the 3 experts was taken for arriving at generalizations.

4. Weightage to Form, Content and Difficulty Level - Question Paper Vs Design:

The weightage to the form of questions was as per the pattern allotted by KSEEB with the paper setter having followed the stipulated pattern.

The experts felt that though the content coverage was good, a few chapters had important concepts such as Electronics and Nuclear Energy, and these could have been tested in greater detail.

The 2005 paper was found to be of average nature with almost no difficult questions. The marks allotted to difficult questions ranged from 0% to 7%. Two of the three experts found no difficult questions in the paper. The percentage of marks to average questions ranged from 30% to 76% and to easy questions, marks ranged from 23% to 61%. Hence, the bulk of the questions were being categorized as average or easy. This wide range exhibits the varying perceptions by the experts on identifying average and easy questions. There was, however, greater unanimity in the identification or lack of difficult questions.

The overall perceptions of the experts on the paper was that knowledge objective has been given more weightage than required while the understanding objective has been tested to a lesser degree in comparison to the weightage allotted to it in the design. More significantly, two of the three experts found that the questions assessing the application objective found no place in the paper. The experts felt that questions testing students for higher order skills should be incorporated. According to one expert, in order to test the competencies like reasoning, prediction and comparison, questions on the application objective need to be set and around 15% to 20% marks could be allocated for such questions. By doing this, the difficulty level of the paper could be maintained and the question paper could cater to the broad spectra of students. The students' capabilities should not be underestimated by asking only memory based questions.

Overview and Trends - Science – I

A glance at the analysis of the three years Science I paper by experts reveals certain important patterns emerging with reference to the assessment of objectives in this subject.

The experts agreed that the 2003 paper assessed the knowledge objective to a greater degree and two of the three experts felt this was in excess by 10% to 12% marks. All of them

unanimously agreed that the application objective had been assessed marginally with two of the three experts allocating 0% to 4% marks.

The analysis of the 2004 paper exhibits a disproportionate increase in the percentage of marks testing the knowledge objective compared to the previous year. Two of the three experts found the allocation to be much higher i.e., 18% to 23% higher than the 40% set out in the design. Compared to the previous year, a far larger percent of marks were allotted to estimate the knowledge objective. All the three concurred on the fact that questions testing the higher application objective were almost absent and 2 of the 3 experts found 0% marks allocated to it.

The weightages allotted to the objectives as per the new design for 2005 were moderately altered so that marks allotted to the application objective were reduced from 20% to 15% and that to understanding increased from 25% to 30%.

In keeping with the trend of the past 2 years, the analysis of the 2005 paper by two of the three experts once again exhibited that a higher weightage had been accorded for questions testing the knowledge objective, which was at 11% to 24% higher than the stipulated marks. The understanding objective was assessed for fewer marks than that allotted, and two of the three experts, once again found a total absence of questions testing the application objective.

The comparative view of assessment over the three year period reveals that in 2003, testing of the knowledge objective was higher by 10% to 12%, but in 2004, there was a dramatic increase (18% to 20%) which was sustained in 2005. The deficiency of questions assessing the high order application objective was a feature across all the three years and being totally absent in the last 2 years, in the view of 2 of the 3 experts. The analysis revealed that the skill objective was estimated appropriately as per the design in the question papers of the 3 years.

It can be seen that variations in experts' responses by their background revealed that the teacher educator and the paper setter unanimously agreed on the absence of the questions testing the higher objective of application in all the 3 years question papers.

In conclusion, what can be stated categorically is that across all the three years, in the Science - I subject, the tendency to assess children for the simpler objective and lowest cognitive abilities of recall has persisted, while the assessment of the higher order objectives and development of higher cognitive abilities so essential in the Science subject has been systematically ignored.

SCIENCE – II

The general objectives of teaching General Science stated in the National Curriculum Framework and outlined in the State syllabus for 2003 and 2004 have already been discussed in the preceding section. The same objectives have to be kept in mind in the teaching of the Science - II subject also.

1. Stipulated Weightage to Objectives in the Design:

The distribution of weightages to the objectives to be attained in the Science II subject as stated in the design is given below:

Objective	Marks out of 35	Approximate Percentage
Knowledge	14	40%
Understanding	11	31%
Application	07	20%
Skill	03	9%

(Revised Syllabus for SSLC Exams Model Papers 1994-95)

In this analysis, an attempt is made to match the weightages allotted to the four instructional objectives by the experts in the Science II question papers, with those stipulated in the design, in order to judge the extent to which these have been complied with, while setting papers. We can thus get an insight in to which objectives and abilities have being primarily assessed through the question papers.

SCIENCE – II – 2003

1. Weightage to Objectives - Question Paper Vs Design:

The weightage to the knowledge objective was judged to be marginally lower by two experts (teacher educator and paper setter) who had assigned 34% to 37% marks to it. This was slightly lower than the weightage to the knowledge objective in the design which was 40%. The third expert (classroom teacher) however allocated a higher percentage of 45% marks to it.

As far as the *understanding* objective was concerned, two of the three experts assigned marks of 43% and 54% to it, which was higher than the 31% in the design. The third expert estimated it as 28.5%, which was close to the stipulated percentage.

Two of the three experts found the percentage of marks testing the application objective to be low in the paper, one allotting just 2% marks to it, and the other expert 11% marks. The third expert assigned 17% marks, which was close to the 20% reserved to test application. It is interesting to note that though the marks allotted to application were lower than that set out in the design, the two experts considered this appropriate or even high, the reason being that in actuality very less emphasis is normally given to testing this objective and the associated competencies.

The only objective which was unanimously assessed in this paper was *skill*, to which 9% marks was accorded uniformly by all three experts. These marks were also in keeping with the design.

In the science-II 2003 paper, the recall competency demonstrating knowledge was assessed appropriately as per the design (34%; 37%; 45%). The understanding objective was sought to be tested by questions calling for the ability to give reasons (20%; 8%); identify (20%; 17% and 8%) and explains concepts (11%; 5%). The abilities demonstrating the application objective were Analysis (8.5%) and Applies knowledge to new situations (14%).

The variance in the experts' views on the 2003 paper was quite evident. Only on 4 of the 17 questions did they all concur on the objectives tested. For another 11 questions, 2 of the 3 experts held similar views on the objectives being tested. For the remaining 2 questions (No. 14 and 17), the three experts held divergent views. The variance pertained to identifying questions testing the knowledge or understanding objectives and on questions assessing the understanding

or application objectives. The findings of the 2003 paper are hence based on the views held by the majority of the experts.

It can thus be concluded that the Science-II question paper of 2003 came fairly close to complying with the design, except for the questions testing the application objective which fell short of the required weightage, according to 2 of the 3 experts.

2. Weightage to Content, Form and Difficulty Level - Question Paper Vs Design:

The weightage to different content units was found appropriate except for a few chapters such as Biogeochemical Cycle, which had received less importance in the question paper.

The weightage to form of questions was found to be satisfactory and as per the marks allotted to different questions, in the design.

Experts again diverged in their views on the difficulty level of questions. Majority of the questions were placed at the average or easy level by the experts. The paper setter and the classroom teacher found the distribution of questions by difficulty level to be good with 22% and 14% marks being accorded respectively to difficult questions, compared to the 20% in the design. The teacher educator identified very few difficult questions, allocating only 2.8% marks to it. Thus, the experts' background was once again a determining factor for identifying questions as difficult or easy.

The perception of the majority of the experts on the paper was that knowledge objective was adjudged for a slightly lesser percentage of marks than the stipulated 40%. However the higher understanding objective was evaluated for a higher percentage whereas the highest objective of application was allocated a low percentage of marks. In the view of the teacher educator, questions testing the higher mental abilities need to be increased so that the children could gain intellectually. Consequently the difficulty level of the paper could also increase. The classroom teacher and paper setter also argued for an increase in the skill type of questions, which could be attained by reducing the allocation of marks to other objectives. The paper setter felt it was a standard paper with meaningful questions, which rural students may find difficult.

Science – II – 2004

There was a greater consensus amongst the experts on the analysis of the 2004 paper and some of the patterns that emerged are highlighted below:

1. Weightage to objectives - Question paper Vs Design:

Two of the three experts (teacher educator and classroom teacher) were of the view that the knowledge objective had been predominantly assessed and allotted 48.5 - 50% marks to it, exceeding the stipulated marks by 10%. The third expert maintained that the allocation to knowledge was marginally higher at around 43%.

The weightage to the *understanding* objective was found to be appropriate by two of the three experts at around 30% to 31% while the third expert felt it was higher at 37%.

There was complete concurrence amongst all the three, on the fact that *skill* objective was assessed for 14% marks, and this was higher than marks allocated in the design.

Lastly the undivided opinion of the experts was that the *application* objective had been neglected by the paper setter, with only 5% marks testing the higher abilities. The low weightage to the application objective appeared to be at the cost of higher weightage given to the knowledge objective.

The analysis of the 2004 paper exhibits a higher degree of unanimity in the experts' views on the specific objectives being tested. For 9 of the 17 questions, all the three agreed on the objectives tested, while for 7 other questions, two of the three experts held similar views. Only on 1 question (No. 11), did all the three differ on the objective it tested. It was discovered that there was consistency in the experts' views with regard to questions testing the application and skill objectives, while the differences were mainly over questions assessing the knowledge and understanding objectives.

The identification of the competencies tested by the paper, once again shows that the lower cognitive ability of recall was over stressed (48.5%; 50% and 42.8%). The understanding objective was mainly assessed by testing competencies such as give reasons (11%; 17%; 12%), explains (11%; 5-7%) and identifies and explains (17%). The skill of constructing diagrams was

assessed uniformly (14%; 14% ; 14%). The question paper neglected the testing of competencies associated with the higher order application objective.

2. Weightage to Content, Form and Difficulty Level - Question Paper Vs Design:

It was agreed by all, that the by and large the weightage to different content units was fairly good. More weightage had been given to the chapter on Human Health, while no importance was given to the Animal Husbandry chapter.

The weightage to the form of questions was as per the norms laid down by the KSEEB. It was felt that some VSA questions could be in the form of Fill in the Blanks since this form required only a one-word answer.

Two of the three experts felt that difficult questions were very few; carrying only 5% to 8% marks and these could be increased to make it a standard paper. The third expert found difficult questions worth 25% marks. The average questions were allotted marks ranging from 31% to 65% and marks to easy questions ranged from 28% to 42%. The wide variation in their views on the difficulty level of questions may be explained by their differing individual perceptions and varied backgrounds.

The overall view of the paper by two of the three experts was that the paper was not well balanced as the knowledge objective had been given undue weightage. The application-based questions were found to be very few by all the 3 experts and they felt that they needed to be increased. The classroom teacher, who also found that weightage to knowledge objective to be higher, had a 'positive' view of this situation. She felt that such a paper would help average and below average students to attempt the paper successfully, as scoring on memory-based questions would be easy. A few questions were found to be taken from the exercises in the text book, and there was a desire expressed to avoid such stereo-typed questions.

SCIENCE – II – 2005

1. Stated Objectives of Teaching Science:

The Science II 2005 paper was based on the new syllabus and design. The general objectives of teaching General Science at the secondary level already discussed for Science I are applicable to Science II also. The new syllabus “envisages meaningful learning of science rather than learning by heart the definition and formula”.

(High Schools Revised Syllabus 1999-2000.)

Some of the abilities associated with the different objectives that need to be developed are recalls, lists out, (testing knowledge), identifies, explains, compares (testing understanding) and abilities demonstrating the higher order objective of application such as solves simple problems, reasons out, observes and generalizes the laws, infers and verifies.

(High Schools Revised Syllabus 1999-2000.)

2. Stipulated weightage to objectives in the Design:

The recommended weightages allotted to different objectives are slightly modified in the new design. The design of the blue print for SSLC Exams 2004-05 state the following percentage of marks:

Objective	Marks	Percentage
Knowledge	13	37.14%
Understanding	11	31.42%
Application	06	17.15%
Skill	05	14.29%
Total	35	100%

(Revised syllabus SSLC Question Paper Design and Model Blue Print 2004 – 05)

3. Weightage to Objectives – Question Paper Vs Design:

Two of the three experts found a disproportionately high weightage given to the *knowledge* objective with 57% to 60% of marks accorded to it by them in the paper. This was about 20% higher than the 37.1% stipulated in the design. The third expert (paper setter) found only 40% of marks allotted of this objective.

The two experts, who had found the knowledge objective to be high, had assigned around 25% to 28% marks to the understanding objective, which was fairly close to the 31% recommended in the design. The third expert (paper setter) found it to be higher at 40% marks.

It is being found once again that the three experts largely concurred on the testing of the *skill* objective, allocating 11% to 14% marks which closely matched the design.

A striking aspect of this paper was the general agreement amongst experts on the near absence of questions testing the higher objective of *application*. The questions testing the higher order skills were allotted only 0% to 5% marks compared to the proposed 17% in the design.

A closer look at the issue of variance in experts' responses on the analysis of the 2005 paper, showed that in the case of 10 of the 17 questions, there was complete concurrence amongst the experts on the objectives being assessed. On the remaining 5 questions, 2 of the 3 experts held similar views. Only for 2 of the 17 questions (No. 8 and 10), were divergent view-points expressed. This analysis also shows the consistency amongst the experts in the identification of questions testing the skill and application objective. The variance in responses pertained largely to questions testing the knowledge and understanding objectives.

In the attempt to discuss which of the abilities associated with the objectives were predominantly tested through the paper, the experts found that the recall competency was prominently evaluated (57%; 60% and 40%). The questions tested the abilities demonstrating the understanding objective were identifies (14%; 14.28% 5.7%), explains (6%), differentiates (14%; 6%; 6%) illustrates (11.42%) and Drawing sketches and diagrams were tested under skill (14%; 14% marks). What the analysis reveals is the striking absence of questions testing the higher cognitive abilities associated with the application objective such as analysis, logical reasoning, applies concepts to new situations, predicts infers and generalizes laws, which though being outlined in the syllabus, have been totally neglected.

4. Weightage to Content, Form and Difficulty level - Question Paper Vs Design:

The weightage to different content units was found to be apt, in keeping with the weightage allotted to them in the design.

As usual, the weightage to the form of questions this was found to be as per the stipulated pattern of the Board. It was suggested by one of the experts that certain VSA questions could take the form of Fill in the Blank Questions.

Two of the three experts found difficult questions in the paper carrying only 0% to 2% marks. The third expert (paper setter) found about 14% marks allotted to difficult questions. They found almost all questions in the paper to be of the average / easy nature mainly due to the over emphasis on the knowledge objective. It was felt by the two experts, that the difficulty level of the paper could be increased by setting questions on the application objective, which was necessary keeping the above average students in mind.

The major observation on the paper was that questions testing the application objective have been totally ignored. Two of the three experts found a greater emphasis on the knowledge objective than what was required resulting in a disproportionate weightage to the objectives and in an imbalanced paper. Two of the three experts also found that less time was required to answer this paper as it was knowledge oriented and the students were required to merely recall facts. It was also felt that as there were no difficult questions to challenge the brighter students, less time would be appropriate.

Overview and Trends - Science – II

The findings of the three years question paper analysis bring out the following picture with reference to assessment pattern in the Science II subject:

In the year 2003, the knowledge objective was tested for a slightly lower percentage of marks than that stipulated in the design by two of the three experts. The understanding objective was over stressed in the paper, being accorded a weightage higher by 12% to 22% marks. The higher objective of application was inadequately assessed, being accorded a lower percentage of marks than stipulated. Thus, except for this higher order objective, the paper, to a great extent, complied with the design.

The analysis brings to the fore the change that took place in the 2004 paper, with two of the three experts allocating a higher percentage of marks to the knowledge objective, which was

about 10% higher than the stipulated percentage. The marks evaluating the understanding objective were found to be appropriate. The unanimous view was that the higher objective of application was largely neglected in the paper being assessed for a mere 5% of the marks, far short of the stipulated 20%.

The year 2005, had a new syllabus and design, which emphasized on the meaningful learning of science rather than learning the definitions and formulae by heart. However, as discussed earlier, this intent was not translated into action, as the new design contained a reduced weightage to the higher order objective of application.

The experts' analysis of the 2005 paper showed that a disproportionate weightage to the knowledge objective has been accorded by two of the three experts, higher than the stipulated marks by 20% to 25%. The experts found the weightage to the understanding objective to be as per the design. All the three experts agreed on the near absence of question testing the higher application objective. The paper was hence imbalanced and not in accordance with the weightages stipulated in the design.

At a deeper level of analysis, one could see the variations in views of experts by their background. In Science II subject, the trend that emerges is that the paper setter's analysis reflects a clear cut compliance of the paper to the design in terms of the weightages allotted to the knowledge and skill objectives. However, regarding the understanding and application objective, she found an over emphasis of the former and a neglect of the latter. The teacher educator and classroom teacher however were fairly consistent in their analysis, which highlighted a higher allocation to the knowledge objective and an under evaluation of the higher application objective.

A comparison of the findings over the past three years in the science paper II show that the 2003 paper was fairly consistent with the design, where in fact the simple Knowledge objective was tested for a lower percentage of marks while assessment of the higher understanding objective was marginally higher. The 2004 analysis reflects an increase in testing the knowledge objective, while the understanding objective was satisfactorily tested. In 2005, the testing of the lower order knowledge objective was disproportionately high. Over the years, there was also a marked decline in the assessment of higher cognitive abilities, the attainment of which is so essential in the Science subject.

MATHS

This section explores the extent to which the objectives and abilities sought to be developed and outlined in the Curriculum Framework and the State syllabus have been assessed by the question papers. This has been attempted by at first delineating the stated objectives and stipulated weightages accorded to each of these in the design. The weightage allotted in the question paper analysis are then compared to the stipulated weightages in the design so that the extent of compliance can be gauged. At the outset, we would like to state that though 3 experts analysed the Maths question papers, we could not utilize the classroom teacher's analysis as he was neither aware of the taxonomy of objectives nor the technique of identifying the objectives being tested by the questions. Hence, our conclusions on the assessment of objectives in the Maths Question Papers are based on the analysis of two experts.

1. General Objectives of Teaching Maths:

The NPE specifies that the secondary stage marks the commencement of the systematic study of Maths as a discipline. The general objective of teaching Mathematics at the secondary stage has been spelt out in the National Curriculum Framework 2000. It states that the school curriculum must help generate and promote mathematical abilities and develop a logical mind that would help them perform mathematical operations. The aim should be:

- i) to enhance the students' capacity to employ mathematics in solving problems faced in their day to-day life;
- ii) to ensure that the curriculum includes study of mathematical concepts and areas like algebra, geometry, graphs, statistics etc., where the thrust should be on the development of deductive reasoning;
- iii) to enable the students should to perform calculations with speed and accuracy; and
- iv) to enable the students to acquire the ability to solve problems using algebraic methods and apply knowledge of simple trigonometry to solve problems of heights and distance.

(NCERT 2000)

The objectives of teaching and learning maths have also been outlined in the State syllabus for 2003 and 2004. It states that children should be able to –

- (i) acquire knowledge and understanding of terms, symbols, concepts, principles etc;
- (ii) apply mathematical knowledge and skills to solve real mathematical problems by developing abilities to analyse, to see inter relationships involved and to think and reason;
- (iii) develop the ability to articulate logically;
- (iv) develop skills in use of mathematical tables for problem solving; and
- (v) develop the ability to interpret algorithms for problem solving etc.

(High Schools New Practice Papers 1992 - 93)

1. Stipulated Weightage to Objectives in the Design:

The four broad objectives to be achieved have been accorded weightages (percentage of marks) in the design which reflects the proportion in which they are sought to be assessed. The allocation of weightages to the four objectives is given keeping in view (i) the nature and structure of the maths subject. "As mathematics is a skill subject (mental skills) the ultimate skill that is developed is the problem solving ability ... Hence this subject gives more scope for understanding, application and skill level testing. Therefore more weightage is given to these objectives. Relatively less weightage is given to purely knowledge level questions in maths" (Revised Syllabus for SSLC Exams. 1994-95). (ii) the socio-economic conditions determine the existence of all categories of students in schools and have also seemed to govern the allotment of weightages to the objectives. The syllabus clearly states "The three categories of students viz., above average, average and below average are kept in view and hence average level questions or understanding level questions are given more weightage". (Revised Syllabus for SSLC Exams 1994-95). The stipulated weightages of marks to the four objectives i.e., percentage of marks that should test each objective in the paper for the years 2003 and 2004, were as follows:

Objective	Percentage
Knowledge	17%
Understanding	54%
Application	15%
Skill	14%

(Revised Syllabus for SSLC Exams 1994-95)

MATHS – 2003

1. Weightage to Objectives – Question paper Vs Design:

The experts found an exceptionally high weightage for assessing the *understanding* objective which may be considered as the average level of mental ability in Maths (Revised Syllabus for SSLC Exams 1994 – 95). It was discovered that 70% to 80% of the marks were allotted to questions, which called for mental processes falling under the understanding objective compared to the 54% marks allotted in the design. Approximately 7% to 9% of the marks tested the lowest cognitive level i.e., the knowledge objective, which was lower than the 17% stipulated in the design.

The experts found a deficiency in the paper with reference to testing the higher objective of *application*, which was allotted only 1% to 5% marks compared to 15% earmarked for it in the design.

The *skill* objective was assessed for 10% and 18% marks by the two experts compared to the stipulated 14%.

This analysis leads us to conclude that there was general agreement between the experts, that in the 2003 paper, the understanding objective, which is tested by the average level of questions, far exceeded the marks earmarked for it. Both experts concurred that (i) this was at the cost of testing the higher objective of application, on which questions were deficient and did not meet the desired allocation; and (ii) the knowledge objective was also not assessed to its required level.

The findings of the analysis revealed a high degree of unanimity in the responses of the two experts. A deeper look shows us that for 34 of the 44 questions in the paper, the two experts were in complete agreement on the objectives being assessed and only on the remaining 10 questions, did they differ in their views. Within these 10 questions, the variance was mainly with regard to the identification of questions testing knowledge or understanding objectives and for a couple of questions on the testing of the knowledge or skill objectives. The variation in the responses of the two experts did not exceed the range of 5% to 10%.

In this paper, the major competencies that were sought to be tested were identified by the experts as the following. The recall and recognition competencies were tested for 7% to 9% marks. The understanding objective was tested by questions calling forth the abilities such as Proves (14%; 26% marks); Finds the solution (18% and 10% marks); Uses the formula to find solution (28% marks) and Calculates (6%; 8% marks). The skill objective called for the ability to construct figures to given specifications (10%; 16% marks).

The deficiency of questions assessing the higher order objective of application has resulted in the absence of the assessment of higher cognitive abilities of students such as analyzing, seeing inter relationships, problem solving and deductive reasoning. A look at major competencies that have been tested through the question papers shows that these are not in consonance with the higher order skills set out to be achieved both in the State syllabus as well as those outlined in the National Curriculum Framework.

2. Weightage to Form, Content and Difficulty Level:- Question Paper Vs Design:

The three other important elements of the design on which the question papers were analyzed, were form, content and difficulty level.

Both experts felt that allocation of marks to the chapter 'Similar Triangles' was less and needed to be increased. Greater emphasis on the chapter Right angled Triangle was also discovered.

It was found that the weightage to the form of questions was satisfactory and in tune with the prescribed allocation. However, there were a few questions whose form could be changed to test the particular content.

There were variations between the experts' views on the difficulty level of questions. While one expert identified difficult questions worth 5% marks, the other assessed these at 25%, compared to the 20% marks reserved for difficult questions in the design. The average questions were assessed by one at 83%, while the other allocated 49% marks to it, against the 60% marks in the design. However both of them agreed that the paper tended to be of the average level. One expert said that the difficulty level could be increased by 15% marks, while the other felt that it could be reduced by 5%. The background of the experts and the way they perceived the questions could significantly account for their differing views on the difficulty level of questions.

The overall view of the paper according to the two experts was that the questions testing the application objective had to be increased while those assessing the understanding ability had to be reduced. In their view, the weightage for testing the application objective should be increased to at least 10 -15%, and that testing the understanding objective could be brought down to 60%. This would then make the paper more balanced and in accordance with the design. Both the experts discovered that most of the questions were taken directly from the solved examples or worked examples in the text book. It was suggested by both that this was not a healthy trend, and could be avoided. They recommended that there should be a change in numerical values and figures of the questions. Similar problems can be framed so that the paper can be of a better standard.

MATHS 2004

The stated objectives to be attained and weightages allocated to them in the design continue to remain the same as the previous year and hence these have not been restated

1. Weightage to Objectives – Question Paper Analysis Vs Design:

The analysis of the paper regarding the weightages allocated to different objectives portrays trends similar to that in the 2003 paper.

It was found that the allotment of marks to the *knowledge* objective in the 2004 paper was far below the recommended percentage of 17%. The experts allotted 9% and 12% of the marks to this objective.

The *understanding* objective was most prominently assessed by the questions to which 74% and 81% marks were allotted against the recommended 54%.

Both the experts unanimously agreed that there were no questions at all in the 2004 paper, testing the *application* objective. Thus 0% marks were allotted by both for testing this higher objective, which was supposed to be tested for 20% marks.

There was a marginal variation in the assessment of the *skill* objective with the marks allotted ranging varying from 7% to 17% compared to the 14% reserved in the design.

The experts identified the major competencies assessed by the paper to be the following. The recall competency was tested for 9% to 12% marks; the understanding objective called for the following competencies – Finds the solution and uses formula to find solution (37%; 43% marks), Proves (26%; 4% marks), Distinguishes between closely related concepts (11% marks); the skill objective called for the specification to construct figures to given specifications (7%; 14% marks).

There was a far greater concurrence in the views of the two experts on the 2004 paper. A closer look revealed that for 37 of the 44 questions, both the experts agreed on the objectives they tested. Of the remaining 7 questions, the differences of opinion pertained mainly to questions testing the knowledge or understanding objectives and on a couple of questions to those testing the knowledge or skill objectives.

Compared to 2003, the situation seemed to worsen in 2004, with questions assessing the higher objective of application being totally absent. The average level abilities exemplifying the understanding objective stand out prominently while the assessment of the higher cognitive abilities of analysis, problem solving and reasoning have been totally overlooked in this paper.

2. Weightage to Form, Content, Difficulty Level - Question Paper Analysis Vs Design:

The weightage to the different content units was found to be more or less adequate, in the paper.

The weightage to the Form of questions was found to be as per the design. However the form of certain questions was not suitable for testing the particular content and modifications to these were suggested.

Diametrically opposite views were expressed by the two experts on the difficulty level of questions. One expert felt that the difficulty level of the questions needed to be increased as she

had allotted only 3% marks to such questions. This could be attained by increasing application-based questions. The other expert felt that the paper tended to tilt towards the difficult level, and allotted 36% marks to it, compared to the 20% marks reserved for difficult questions. The average questions were allotted 86% by the teacher educator and 43% marks by the paper setter, compared to the 60% recommended in the design. The varying perceptions of the experts, to some extent may be accounted for, by their differing contexts and background with the teacher educator placing most questions at the average level and finding a dearth of difficult questions, and the paper setter allotting a higher percentage of marks to difficult questions.

Taking a comprehensive view of the paper, the two experts have, by and large, agreed on the fact that the question paper was imbalanced since the assessment of the understanding objective has been over-stressed in the 2004 paper. The application objective has been totally ignored, even though it is a higher order objective. In their view, the weightage to assess this objective had to be escalated to 15%, while the weightage to the understanding objective could be reduced by 20%, so that the paper could be balanced in terms of testing all the instructional objectives. There was also general consensus between the two that majority of the sums and questions in the maths paper were taken directly from the text book, from its solved or worked examples. This trend was an unfavourable one. Both of them recommended that efforts should be made to bring about a change in the numerical values, figures and measurements of the problems. Similar questions can be framed based on the same content in the syllabus and, in this way the paper can be standardized.

MATHS - 2005

1. General Objectives of Teaching Maths:

The new syllabus for 2005 stresses that, "it gives more importance to logical reasoning and thinking in learning maths than mechanical skills and rote memory" (High School Revised Syllabus 1000-2000). Some of the general objectives and abilities sought to be attained at the secondary stage are the following:

- (i) To acquire knowledge of mathematical terms like factors, square roots, etc, concepts like, factorization, concurrence etc.

- (ii) To develop understanding of processes involved in calculation with number, algebraic manipulation and theorems.
- (iii) To develop skills of substitution, calculation, simplification.
- (iv) To develop ability to think and reason logically Develop the ability to estimate measures.
- (v) To develop necessary skills for solving problems.
- (vi) To analyse and see inter relationships between and among variables in mathematical problems etc.

(High Schools Revised Syllabus 1999- 2000)

The syllabus also elucidates the expected learning outcomes that need to be demonstrated by children in mathematics. Some of these abilities are recalls, recollects, learns to calculate, interprets data, learns problem solving technique, manipulation and performs operations, learns deductive reasoning, learns to argue and proves propositions and develops skill in geometrical constructions.

(High Schools Revised Syllabus – 1999 -2000)

2. Stipulated weightage to objectives in the Design:

The new design for the setting of the 2005 question paper has further reduced the allocated weightage to the higher application objective from 15% to 10%. Thus, this reduced weightage is not in tune with the outlined objectives and abilities sought to be attained in the new syllabus.

Objective	Percentage
Knowledge	17%
Understanding	55%
Application	10%
Skill	18%

(Revised syllabus for SSLC Question Papers,
Design and Model Blueprint 2004-2005)

3. Weightage to Objectives:- Question Paper Vs Design:

As in the case of the previous two years, what comes to the fore in this paper too is that undue weightage has been given to testing the *understanding* objective in the paper. The experts identified questions worth 63% and 74% marks assessing the understanding objective against the stipulated 55%.

The percentage of marks allotted to the lowest level i.e., the *knowledge* objective ranged between 12% to 15% as per the analysis, compared to the 17% outlined in the design.

The striking aspect of the analysis is the unanimity with which the experts agree on the assessment of the *application* objective – which has been found to be low with only 4% marks allotted to it in the paper. This can be compared to the reduced 10% recommended by the Board.

There is again some degree of variance between the two experts on the testing of the *skill* objective with marks ranging from 10% to 18%, compared to the 18% set out in the new design.

The major mathematical skills that were assessed by the questions in this paper were the recall competency (12%; 12%). The abilities exemplifying the attainment of the understanding objective were 'Finds the solutions' or 'Uses formula to find solution' (29% and 50% marks); 'Proves' (13% marks); 'Interprets graphs' (8% marks) 'Calculates' (9% marks). The skill objective was tested by questions calling forth the ability for constructing and drawing (10%, 18% marks).

As in the analysis of previous 2 years papers, in the 2005 paper too the experts largely concurred on the identification of objectives the paper tested. For 37 of the 44 questions, the two experts held similar views, and only on the remaining 7, did their views differ. These minor differences pertained to the questions testing either knowledge or understanding objectives as well as between the understanding and skill objectives. There was complete unanimity on the absence of questions testing the application objective.

The analysis of the 2005 paper also exhibits the fact the average mental abilities were predominantly assessed, while the higher mental faculties associated with the attainment of the application objective had been ignored.

2. Weightage to Form, Content and Difficulty Level:-Question paper Vs Design:

The weightage to content was found to be fairly satisfactory except for a few chapters which were over-emphasized, such as Quadratic Equations and inadequate emphasis was placed on chapters like HCF / LCM and Circles.

The weightage to different forms of questions was satisfactory, and was as per the norms set by the Board.

Regarding the weightage to the difficulty level of questions, though both the experts agreed that the question paper catered to the average students, there were variations in the way the questions had been placed in the average or easy category. The marks to average questions ranged from 57% to 73% and those to easy questions from 19% to 36%. However, they unanimously agreed that the question paper had very few difficult questions allotting only 7% to 8% of marks. The experts suggested increasing the marks for difficult questions to 15% to 20%.

The overall perspective of the paper was that it was one in which application based questions were very few and the understanding objective had been assessed disproportionately. This imbalance could be rectified by increasing the application level questions to 15% to 20% of the marks. Consequently the difficulty level of the questions would also increase. As in the past 2 years, another drawback of the paper was that the questions and sums in the paper were taken directly from the textbook. The familiarity with these could result in an inappropriate assessment of higher order objectives. This trend needed to be reversed.

Overview and Trends:

The following trends have emerged from the three years question paper analysis of the Maths subject:

For the year 2003, the experts discovered that the lower mental ability of recall associated with the *knowledge* objective was assessed for only a few percent of marks, even lower than that laid down in the design. The maths paper tested students mainly for the *understanding* objective, which, in this subject, is associated with the average level of mental abilities. The marks were 16% to 26% higher than the allocated percentage for the understanding objective. Both the experts felt

that the testing the higher objective of application and the associated higher-level competencies had been neglected with a negligible percent of marks accorded to it.

The 2004 paper displayed a similar trend, according to the analysis. The knowledge objective as expected was barely tested. A high percentage of marks, higher by 20% to 26% than the stipulated marks, focused on testing the understanding objective, and the average mathematical abilities, which could be attempted by all categories of students. A major observation of 2004 paper was that the questions estimating the higher problem solving abilities associated with the application objective were totally excluded in this paper.

The 2005 paper was based on a new syllabus and design, which stressed on developing the highest mathematical abilities. However, this is not reflected in the design which reduced the weightage to the application by 5% compared to the old syllabus and design.

Irrespective of the change in weightages, the experts found that once again in the 2005 paper, the understanding objective was assessed to a larger extent higher than the stipulated weightage by about 15% to 20% marks. The application objective and associated higher-level competencies were ignored once again, as they were tested only negligibly.

Though variations in the experts' views were not found to any significant extent with reference to the objectives being assessed in the question papers, there existed vast differences of opinion between the two experts on the identification of the difficulty level of the questions.

A comparative look at the analysis of the three years papers reveals the common pattern that secondary level students in maths are being assessed for the attainment of the simpler objective of understanding, which falls within the lower end of objectives. The knowledge objective, characterized by recall of facts and concepts, has been tested for a lower percentage than that stipulated in the design, in all the three years papers. This appears to be in consonance with the proposed policy of the Board, where a greater weightage is allotted to understanding level questions to enable all categories of students to attempt the paper successfully. The disturbing trend is that, across three years, testing of the higher order application objective has been consistently low and was totally ignored in the year 2004.

Thus, despite the stated objectives outlined in the syllabus and in the National Curriculum Framework, which stressed on the attainment of higher cognitive abilities, the analysis reveals that in actuality, only simple mathematical skills are being assessed through the papers, resulting in a wide schism between the stated objectives and the abilities tested through the question papers.

Another important trend the analysis revealed was the tendency to lift the mathematical problems from the worked or solved examples of the textbooks with which the students were all too familiar.

SOCIAL SCIENCE

An analysis of the objectives and abilities that are being assessed in the Social Science subject must necessarily begin with a statement of the general objectives that are sought to be attained in this subject, at the end of the secondary stage education. An understanding of these objectives would enable us to compare the weightages accorded to the different objectives in the question paper analysis with the weightages stipulated in the design.

1. General Objectives of Teaching Social Science:

The general framework of objectives of teaching Social Science at the secondary stage has been spelt out in the NPE and POA 1992. It has three components -

- i) deepening the pupils' understanding of contemporary India and its social, economic and political development;
- ii) developing in the pupil, a world perspective and an understanding of the problem of the contemporary world; and
- iii) inculcating in the pupil, a spirit of inquiry, a scientific outlook and aversion to injustice and bigotry. (MHRD 1992).

The National Curriculum Framework also outlines the abilities to be developed in Social Sciences:

- a) At the end of secondary stage, the student should develop the ability to describe interaction within natural and human processes and recognize patterns.
- b) They should be able to look for sources of information and analyse problems / issues rationally and scientifically

(NCERT 2000)

The State syllabus for 2003 and 2004 clearly outlined the objectives to be achieved for each subject within social science. The objectives were general and referred mainly to developing the knowledge, understanding and appreciation of historical, political, economic and geographic

events and phenomena and to the skill of drawing and interpreting maps and charts in social science. A few of these are outlined below:

- i) The student will understand the foundation of human civilization and appreciation of the basic unity of mankind.
- ii) The student will understand the study of history of specific countries and regions in the general perspective of world history.....
- iii) The student will develop an understanding and concern about the growing world population and its impact on the environment.
- iv) The student will develop an appreciation of the importance and need of conservation of resources in the light of rapidly growing population.
- v) The student will familiarize with the basic terminology and elementary ideas of economics.
- vi) The student will acquire skills in interpreting simple statistical data ... etc.

(High Schools New Practice Papers 1992-93)

Though the general objectives of teaching social science are stated, the specific abilities which could demonstrate the attainment of these objectives and needed to be developed were not delineated in the syllabus, by the Board of Secondary Education.

2. Stipulated Weightage to Objectives in the Design:

A scrutiny of the design and model blueprint prepared by the Board, which is to serve as a guide to the paper setter, reveals that in social sciences, the four broad instructional objectives of knowledge, understanding, application and skill have not been clearly delineated.

It is interesting to note that the higher objectives of understanding and application have been grouped together in one category and a common weightage (percentage of marks) was allocated to testing both these objectives. A look at the model blueprint reinforces this fact, wherein the higher order objective of application and that of understanding have been equated and referred to synonymously as 'understanding or application' (Revised Syllabus of SSLC Exams.

1994-95). Thus, from the Board's point of view, no need has been felt to distinguish between these two higher order objectives. The distribution of weightage to these four objectives, in social sciences, is as follows:

Objective	Percentage
Knowledge	40%
Understanding and Application	56%
Skill	4%

(Revised Syllabus for SSLC Exams – 1994-95)

SOCIAL SCIENCE - 2003

1. Weightage to Objectives: Question Paper Vs Design:

In the 2003 paper, the allotment of marks to the *knowledge* objective was perceived to be higher than the stipulated 40% by all the three experts. Their allotment to this objective ranged from 48% (paper setter) to 53% (teacher educator). Thus, two of the three experts estimated the marks testing the knowledge objective to be 8% to 13% higher than the stipulated weightage, while the third expert found it to be only marginally higher at 42%.

The understanding and application objectives were assessed at 48% (36% + 12%) and 54% (51% + 3%) by two of the three experts and these estimates were slightly lower than the stipulated 56% set aside for the higher objective of understanding and application. The third expert (the teacher educator) found the allocation to be much lower than the design at 43% (26% + 17%). A deeper examination reveals that two of the three experts allocated 12% and 17% marks to the higher objective of application, which was in consonance with the design. There were wide variations in the experts' analysis on questions testing the understanding and application objectives which revealed that the experts could not clearly distinguish between these two higher order objectives.

It was found that there was complete unanimity on the identification of the skill objective, which had questions for 4% of the marks.

The chief competencies that were called forth in the 2003 paper were recall (52%, 48% and 42% marks). The understanding objective was exemplified by abilities of explains concepts (11%; 27% marks) and gives reasons (16%; 4% marks). The application objective was associated with the ability of critically analyses (8%) and justifies (13%). The competency of drawing maps/charts/diagrams was tested for 4% of the marks.

A perusal of the variance in the experts' views exhibits that for 23 of the 50 questions, there was complete agreement among the 3 experts on the testing of specific objectives. For the remaining 27 questions, 2 of the 3 experts held similar views on the objectives the questions tested. While in 12 of these questions, the difference pertained to whether the questions tested the knowledge or understanding objective, for the remaining 15 questions, the differences were on questions assessing the higher order Understanding or application objective.

2. Weightage to Form, Content and Difficulty Level – Question paper Vs Design:

A small deviation from the design was found in the weightage to content. The drawback was that the weightage to chapter 6 in Geography, chapter 3 in Economics and chapter 7 in History was reduced. Extra weightage had been given to chapter 3,4 and 5 in History.

The weightage to form of questions was strictly in accordance with the set pattern. The experts felt that under VSA form of questions, a variety of questions could be introduced such as completion type, analogy and chronological order.

Individual perceptions have played a great role in categorizing questions according to their difficulty level. The teacher educator and paper setter found difficult questions worth 28% and 32% marks respectively, while the classroom teacher assessed these for only 14%. The majority of the questions were judged to be average or easy by all the three experts.

The overall view of the experts on the 2003 paper varied to a great extent. The teacher educator felt that the assessment of the knowledge objective was higher and there was a need to increase the questions testing understanding and application. The paper setter, while finding a marginally higher weightage to knowledge objective, called it a good question paper. The classroom teacher too felt that the question paper was balanced in terms of weightage to

objectives. What emerges from the analysis is the fact that while two of the three experts concurred on the knowledge objective being marginally higher, there were wide differences in the identification amongst the experts on questions testing the higher objectives of understanding and application. This brings out the fact that as in the design, in practical situations too, the experts have not been able to clearly distinguish between the two higher order objectives.

SOCIAL SCIENCE - 2004

As the syllabus of 2003 was also applicable to 2004, the stated objectives and weightages allotted to them, in the design, also remained the same. The three experts displayed a high degree of unanimity in the analysis of the 2004 paper.

1. Weightage to Objectives - Question Paper Vs Design:

All the three experts concurred very closely on the fact that the *knowledge* objective had been assessed to a greater extent in the 2004 paper. This was estimated at 52% by one expert and 54% by the remaining two. This was 12% to 14% higher than the stipulated 40% marks allocated for testing the knowledge objective, in the design.

The *understanding* and *application* objectives were found to be tested for 44% (40% + 4%), 42% (26% + 16%) and 42% (37% + 05%) by the three experts, which was considerably lower than the allocated 56% to the two objectives. While all the three concurred on the totals, there were once again variations while distinguishing between the understanding and application objectives.

The higher objective of application was estimated by two of the three experts to be fairly low with only 4% to 5% marks, allocated to it. This appeared to be at the cost of the excessive importance attached to testing the knowledge objective. The third expert (the paper setter) found allotment to the application objective to be high at 16% marks. The skill objective was allotted 4% marks by all three uniformly.

A closer look at the analysis by the experts reveals that the variance in their responses was less. For 33 of the 50 questions, all the 3 demonstrated complete unanimity of the objectives

being tested. For the remaining 17 questions, at least 2 of the 3 experts held similar views. The differences of opinion pertained mainly to questions testing the higher order objectives of understanding and application.

The picture that emerges from this analysis is that there is general agreement among the experts that the knowledge objective has been accorded greater weightage than stipulated. However, there is not much unanimity on the distinction between questions testing the understanding and application objective in Social Sciences, This is quite unlike the pattern that emerged in the maths and science subjects, where there was a great consensus on the lack of assessment of the higher objective of application.

The competencies which were tested through the questions in the 2004 paper were the following. The recall competency was primarily assessed for 52-54% marks. The understanding objective was sought to be attained through testing abilities such as giving reasons (15%, 13% & 10% marks); and explaining concepts (19% & 7% marks).

The greater importance given to testing the knowledge objective in the 2004 paper reflects the testing of mainly the recall competency. Higher mental abilities, that need to be developed and assessed at the secondary stage in Social Science include Critically examines phenomena, Assesses various aspects, Analyses issues, Draws inferences etc. These, it appears, have not been assessed through the 2004 question paper.

2. Weightage to Form, Content and Difficulty Level - Question Paper Vs Design:

The weightage to content was found to be more or less appropriate. Extra weightage had been given to chapters 4, 5, 6, 7 and 9 in History while the weightage had been reduced in chapters 3 and 8. Distribution of marks to the chapters in Geography and Economics was apt.

The weightage to form of questions was strictly as per the design approved by KSEEB.

There were differences in individual perceptions on the difficulty level of questions. Two of the three experts estimated the difficult questions to be of 15% to 17% marks, the third expert put these at 9%. However, the bulk of the questions were placed as average or easy, and the distinction between the two types was not maintained.

The overall view of the paper according to all the three experts was that questions were predominantly testing the lowest objective of knowledge to a greater extent than what was laid

down in the design. Two of the three experts also felt that there was a dearth of questions testing the application ability and more balance could have been maintained in the weightage to objectives. The paper was found to be appropriate with regard to the weightage to difficulty level of questions. While catering to the intelligent students, a higher percentage of marks were reserved for questions that could be attempted by average children.

SOCIAL SCIENCE – 2005

1. General Objectives of teaching Social Science:

The new syllabus introduced for the year 2004-2005, unlike the previous one, has clearly distinguished between the four instructional objectives. It states that the general objectives of teaching social science include –

- (1) Acquire the knowledge about the process of change and development through human societies
- (2) Acquire understanding of the process of change and development through which human societies have evolved
- (3) Develops critical thinking about the various social, economic and political challenges facing the world.
- (4) Develop ability to appreciate the contribution made by human civilization for the basic unity of mankind.
- (5) Develop skills and abilities to read, analyse and interpret geographical information and data

(High Schools Revised Syllabus 1999-2000)

Apart from these broad general objectives, the expected learning outcomes, and competencies sought to be developed through the social science syllabus, are the following -

- (1) Acquires knowledge and information about the features of various events and phenomena.
- (2) Develops abilities to compare with reference to present social and political order.
- (3) Develops critical thinking.

- (4) Evaluates impact of new religions.
- (5) Analyses the conditions responsible for.
- (6) Assesses the contributions of kingdoms.
- (7) Understands the basic requirements of democracy.
- (8) Acquires skills in preparing maps.
- (9) Understands the meaning of environment and the importance of maintaining ecological balance.
- (10) Critically examines the impact.

(High Schools Revised Syllabus 1999-2000)

2. **Stipulated Weightage to Objectives in the design:**

Unlike the old design of the previous two years where the higher order objectives of understanding and application were equated in one category and allocated a combined weightage of marks, the new design and model blueprint, clearly distinguishes between the four instructional objectives. Here, a separate weightage (percentages of marks) was allotted for assessing each of these objectives separately which is as follows:

Objective	Percentage
Knowledge	40%
Understanding	38%
Application	18%
Skill	4%

(Revised Syllabus for SSLC Question Papers Design and Model Blueprint 2004-2005)

3. **Weightage to objectives:- Question Paper Vs Design:**

The analysis shows that two of the three experts (teacher educator and classroom teacher) discovered that once again the *knowledge* objective has been predominantly tested in the

paper. The percentage of marks allotted to it being 52% and 57%, which was higher by 12% to 17% marks than 40% set out in the design. The third expert (paper setter) however maintained that this objective was adequately assessed and allotted 45% marks to it.

Two of the three experts found that the *understanding* objective was appropriately assessed with the marks allotted to it ranging from 33% to 41% against the stipulated 38%. The third allocated 31% marks to it.

Two of the three experts i.e., the classroom teacher and teacher educator (who also found the knowledge level questions in the paper to be higher), felt that questions testing the higher objective of *application* were lacking and needed to be increased. The percentage of marks allotted to this ability by them was 3% and 6% respectively, compared to 18% laid down for it. The third expert (paper setter) who found a good distribution with reference to objectives being tested allotted 20% for the testing of the application objective.

The skill objective was appropriately assessed being allotted 4% marks, as per the design.

A deeper look at the variance in the experts' responses revealed that for 26 of the 50 questions in the paper, the three experts identified the same objectives being tested. For the remaining 23 questions, 2 of the 3 experts concurred on the objectives they assessed. Of these 23 questions, in 13 questions the differences of views were regarding the testing of the application or understanding objectives, and in the remaining 10, the experts differed on questions assessing the knowledge and understanding objectives. Only one question (Q. 14) was judged differently by the 3 experts.

The expected learning outcomes that were assessed in the 2005 paper were as follows: The recall competency was most commonly identified by the experts for the maximum number of marks (52%, 57% and 45%). The understanding objective was assessed by the learning outcomes such as Explains concepts (22%, 13%); Gives reasons (9%, 6% & 8% marks); Arranges historical events in order (10%); and Identifies and Gives illustrations (6% marks each).

As the knowledge objective has been predominantly assessed in the 2005 paper, the associated competencies sought to be developed were mainly of recall and recognition. The prominent abilities displaying the understanding objective were explains concept and gives reasons. Hence it is found that the learning outcomes sought to be developed and slated above such as critical thinking, analysis and evaluation have been seriously ignored in social sciences.

4. Weightage to Form, Content and Difficulty Level:- Question Paper Vs Design:

The weightage to content was also found to be in keeping with the content load and weightage fixed by KSEEB except that there were minor variations between weightage to Geography and Economics, due to the chapter on Agriculture, which is common for both subjects.

All the three experts found the weightage to form of questions to be in agreement with the pattern decided and approved by the Board. The experts felt that combined questions testing different objectives could be avoided, or if given, should test the same objective.

In appraising the difficulty level of questions, all three experts found a higher percentage of marks for average and easy questions. There were large variations in the way the questions were placed as average or easy and this could possibly be explained by their varying perceptions and backgrounds. To some extent it was felt that difficult questions were fewer being allotted 17% to 24% marks, compared to the 30% in the design.

The overall view of the paper by the majority of the experts was that it mainly assessed the lower level objective of knowledge, to the exclusion of the application objective. Though questions did test the students for the higher objectives, in the view of the experts, it was a very average paper, mainly to help the children coming from rural areas. Most of the questions in the paper were found to be selected from the exercises given in the textbook. There was a need to standardize the paper so that intelligent students could take it as a challenge.

Overview and Trends – Social Science

This section summarizes the findings of the analysis of three years question papers to provide an overview of the trends and patterns that have emerged from the analysis.

In the year 2003, two of the three experts found memory based questions to be marginally higher by about 8% to 13% marks and the understanding and application objectives were together assessed for marks that were marginally lower by 8% to 12%.

For the year 2004, all the three experts found the percentage of marks assessing the knowledge objective had increased, and these were higher than the allotted weightage by 12% to 14%. Thus the analysis exhibits a rise in the weightage to knowledge objective compared to the previous year. The questions testing the understanding and application objectives were allotted

marks which were lower by 12% to 14% compared to the design. Two of the three experts found a negligible percentage of marks assessing the application objective.

In the 2005 paper, there was a further escalation of marks testing the knowledge objective. Two of the three experts estimated these as being 12% to 17% higher than the stipulated 40% marks. Two of them also found marks testing the understanding objective to be in near accordance to the design, but the marks for evaluating the higher objective of application fell far short of the recommended weightage.

A comparative over view of findings over the 3 year period reveals that in the 2003 paper, the assessment of the knowledge objective was slightly higher than the design. However, there was a significant increase in marks allotted to memory based questions in 2004. The allocation to the lower level knowledge objective was even higher in 2005. A marked feature in the 3 years was the decline in the assessment of the application objective according to the experts.

With reference to the variation in experts' views by their background, one can observe the consistency in the teacher educator's views on the precedence given to assessing the knowledge objective, which progressively increased over the three year period. In comparison, the paper setter's analysis and comments reflect his desire to concur with the stipulated weightages, which is evident from his analysis of the question papers.

Reflecting back on the objectives which are sought to be attained at the end of the secondary stage, as outlined both in the Curriculum Framework and the State syllabus, what can be observed is that these are neither being developed nor evaluated through the secondary examinations. In social sciences, the development and assessment of higher order skills of critical thinking, analysis and evaluation have not been focused upon, and testing the rote based memorization of factual knowledge seems to continue.

One striking aspect that becomes apparent from the question paper analysis is that in the field of social sciences, the experts do not distinguish, clearly between the attainment of the higher order objectives of understanding and application. This is evident from the wide variations in the manner in which questions have been assessed. This is endorsed by the fact that design prepared by the Board itself, till recently, did not distinguish between the higher order objectives allocating a combined weightage to them. Hence, what one finds in the field of social science is the lack of awareness at all levels (in the Board and within the school set up) of the distinction between the higher educational objectives that need to be taught and assessed.

THE QUALITATIVE ANALYSIS

This chapter presents a qualitative analysis of the question papers in each subject undertaken by the experts. (i) It puts forth their views on the inadequacies found in specific questions, on the major shortcomings of each paper and how these may be overcome; (ii) It highlights the suggestions proffered by them on how given questions may be reframed so that higher order objectives may be effectively assessed; and (iii) It offers an assessment on the overall quality of question papers with reference to certain important parameters such as language clarity, delimitation of scope of questions, content validity etc. The year-wise analysis of each question paper within each subject is presented below:

Science – I - 2003:

In the Science I 2003 paper, the following were the major shortcomings identified:

1. Some of the questions were grammatically incorrect and wrongly worded. There was an improper use of words in certain questions (Question Nos. 5, 9, 12, 14, 16, 21 and 25).
2. Two questions had to be made more specific as the scope of such questions was not clearly defined (Question No. 13 and 28).
3. Translation errors existed in the Kannada version of the question paper, where some questions did not convey the same meaning in the two languages (Question Nos. 10, 7, 16 and 28).
4. Majority of the questions - approximately 20 of the 31 questions - were found to be taken directly from the exercises in the textbook. Formulation of alternate questions could test the higher order objectives more effectively.

The experts suggested ways to modify questions so that the above mentioned errors could be rectified, as follows:

- i) *How are X rays useful in Medical Diagnosis*, instead of *Write the role of X rays* (Q.No.25).

- ii) *Which are the 2 main allotropic forms of Phosphorus* instead of which are the 2 chief allotropic forms (Q.No.12).
- iii) *Name the Electro-magnetic radiations useful for taking pictures*, instead of which type of camera can be used to photograph an object totally invisible to the naked eye (Q. No. 5).

Experts also reformulated certain questions so that higher objectives of understanding and application could be assessed. The questions are upgraded to test the reasoning and explaining abilities instead of testing mere recall of names / concepts / symbols:

- i) *State two applications of radar*, instead of two uses (Q.17).
- ii) *State the layer containing atomic oxygen*, instead of what is exosphere (Q.8).
- iii) *What are constituents of coal*, instead of what is coal (Q 14).
- iv) *Biogas is best suited for cooking, why?* Instead of Name the raw materials used to produce biogas (Q. 15).
- v) *Why can't the efficiency of a heat engine be 100%*, instead of Draw a neat labeled diagram of a petrol engine (Q 31).

Science – I - 2004:

1. A major shortcoming of this paper was that a few questions were general and not specific; not calling for a clear and definite answer as a result of which the expected answers could vary. Thus the wordings of the questions could be made more specific (Q. 3, 21 and 22).
2. The allotment of marks to certain questions was not appropriate as a few 2 marks questions required lengthy answers. Moreover, some questions of 4 marks (LA) could be formed to test higher abilities other than just skill.
3. Translations errors existed in the Kannada version of the paper wherein questions did not mean the same as in English version (Q. 17 and 19).
4. 13 of the 31 questions were found to be identical to those in the exercises of the textbook. Modifications were recommended appropriately to elicit better and accurate responses for e.g.
 - i) *What are the applications of space crafts*, instead of what are the achievements of spacecrafts? (Q.21).

- ii) What is the orbital period of an artificial satellite, instead of what is the orbital period of a satellite? (Q. 22).

The experts formulated questions, which called forth competencies that could effectively display the attainment of the higher order objectives of understanding and application rather than questioning children to test their ability to recall facts and information. Some of these questions called for demonstrating higher order skills such as identification, explanation, distinguishing and application of previous learned facts to analyse a new situation. Examples of such questions are -

- | | |
|------|---|
| i) | <i>Pick out recycling materials from the following - metal, petrol, glass, coal, instead of Name 2 recycling materials (Q.7)</i> |
| ii) | <i>People in Australia are prone to skin diseases. Which is the electromagnetic radiation responsible for this, instead of write 4 uses of ultra violet light (Q.No. 11).</i> |
| iii) | <i>State differences between constellation and Zodiacal constellation, instead of name the types of galaxies (Q. 16).</i> |
| iv) | <i>State the functions of alum and chlorine in water, instead of a direct question asking for the biological importance of water (Q.20).</i> |
| v) | <i>What property of laser is used in (1) optical communication (2) laser surgery, instead of state the differences between laser and ordinary light (Q.27)</i> |
| vi) | <i>What is retrograde motion and its effects on planet earth, instead of name the planets (Q.15).</i> |
| vii) | <i>In which engine is a spark plug used, instead of why is a spark plug not required in a diesel engine (Q. 9).</i> |

Science – I - 2005:

The prominent lacunae, which were identified in this paper, were -

1. Some questions were rather general and called for long, varied answers, instead of specific answers.
2. For certain questions, marks were not allocated appropriately Questions carrying 1 or 2 marks, could have been estimated for 4 marks due to the length of the expected answers.

3. Words used in the questions could be made simpler, to make it more easily comprehensible for students (Q. 2, 23, 30);
4. 25 of the 31 questions were identical to those present in the textbook. Incorporating such questions in the paper could encourage rote memorization, and prevent the assessment of higher order skills.

Experts have put forth ways to test the same content area by formulating alternate questions instead of the regularly asked questions. Yet, other questions were developed which called forth the abilities that could assess the higher order understanding objective. Some examples are -

1. *Why is watering necessary for cement*, instead of draw a sketch of a rotary kiln? (Q. 2).
2. *How is a black hole recognized?* (Q. 25).
3. *Examples of hydro carbons may be given and student is asked to classify into Alkane and Alkene* instead of state the differences between the two (Q.22).
4. *Arrange stars in increasing order of their magnitude*, instead of how many times is a star of the 1st magnitude brighter than a star of the 3rd magnitude (Q. 17).

The identification of the shortcomings found in the Science - I papers, and a demonstration of how higher order objectives may be assessed by presenting an alternate set of test items, is followed by an analysis of the quality of questions in the 3 years papers.

Quality of Questions in 3 years Question Papers:

The questions were based on pre-set objectives and tested these effectively. In the Science 1 subject, the 3 experts were of the view that in the 2003 paper, almost all questions were suitable for testing the concerned objective effectively. This was justified by the experts who stated that the questions called for certain specific abilities which demonstrated the attainment of the objective. The same findings were reported by them for the 2004 and 2005 question papers. However, the analysis of question paper revealed that the lower order objective of knowledge was assessed for a larger percentage of marks, which affected the overall quality of the paper.

The second dimension pertained to the content area the questions tested. Experts found all questions to be from either the syllabus or textbook and almost all the questions possessed content validity in that they sampled the same content area intended to be tested. The finding held good for all the 3 years papers.

The form of question chosen depends on the kind of ability and content area being tested. It was found that except for a couple of questions, the form of questions chosen was quite suited for testing the appropriate abilities and content.

With reference to delimiting the scope of the answer, while 2 experts felt that most of questions had clearly specified the scope and length of the expected answer, the paper setter found that 6 / 31 questions in 2003 and 8 / 31 questions in 2004 did not fulfill this requirement.

A good question should be framed in clear and simple language, easily comprehensible by all. In the 2003 Science I Paper, 2 of the 3 experts found around 7 / 31 questions were unclear in the wording of questions. They also found that about 8 / 31 questions were not easily comprehensible. Around 5/ 31 questions were found to convey different meanings in English and Kannada versions. However, the questions had appropriate use of directional words. In 2004 and 2005 papers, almost all questions were found to have language clarity, were easily comprehensible by all and conveyed similar meaning in English and Kannada versions in the view of 2 of the 3 experts.

Lastly, data reveals that in all the 3 years papers, most of the questions were valid i.e., they tested the objective appropriately, according to the 3 experts.

Thus, the question wise analysis of all questions of the 3 years Science - I papers shows that most of the questions fulfilled the criteria required to be categorized as good quality questions. However, as the analysis has shown, the question papers were imbalanced in the sense that questions primarily focused on testing the lower order objectives.

Science - II - 2003:

1. The major shortcoming of this paper pertained to language errors in the questions. All the experts pointed out that certain questions did not convey the same meaning in the Kannada version as it did in the English paper (Q. 5, 9, 14 and 15). In fact, a portion of the question was found missing in the Kannada version (Q. 16).

2. Certain questions were rather general and did not specify the expected length of the answer. Hence, the scope of answer was not clearly defined (Q. 6, 12, 16 and 17).
3. A few questions were found to test the same area of content while there was a wide scope for selecting questions from the different chapters.

Experts have offered valuable hints on how the questions may be restructured so that the question papers are valid tests of desired competencies and higher curricular objectives such as understanding and application. The methods employed to assess these involve creating novel situations, calling forth abilities such as logical reasoning, identification and application of learned concepts.

1. *Cite examples of trophic levels and ask students to identify the same (Q. 3)*
2. *State the energy requirements of different categories of people and students have to analyse the same (Q. 4).*
3. *Symptoms of the disease are presented and the student identifies the disease (Q. 12).*
4. *Distinguish between Cold Storage and Freezing? Which method is used for distant transportation? (Q. 17), instead of what is meant by dehydration?*
5. *Distinguish between nitrification and denitrification, instead of define nitrification (Q. 7).*

Science – II - 2004:

The subject matter experts identified the following deficiencies in the 2004 paper:

1. The scope of certain questions was not clearly defined. As a result, there were a vast number of possible answers which could be given (Q. 5, 13 and 17).
2. Certain questions gave clues to the expected answers which could be avoided (Q. 5, 10, 11 and 16).
3. Some of the questions in the Kannada version were not satisfactory in terms of meaning conveyed (Q. 15).
4. There was an unnecessary use of difficult words in some questions which could be avoided (Q. 16).

The questions have been modified so as to overcome these inadequacies:

- i) Questions can be made more specific for e.g. *why will citrus fruits get toxic in metallic containers?*(Q.1); *what are effluents and how can they be treated?*(Q.13).
- ii) Questions are also changed to increase their difficulty level, such as *Enumerate 4 measures taken by the Government to preserve biodiversity* (Q. 9).

The experts have put forth a number of alternate questions which may successfully assess the higher order objectives of understanding and application. These questions call forth specific competencies such as classifies, justifies, predicts and applies knowledge to new situations, which would demonstrate the attainment of these higher objectives.

1. *The student is given examples of saccarides such as rebose, cellulose etc. and asked to classify and group them into mono or polysaccharides.* This is in place of merely distinguishing between mono and polysaccharides (Q. 7).
2. *'How are hydrophytes adapted for aquatic life - justify'* - can be asked in place of Enumerate the 4 adaptations of hydrophytes (Q. 16).
3. *A situation is given where particular food stuff gets spoiled. The student is asked to predict the consequences* (Q.1)

Science - II - 2005:

The panel pointed out a number of lacunae in the paper, though only a couple of questions in the paper may have each of these deficiencies:

1. Some questions did not demand a specific answer. Their scope was not clear, and there could be many possible answers to these questions (Q - 3, 4 and 12)
2. Some questions had unnecessary words making them difficult to understand (Q. 5).
3. In certain questions, clues to the answer were provided in the question itself (Q. 13).
4. The Kannada version of some questions was not clear (Q. 10 and 17).
5. Some questions have usage of words, which are not clear in the text itself e.g., the word 'endemic disease' needs to be clarified in the text (Q. 9).

Experts reframed such questions so that these shortcomings could be overcome -

- i) *What is a muscular tissue?* instead of name the tissue responsible for movement (Q.13).
- ii) *Name the device to test the density of milk,* instead of name the device to test the purity of milk (Q. 4).

Suggestions were also given by the panel on how to create test items which would be conducive for testing the higher order understanding and application objectives.

1. *A man injured his right cerebral hemisphere in an accident. What effect will this have in his body?(Q.14).*
2. *The conditions of goitre are depicted in the question and the students are requested to predict the disease (Q. 9).*
3. *State an example like 'touching a hot object' and the student predicts which type of action it reflects (Q. 14).*
4. *Why are hormones called chemical messengers, instead of what are hormones (Q. 9).*

The detailed analysis of each question has pinpointed the lacunae present in them as well as offered suggestions on the modification of certain questions to suitably test higher order skills. We also take a look at the overall quality of questions in the three years papers.

Quality of Questions in 3 years Question Papers:

An attempt has also been made to assess the quality of the questions in the Science II Question Papers, by eliciting the experts views' on the different dimensions of a good question, and to assess how many questions of the paper met these conditions. The results of the analysis are presented below:

Almost all questions were based on a preset objective and were to be suitable for assessing the chosen objectives in the papers. This was justified by the experts who stated the specific abilities which exemplified the attainment of the objective called for by these questions. One of the experts highlighted that the form of questions were suitable for testing the particular objective as the questions carried a certain number of marks, rather than emphasizing on how well they tested the concerned objectives.

Concerning the relevance of the content area on which questions were based, it was found that all questions were drawn from the syllabus or textbook and all sampled the same area of content, aimed to be tested. These were the views of all the 3 experts on all the 3 years papers.

With reference to delimiting the scope of the expected answers, 2 experts found that except for a couple of questions in 2003 paper where the length of the answer was not in accordance to the estimated time and marks allotted, all the others met this requirement. In 2004, the paper setter found 6/17 questions with this inadequacy, while the other 2 experts were satisfied. In 2005, all questions had appropriately indicated the scope of the expected answer.

The wording or language of the questions was found to be clear and precise in all the 3 years papers and the questions could be easily understood by all. The paper setter found 3/17 questions in 2003 with unclear wordings. 2 experts were not satisfied with 2 or 3 questions in the 2003 paper where Kannada versions of questions conveyed a different meaning. In 2004, the paper setter found 7 out of the 17 questions having problems of translatability. In 2005, only 1 or 2 questions had such errors. Directional words pinpointing the scope of answers were appropriately used, except 1 or 2 questions in the 3 years papers.

The estimated marks were allotted fairly satisfactorily for all questions in the 3 years papers except for 1 or 2 out of 17 questions in 2003 / 2004.

Lastly, the overall comment on the validity of the questions revealed that 2 of the 3 experts found that all the questions were valid, in that they effectively tested the objectives. The paper setter could not give relevant responses to the issue of validity of questions.

Thus, except for language errors in terms of not conveying the same meaning in English and Kannada versions, which were present in a few questions, most of the questions in the 3 years papers met the requirements to be judged as good questions. It was also discovered that the quality of the 200 paper was good as it complied with the design to a great extent. However, 2004 and 2005 papers were found to be imbalanced as they assessed the lower order knowledge objective for a high percentage of marks ignoring the assessment of the critical higher order skills.

Maths 2003:

The Maths 2003 papers had a number of flaws, which were of the following nature -

1. Some questions had language errors, which were mainly grammatical (Q. 12, 15 and 28). There were also translation errors in the Kannada version of the paper (Q. 7 and 17). The English version had errors with certain symbols missing which did not convey the correct meaning (Q. 41).

2. The structure of the sentence was not found to be appropriate for certain questions. The framing of questions made them unclear and incorrect (Q.11, 30,31 and 38).
3. Directional words were not used for certain questions which needed to be included for further clarity (Q. 36).
4. Estimated marks were allotted inappropriately, for certain questions which should have had more marks allotted to them as their solving involved many more steps (Q.15, 25 and 35).
5. A basic drawback of the paper that both experts discovered was that many questions were taken directly from the textbook (Q. 6, 11, 14, 15, 17, 23, 24, 25, 28, 29, 32, 33, 35, 40, 41, 43 and 44). Some were also taken from the solved or worked examples in the text book.

The experts recommended altering some of these questions so that the inadequacies could be removed. (i) Appropriate directional words needed to be included such as 'state the reason'. (ii) Questions had to be made clear (Q.4) by reframing them so that appropriate symbols and missing words could be included e.g., inclusion of the word "formula" in the English version (Q.12) and putting the appropriate symbol (Q.41). This would help in conveying the correct meaning.

Examples of the altered questions are -

- i) Construct Calley's table for 1, 3, 7, 9 and check whether it is a group.
- ii) How many oblique planes are there in a square pyramid (Q. 11).

The experts strongly recommended that the trend of lifting problems directly from the text book with same numerical values should be avoided. An attempt must be made to change numerical values and figures in the problems so that the paper may be standardized.

The experts could not come up with suitable questions which could effectively assess the higher order objectives of application and analysis.

Maths 2004:

1. The major problem identified in this paper was the inappropriate allotment of marks, though the questions were valid. It was felt that for many 2 marks questions, 3 marks could

have been allotted (Q.12, 13, 17 and 20) while many 3 marks questions deserved 4 marks (Q.30, 32 and 33) and the 1 mark question could be allotted 2 marks (Q. 10).

2. The second shortcoming was that a few questions lacked clarity, and appropriate directional words were absent, and some were grammatically incorrect (Q.2, 6 and 7).
3. The third major drawback, which was identified by both experts, was that most of the problems in the paper were taken directly from the textbook. This was not a healthy trend as even the understanding objective was not being properly assessed. Questions taken from the text were 14, 15, 16, 17, 19, 20, 22, 23, 25, 27, 28, 29, 30, 31, 35, 36 and 43).

The experts suggested putting an end to this tendency, by calling for the creation of questions with different numerical values and measurements not found in the text book, but related to the content prescribed in the syllabus.

Minor modifications to the questions were also recommended, such as -

- i) Simplify by taking the square roots positively (Q. 30).
- ii) Use the directional word in the question "Give reasons wherever required" (Q. 32).

Once again the experts could not conceive of alternate set of questions, which could successfully test the higher order problem solving abilities of children.

Maths 2005:

The common lacunae the questions of the Maths 2005 paper suffered from were the following:

1. The allotment of marks was not found to be appropriate for a few questions. Hence some questions should be SA 1 type instead of SA 2 type, as the number of steps involved in the solution were few (Q. 28 and 39).
2. Translation errors were present for certain questions with certain terms found in the Kannada version, not being present in the English version (Q. 12).
3. Some questions were not specific and as a result, expected responses were not clear. In a certain question, it was unclear whether the check had to be done by drawing or by using the condition. The question was therefore found to be vague as the objective to be tested could not be decided (Q. 26).

4. A number of problems in the paper were the same as those present in the text books, in terms of their numerical values and measurements (Q. 11, 20, 21, 24, 25, 28, 36 and 41). Some were also from worked / solved examples of the text book (Q. 16, 17, 22, 23, 32, 33 and 34).

Modifications of such questions have been suggested to overcome such difficulties:

- (i) The question can be structured to test a particular objective e.g., check whether the figure is transversable or not by drawing arrow marks (skill level), by using the condition of transversibility (understanding level) (Q.26).
- (ii) The question must incorporate the word arithmetic series, in the English version, as it is present in the Kannada version (Q.12).
- (iii) Grammatical errors should be removed e.g., find the co-efficient of variance (Q. 15).
- (iv) Questions can be restructured and framed differently with different values and measurements so that a correct assessment of the understanding and application objectives may be obtained.

As such, no particular suggestions / alternate questions were preferred by the experts on how higher order objectives could be assessed.

Quality of Questions in 3 years papers:

The analysis of 3 years question papers has also evaluated questions on important parameters pertaining to the overall quality of the questions. In the Maths subject, the results were the following -

Almost all questions were framed on the basis of pre-determined objectives and were suitable for testing the particular objective chosen in 2003, but in remaining 2 years papers, a few of the 44 questions did not satisfy this condition according to 1 of the 2 experts. The teacher educator justified the view that questions effectively assessed the objectives by stating the specific ability called for by them. The paper setter could not give an appropriate justification for 14 of 44 questions. In the 2004 and 2005 paper, the paper setter stated the specific ability called for, as an indicator of questions effectively testing the objective. The teacher educator also stated that the

particular form of question was appropriate to test the objective as it carried a particular number of marks.

The experts had no complaints regarding the content area on which questions had to be based. All questions, in the experts' view, were taken from the syllabus and most importantly, almost all sampled the same area of content they attempted to test.

Except for 1 or 2 questions in all the 3 years papers, the questions were so worded that the length (scope of the expected answers) was clearly specified in the view of both the experts.

While framing questions, the language of questions must be simple and precise, and this characteristic of a good question was fulfilled by almost all questions in the Maths papers. They were simply worded and could be easily comprehended. In 2003 paper, the teacher educator found the wording of 7 of the 44 questions faulty with reference to Kannada version and the paper setter found this inadequacy in 3 questions. However, in the next 2 years, this deficiency was seen only in 2 to 3 questions. Appropriate directional words were found to be used for majority of the questions.

With reference to the appropriateness of marks allotted to the questions, in 2004 and in 2005, a number of questions, about 4 to 8 out of 44, were found to be unsuitable for the number of marks carried. The marks were either too few for the mental processes called for or greater than required.

Almost all questions, in all the 3 years, were found to be valid i.e., they effectively tested the objective, in the view of the experts.

It can thus be stated that in all the 3 years Maths papers, while majority of questions satisfied most of the other criteria which are important for them to be categorized as good questions, the major shortcoming of the paper as a whole was that the lower order objective of understanding was primarily tested for the largest percentage of marks. Hence the quality of the overall question paper was affected as it was not balanced in the assessment of the different instructional objectives.

Social Science - 2003:

Experts pointed out the main deficiencies of the 2003 Social Science Paper. They also modified some of the questions so that these inadequacies could be overcome, making the questions more specific and grammatically correct, so as to elicit better and more accurate answers.

1. Certain questions did not call for specific answers and could generate a number of different responses (Q. 20, 25, 26, 32 and 36).
2. Some questions required lengthy responses; hence the allotment of marks was not appropriate (Q. 24).
3. The paper was abundant in language errors in both the English and Kannada versions (Q.7, 21 and 26). Translation errors were replete in a number of questions (Q.13, 16, 27, 31, 38, 42, 43, 44 and 45). In certain question, the English version had 2 parts while the Kannada version had only one part (Q. 31). In some questions, words used in English and Kannada were different (Q.38).

The modifications of some of these questions were the following:

- i) Explain 3 causes for the failure of the 3rd 5 year plan (Q. 42).
- ii) List 4 provisions of Morley - Minto reforms (Q. 32).
- iii) The more famous literary work of Dayanand Saraswati was.... (Q.7).
- iv) Which are the permanent members of the Security Council ? (Q. 21)

Suggestions on how questions may be framed to assess the higher objectives have not been put forward for the 2003 paper by the experts.

Social Science 2004:

1. The major flaw in the Social Science 2004 paper, discovered by the teacher educator, was the fact that the scope of the questions was not appropriately limited. The questions were not specific and could generate lengthy, detailed answers. As a result of this, the estimated marks allotted could become inappropriate (Q. 24, 26, 30, 32, 35, 38, 39 and 47). Alterations to some of these questions have been suggested to make them more specific.

- i) Explain briefly the factors responsible for Great Depression (Q. 32).
- ii) Why did Portuguese power decline - support with six factors (Q. 38).
- iii) What were the 3 important economic causes for the Great War of Independence (Q. 39).
- iv) Mention any 3 Social Service Programmes of Ramakrishna Mission (Q. 43).

To make the questions more thought provoking, the experts suggested several up gradations of the questions which could assess the broader objectives of understanding and application.

- i) A recall question such as what is southernmost point of India called can be converted by *stating the location of the place in latitude / longitude and asking the student to identify the place* (Q. 15).
- ii) *Why are cottage industries called household industries* instead of what is another name for cottage industry. (Q. 17).
- iii) *Why are paper mills situated in the region where sugar is grown* instead of Name industries dependent on sugar (Q. 24).
- iv) *Why are Directive Principles of State Policy included in our Constitution* instead of recall the Directive Principles of State Policy (Q. 28).
- v) *Economic conditions were one of the causes of the War for Independence - Justify how*, instead of enumerate the economic causes of the Great War of Independence. (Q. 39).

Social Science - 2005:

1. A major inadequacy of this paper was that some questions were not specific and as a result varied responses were possible, especially in the form of lengthy answers. The number of factors to be mentioned while answering was not specified (Q.9, 21, 26, 27, 35, 44 and 48).
2. The second shortcoming was that the form of questions chosen in some cases was not appropriate. Certain questions could have carried a higher number of marks, as the

answers expected were lengthy. Hence the Long Answer (4 marks) form or Short Answer form (3 marks) could have been utilized (Q. 22, 28, 30, 41 and 50). It was found that a few questions testing the application objective which required justification of the student's views carried only 2 marks. This objective could have been better assessed by a LA / SA 2 form of question of 3 or 4 marks.

3. Translation errors were abundant in this paper with reference to a number of questions (Q.21, 26, 29, 36 and 45).
4. Certain ambiguous questions could be modified to be made clearer. The uprising of 1857 proved to be turning point in modern history - explain, could be changed to explain briefly the after effects / consequences of the uprising of 1857 (Q. 17).
5. Experts have also pointed out errors in the text itself -
 - ii) The term Cofeposa while being given in the new text, the interpretation was not given as in the old text. This may confuse the student who may not be able to interpret the term.
 - iii) The second error was that - the term organ / agency of the UNO is used interchangeably which may lead to confusion. This matter should be brought to the notice of the DSERT.

Modifications pertained to making these questions more specific such as -

- i) Explain briefly the conditions of Karnataka before unification (Q.44).
- ii) Explain any 4 problems of small scale industries (Q.48).
- iii) List any 3 achievements of SAARC (Q.41).
- iv) Mention 2 significant features of Charles Wood Despatch (Q.26).

Only one question was reframed by the experts so that higher abilities could be effectively tested -

<p><i>"What did Netaji believe would help secure Freedom for India?"</i> instead of Briefly explain the role of Subhash Chandra Bose and INA in the Freedom Movement in India (Q. No. 40).</p>
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Quality of Questions in 3 years Question Papers:

To assess the quality of the questions in the 3 years papers, experts expressed their views on whether the questions satisfied the required criteria necessary for being good questions.

In the Social Sciences, experts found that almost all questions in the 3 years papers were suitable for testing the particular objective, except for 2 - 3 questions in the 2005 paper. 2 of the 3 experts justified their view by referring to the specific ability called upon by the questions for testing the objective. The third expert validated his view on the suitability of the questions for testing the objective by emphasizing that the particular form of question was suitable as it called for an answer of a particular length and carried a certain number of marks. This explanation was given by him for 21 / 50 questions in 2004 and 20 / 50 in 2005 and for the remaining questions, the form of questions chosen was not found to be appropriate.

Regarding the content area on which questions are based, the experts found that all questions were from within the syllabus and textbook and almost all sampled the same content area, which was aimed to be tested.

Two of the three experts found that for 5 / 50 questions, the scope (length) of the answer was not clearly specified by the questions, in the 2003 paper. The teacher educator found the same shortcoming in 2004 for 8 of the 50 questions. In 2005 paper, the classroom teacher felt that for 7 of the 50 questions, the scope of the expected answer was not limited, and was not in accordance with the time or marks allotted.

A good question must be framed in clear and simple language. 2 of the 3 experts were satisfied with the wording of the questions, but the classroom teacher found a few language errors in both the versions of the 2003 question papers. Two of the 3 experts also found the questions to be easily comprehensible by students, but the classroom teacher was dissatisfied with a few questions on this ground. Two of the three experts expressed satisfaction on the adequacy of translation between the English and Kannada versions of the questions, but the classroom teacher found differences in English - Kannada versions of 10 questions in the 2003 paper. Two of the three experts found appropriate use of directional words while framing the questions.

Another dimension of a good question is the appropriate allocation of marks. The teacher educator found that in 2005, the marks allotted for 7 to 8 questions out of 50 were not in

consonance with the length or mental processes required. The marks allocated for the questions were either too few or greater than required.

Lastly, most of the questions were found to be valid in that they tested the objective effectively. For many questions, the experts' comments on the validity of the questions were not found to be relevant.

Thus, we can conclude by stating that regarding the quality of questions set in the Social Science papers, the experts were dissatisfied with a number of questions on the ground that the questions were not specific, the scope was not clearly specified. The marks allotted to a few questions were not appropriate, and there were language errors in a few questions.

With reference to the overall quality of the question paper, it was observed that while the 2003 paper was fairly balanced in terms of weightages to different objectives, the overall quality declined in the 2004 and 2005 papers as a higher weightage was accorded to the lower order knowledge objective and the assessment of higher order skills of critical thinking, evaluation and reasoning were ignored.

This chapter explicates the various drawbacks the question papers of Science I and II, Social Science and Maths suffered from and how these may be overcome. The experts have also, wherever possible, reframed or proposed an alternate set of questions in order that the higher order objectives and skills could be fruitfully assessed. Some of these suggestions could provide us valuable clues on how to bring about improvements in question paper setting from this perspective.

IV

CONCLUSION

The prime concern of this research study has been to quantifiably estimate the extent to which the different instructional objectives have been assessed in the secondary examinations in Karnataka State. The analysis of the 3 years question papers in the four core subjects has brought forth the following results:

Summary of Findings:

- (i) In the Science - I subject, the analysis revealed that in 2003, in the view of the majority of the experts, the lower order knowledge objective and its associated abilities of recall had been assessed to a greater extent than stipulated in the design. There was a dramatic increase in the marks allotted for testing this objective in the year 2004 which was 18-23% higher than that stipulated in the design. In keeping with this trend, the 2005 paper also exhibited a higher weightage of marks being allocated for assessing the knowledge objective. The unanimous finding of all the three experts has been the near total absence of questions assessing the higher order objective of application and its' associated competencies in the three years question papers.
- (ii) In the Science - II subject, the analysis showed that, in the year 2003, the testing of the knowledge and understanding objectives was in consonance with the stipulated weightages in the design, except for the application objective which was inadequately tested. In the year 2004, however, the change took place for the worse, with the results pointing to an increase in the marks allotted for testing the lower level knowledge objective. The year 2005 marked an inordinate increase in the weightage allotted to the knowledge objective, which was higher by 20% than the recommended weightage. In 2004 and 2005, what is also evident is the near complete dearth of questions assessing the critical higher order objective of application.

The analysis also exhibits the progressive deterioration over the three year period in the assessment of instructional objectives in that the paper was fairly compliant to the design in 2003, but became imbalanced in favour of testing the lower level knowledge objective, in 2004 and 2005.

The analysis of both Science - I and Science - II question papers shows that the tendency in this subject to assess students for lower order abilities such as memorization and recall has persisted, even though meaningful learning in science requires the development of the critical higher order objectives and skills, as outlined in the syllabus.

- iii) In the Maths subject, the results of the question paper analysis revealed that in 2003, the questions primarily assessed the 'understanding' objective. In fact, this was 15% to 20% higher than the stipulated weightage. In Mathematics, this objective falls at the lower end of objectives to be attained and thus only the average level of mental abilities were being tested. The 2004 analysis reflected a similar trend with the simpler 'understanding' objective being tested for marks higher than the design by 20% to 26%. The 2005 paper analysis once again revealed a similar trend. A major observation of the experts was that the assessment of the higher application objective and the competencies such as reasoning and problem-solving, which are critical in the Maths subject, have been consistently low in the three years papers and were totally absent in the 2004 paper. The common pattern that emerges from the three years analysis is that secondary level students are being assessed in Maths for simple mathematical skills, rather than for higher cognitive abilities that have been outlined in the syllabus and the Curriculum Framework.
- iv) In Social Science, the results portray that the 2003 paper only marginally deviated from the design with reference to the assessment of objectives. The memory-based knowledge objective was tested for a slightly higher percentage of marks than the design, while the understanding objective was estimated for a marginally lower percentage of marks. In 2004, the three experts unanimously agreed that there was a marked increase in marks testing the lower order knowledge objective, which was 12% to 14% higher than the design, and the marks testing the higher understanding objective were 12% to 14% lower than the design. In the year 2005, the simpler

memory based objective was accorded marks 12% to 17% higher than the design. In the year 2004 and 2005, the assessment of the higher order skills of critical thinking and evaluation appears to be systematically neglected. Thus what is clearly visible over the 3 year period is the cumulative increase in the assessment of the lower order knowledge objective and an overall decline in evaluating the higher order skills associated with the application objective.

The qualitative analysis of the question papers of each subject undertaken by the experts has provided us with useful insights into the type of lacunae the questions and the paper as a whole suffered from. More importantly it has offered valuable suggestions on how questions testing only recall of memorized facts can be upgraded to effectively assess the higher order objectives and skills through innovative means.

Learnings from the Study:

Along with the summation of the results of the study, this concluding section presents below some important observations and insights on assessment patterns in Karnataka that have emanated from this critical question paper analysis. These need serious deliberations as they point to the need for reforms both in the framework of assessment i.e., the question paper, the design and the assessment model as well as in the human resource component dealing with assessment itself. The immediate learnings from this study are as follows:

1. An indisputable finding of the question paper analysis, in all the 4 core subjects is evidently the fact that there is a marked non-compliance of the question papers to the Design with regard to the weightages to the four different instructional objectives. Skewed weightages in favour of the lower recall based knowledge objective has led to the creation of imbalanced papers, whereas the assessment of higher order objectives stands neglected. The disturbing trend is that, over the three years period, there has been a progressive increase in testing the lower level abilities at the cost of higher order skills, especially in the last two years of 2004 and 2005. The first step in the direction of reforms would hence be to ensure that the question papers conform to the design in respect of the weightages allocated to the different instructional objectives by the Board so that these may be assessed in the desired proportion.

2. Another important finding of the study is the fact that the State Board has allocated lower weightages for the assessment of the higher order objectives in its design, which is contradictory to the proclaimed objectives outlined in the syllabus. This is true of both the Maths and Science subjects. In Maths, for example, the purported objectives of the New Syllabus of 2005 stress the development of logical reasoning and thinking instead of mechanical skills and rote memory, but these are not reflected in the design where the weightage for the assessment of higher objective of applications stands reduced from 15% to 10%. The state's policy of allocating a reduced weightage to higher order objectives is apparently due to its concern for the children of disadvantaged groups and regions, who it feels must also be able to pass the secondary examinations. This leads us to wonder if the development of excellence is being sacrificed at the cost of equity. While the socio-economic conditions of our country have to be accepted as a reality, there is no reason why efforts cannot be made to introduce changes in assessment so that higher order skills, relevant for the present context, can be developed in children of all backgrounds. This is also the view expressed by the Focus Group on Exam Reforms (Report, Focus Group on Exam Reforms 2005). In the light of the above, there is a need to re-examine the policy of allocating a lower weightage for testing higher order skills, which need to be increased, if changes in assessment pattern are to be brought about.
3. Lastly, at the macro level, changes in the assessment framework may be contemplated which could signify a reconstruction of the model of instructional objectives that had been developed by the NCERT. Given the requirement of the 21st century and the skills and abilities that need to be developed, an attempt may be made to re-examine whether the model could now incorporate the higher order objectives of Analysis, Synthesis and Evaluation, as separate elements to be assessed, so that these can be sought to be attained by students at the secondary stage of education.
4. Apart from these reforms , there is an urgent need to improve and upgrade the human resource component itself comprising the teacher educators, classroom practitioners, and paper setters, who are active participants in the teaching - learning and evaluation process. Our study brings out the fact that the classroom teachers and paper setters needed greater clarity on what the instructional objectives stood for and the intricate distinctions between them. One of the experts who was an experienced class room teacher and an erstwhile paper setter mentioned

how the question paper analysis had been a very beneficial exercise as it had helped her attain a better understanding of the instructional objectives. There is thus a need to take up systematic orientation programmes for these participants in order to (a) develop an increased awareness in them of the educational objectives and the need to develop the critical higher order skills in children; and (b) equip them with the requisite skills so that they can contribute to this process more effectively.

The insights gained from this research study are important indicators of the need to initiate reforms in the system of assessment by placing a greater emphasis on the assessment of critical higher order cognitive abilities. Such changes can have a cascading effect on the teaching - learning process, so that true learning can take place and the overall quality of learning in schools may improve, for as Socrates once noted *"Education is not the filling of a vessel, but the kindling of a flame"*.

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