3

LANGUAGE AS A SUBJECT AND DISCIPLINE

3.1. CENTRALITY OF LANGUAGE IN EDUCATION

Education

The term 'Education' is not restricted to the process of teaching, learning or schooling. Education encompasses—

- Acquisition of knowledge.
- Self-activity.
- Adjustment to one's own surroundings.
- Construction and reconstruction of experience.
- Construction of one's identity.
- Conservation, transmission and enrichment of socio-cultural heritage.
- Modification of the social reality.
- Creation of a better world.

Language

The Oxford dictionary defines language as—

- The means of human communication, consisting of the use of spoken or written words in a structured way.
- The system of communication used by a particular community or country.
- A particular style of speaking and writing (as in legal language)
- Computing a system of symbols and rules for writing programmes.

Linguists and teachers have accepted the role of language as a means of communication. They have called language a rule governed system. But today, language is also considered to play a multi-dimensional role—

- Language is central to the understanding of academic subjects and disciplines.
- Language is an instrument for knowledge acquisition.
- Language is the medium of expression of thoughts and feelings.
- There is a close relationship between language, mind, society, knowledge and power.
- We understand our science, history and culture through language.
- We define ourselves through language.

Language and Education

In order to understand the role of language in education we need to examine the multidimensional space given to language by the human civilization and examine language by giving importance to its structural, literary cultural, sociological, psychological and aesthetic aspects.

Language as a Rule-Governed System

The structural analysis of human language reveals discrete units of various sorts and the way these discrete units are combined, ordered and recombined according to some rules and principles is termed grammar.

The grammar of a language is an abstract system consisting of several subsystems.

Level of sounds—Consonantal and vocalic sounds and its associated rhythm, music, intonation patterns and pitch contours are rule bound to give a subsystem of grammar. This grammar is in the field of Phonology. Phonology is the sub-field of linguistics that studies the structure and systematic patterning of sounds in human language.

Level of words—Word formation form the basis of another subsystem. One word is related to another set of

words both in terms of form and meanings of words. Morphology studies the internal structure of words and the relationship among words. The meaning of words is dealt by another sub-field. This grammar is in the field of Semantics.

Level of sentences—A set of rules defines the relationship of different constituents of a sentence. A sentence may be simple, compound or complex depending on its constituents and the relation with which they exist in the sentence. Syntax is the order in which words are put into a sentence.

Level of discourse in society—Every society has a set of linguistic, historical, sociological, religious or cultural convention. Written or spoken communication, which we term discourse, in any society follow the aforementioned conventions.

'Language constructs reality', it does not name a pre-existing reality. The Indian philosopher Bhartrihari opined that language performs this constructivist role by using language according to the socio-cultural reality. Humans evolve language according to conventions and this is the subject matter of the sub-system pragmatics.

Knowing a word, for example, TREE, means knowing its sequence of sounds, its pronunciation, stress, intonation: this is studied in phonology; the word TREE cannot be broken down into meaningful parts, on the other hand the word, TREES can be broken down into TREE+S, where S is the plural ending: this is studied in morphology; A TREE is a perennial plant with a trunk, supporting branches and leaves- such a meaning is attributed to every individual word together with extended meanings as in the case of A Family Tree. This is studied in semantics. The internal structure of sentences and the relationships of their component parts is studied through that sub-field of linguistics called syntax, Thus we intuitively know the difference between the two sentences: 'He reads a book,' and 'The book is readable' and never make the error of

saying 'he READABLE the book.' The word-order is guided by syntactical rules. Pragmatics is another subfield of linguistics which studies the use of words and phrases and sentences in the actual context. For example, 'Oh brother! What a mess!' does not necessarily address a male sibling.

So the five linguistic elements of language: Phonology; Morphology; Semantics; Syntax and Pragmatics make language a rule governed system.

Language, Literature, Aesthetics

Language paved its way to the world of art and aesthetics through its body of literature. The great impulses behind literature are—

(1) Human desire for self-expression
(2) Human interest in people and their doings
(3) Human interest in the world of reality and the world of imagination conjured up by human beings
(4) Human love of form as form., Prose, Poetry, drama or any work of literature arouse in us a sensitivity to life, aesthetics and the world around us. It refines our sensibilities and nurtures creativity.

Language, Society, Culture and Thought

The linguistic and cultural patterns are acquired subconsciously and they become the constitutive features of our identity. According to the Sapir-Whorf hypothesis, our thought is constructed by our language system. "The background linguistic system of each language is itself the shaper of ideas, the programmes and guide for the individual's mental activity"(Whorf). We are guided by the structure of the language that we speak when we perceive the social and cultural patterns of the world around us. In other words. cognition is also structured by our language. Language and thoughts feed on each other. Language structures our thoughts and also liberates us and takes us into unexplored territories of knowledge and imagination. Development of language is stimulated by the cultural

heritage and the needs of social development. Language develops because of the society and society also cannot exist without language. So there is a reciprocal dependence between language and society. Language thrives in the society as a means of communication, as a means for the formation of thought and its accumulation, as a medium of transmission of expression and as a mode of change and creation of new form, thoughts and ideas.

Language and Identity

As language is the vehicle of culture, linguistic and cultural conventions constantly shape our identity. An individual is born into a group. She identifies herself to that group. In the process she acquires communicative competency in the language that group speaks. She is identified as a member of the group because of her birth and the language that she speaks. If she continues to lead a life in that community we find in her a phenomenon of language maintenance. If she discontinues using her home language in school and other formal contexts, a phenomenon called language shift occurs. A migrant may experience this phenomenon of language shift. In certain cases the identity of that person may face a crisis; she may feel herself to be de-rooted. Language thus facilitates identity maintenance. Language can also serve as a cause of identity-conflict. In certain other cases language can be the gateway to social mobility thereby creating a status symbol or prestige to individuals and groups. This happened in colonial India, when using English conferred a status symbol–an elevated identity to Indians under the British Raj. The question of identity and language becomes particularly relevant in case of minorities and there is a great need to be sensitive to the minority languages and culture for the sake of national and global harmony.

Language and Power

The power structure has two binary opposites—the exploiter and the exploited. In the world of language, the language

of the elite group in a society enjoys a prestige compared to the language of the underprivileged class. This prestige is endowed with power which is associated with history, politics, sociology and economics of the particular community. Linguists do not believe in the superiority of one language variety over another. Yet the socio-cultural-political and economic issues interact to make the standard dialect more powerful than the other dialects; the majority language more powerful than the minority language; the world languages (English, French, Spanish, Russian, Chinese, and Arabic) more powerful than the other languages used in the world. The exploited languages in the society have a stigma attached to them and such prejudices based on dialect, tribal and minority languages is detrimental to the multilingual ethos of a country. These underprivileged languages must be empowered with proper support structures so that they can be used in a variety of contexts.

Language and Gender

Gender stereotyping like 'Father in the office' and 'Mother in the Kitchen', have long been coded in the texture of language. Female speech has been termed 'trivial', 'signifying nothing'. This gender-bias has been transmitted through our textbooks to the posterity. Construction of knowledge in a 'gendered' manner is something which is denigrated in the post-modernist age. 'Language and gender' reflects the attitude of the society towards the 'weaker sex' and to change this, the textbook writer, teachers, sociologists and language researchers are constantly pleading for a gender-neutral language perspective.

Language, Attitudes and Motivation

Language learning is possible only if the learners have a positive attitude and motivation. This is particularly true for second language and third language learning. Gardner and Lambert believe that a foreign language/second

language learner progresses well if there is a willingness in him/her to identify the linguistic and non-linguistic features of a native language user. Parental attitude towards learning a language and parental encouragement also play a part in learning a second/foreign/third language. The other psychological variables that influence language learning are aptitude and intelligence.

Having discussed the concept of language in a holistic perspective we can surely conclude that everything that is characteristically human, everything that contributes to education and life is dependent upon language. The centrality of language in education is thus an undisputed issue.

3.2. ROLE OF LANGUAGE IN CHILDREN'S INTELLECTUAL DEVELOPMENT AND LEARNING

The Child's Language

Children learn to acquire a language at a very young age. Any four year old child can communicate, express herself emotionally, and interact socially by using the linguistic system of her home language. The child of four is aware of the effect of sound produced by her language and she controls her reality through her language. It has been observed that many children are fluent in two or three languages by the time they are three or four years. They even know the proper contexts to use those languages and are capable of keeping the language systems separate.

Language Learning

Behaviourists like ***Pavlov*** and ***Skinner*** gave us a simplistic version of language learning. Language is learnt like any other habit, through an association of stimulus and response. The behaviourists thus give importance to practice, imitation and memorization as the key processes of language learning. "Skinner argued that children learn language based on behaviorist reinforcement principles by

associating words with meanings. Correct utterances are positively reinforced when the child realizes the communicative value of words and phrases. For example, when the child says 'milk' and the mother will smile and give her some as a result, the child will find this outcome rewarding, enhancing the child's language development" (Ambridge & Lieven, 2011).

Noam Chomsky in an article 'Review of Skinner's Verbal behaviour, (1959) refuted the idea of language as habit formation. According to Chomsky every human possesses a Language Acquisition Device (LAD) and this innate language faculty causes human beings to create, even in childhood, language systems of enormous complexities. Unlike the behaviourists, who held that the human mind was like a blank state, Chomsky was of the opinion that language is already there in the human mind 'hard-wired' in the form of Universal Grammar.

"Chomsky argued that children will never acquire the tools needed for processing an infinite number of sentences if the language acquisition mechanism was dependent on language input alone. Consequently, he proposed the theory of Universal Grammar: an idea of innate, biological grammatical categories, such as a noun category and a verb category that facilitate the entire language development in children and overall language processing in adults. Universal Grammar is considered to contain all the grammatical information needed to combine these categories, e.g. noun and verb, into phrases. The child's task is just to learn the words of her language" (Ambridge & Lieven). For example, according to the Universal Grammar account, children instinctively know how to combine a noun (e.g. a boy) and a verb (to eat) into a meaningful, correct phrase (A boy eats).This Chomskian (1965) approach to language acquisition has inspired hundreds of scholars to investigate the nature of these assumed grammatical categories and the research is still on-going.

Psychologists like Piaget and Vygotsky do not accept Chomsky's innate faculty hypothesis. Piaget is of the opinion that language is constructed through and interaction with the environment in consonance with the stages of development, like any other cognitive system. Vygotsky gives importance to social interaction in the development of human speech.

Role of Language in Children's Intellectual Development

A study of the role of language in children's intellectual development will remain incomplete without a discussion on the ideas found in two books. The first book is 'The language and thought of the child' (1926) written by Jean Piaget and the second book is 'Thought and Language' (1962) written by Lev Vygotsky. Both Piaget and Vygotsky worked with children, observed them and documented their analysis of cognitive and language development of children. Both these books contain seminal ideas on the language development of children and have and everlasting influence on education planning and transaction.

Piaget's view on Langugage Development

According to Piaget language emerges from the existing cognitive structures and in accordance with the child's needs. Language function differs at each of the cognitive levels. In the sensori-motor stage, when the child (from 0-2 years) is egocentric, language is more or less not prominent. In the pre-operational stage (from 2-7years) the child exhibits two types of speech–egocentric speech and socialized speech. Ego-centric speech takes the form of repetition, monologue and collective monologue and this sort of speech helps the child to increase symbolic activity. Socialized speech helps the child to begin representation. In the concrete operational stage (from 7-11 years) the child uses language to understand concrete objects and shows signs of verbal understanding. In the formal operation stage (over 7years) language is freed from the concrete and the

child gains the verbal ability to express the possible. Thus we see that Piaget believed that every individual child, like a little scientist, constructs a view of the world by framing cognitive structures. Language emerges as the cognitive structure develops. So, every developmental period has its outstanding language equivalent. Piaget believed in the stage theory of development, a view which has been criticized by later psychologists. Development is not necessarily a sequential process and critics opine that acquisition of cognitive structure may be more gradual than what Piaget believes.

Vygotsky's view on Language Development

Vygotsky proposes a dual path of cognitive development. The first path constitutes the elementary processes that are fundamentally biological and the second path consists of higher psychological processes which are essentially socio-cultural. The biological processes experience a transformation into higher psychological processes in the process of development. The socio-cultural processes shape the child towards cognitive development. Vygotsky explains language development through four stages of speech—

Pre-intellectual speech; Naive psychology; Egocentric speech and Inner speech.

The crying, cooing, babbling and body movements come under the purview of Pre-intellectual Speech. These are the elementary processes having a biological origin. The second stage of language development is called Naive Psychology where the child labels objects and gets the syntax for his/her speech.

The third stage of language development is called Egocentric Speech.- the child now is about three years old and he/she carries on conversation with himself/herself and does not care if someone is listening to him/her. This according to Vygotsky is inner speech, but it is manifested in an outer form.

The final stage of language development comes with the development of inner speech which helps a human being in

guiding and planning behaviour and action. Inner speech is the main force for cognitive development according to Vygotsky.

Both language development and cognitive development according to the Vygotskian perspective progresses through social interaction.

According to Vygotsky learning and cognitive development should match with the child's developmental level. Each child possesses a developmental level by which he/she can solve a problem independently. But there is another level of development in each child by which he/she can solve a problem with the help of adults or 'more capable peers.' To explain this phenomenon Vygotsky coined the concepts of Zone of Proximal development (ZPD) which he defined "as the distance between a child's actual development level, as determined by independent problem solving, and the higher level of potential development, as determined by problem solving under adult guidance or in collaboration with more capable peers." (Vygotsky) The guidance that the adult bestows to the child to help him/her to proceed from the zone of proximal development to development is called scaffolding. Scaffolding thus stimulates the developmental process. This is equally true for both language development and cognitive development.

Thus we see that for both Piaget and Vygotsky language development is associated with cognitive development. For Piaget each developmental stage appears to have an outstanding language equivalent. For Vygotsky 'Speech' is a defining moment in cognitive development. Language is one of the powerful tools human beings use to progress developmentally.

3.3. POLICY ISSUES AND LANGUAGE AT SCHOOL

Recommendations of different Commissions and National Policies in Post Independent India: A Historical Perspective Radhakrishnan Commission-1948

Chapter ix of the Radhakrishnan Commission Report discusses extensively on the Medium of Instruction. The report dwells on :

1. The Problem of the National Language. 2. The Difficulty of the Problem.

II. Indian Languages

3. Chief Languages of India.

III. Hindi, Hindustani and Urdu

4. Hindi and Allied Languages. 5. Hindi as Literary Language. 6. Forms of Hindi.

IV. Development of the Federal Language

7. Need of Development. 8. Inadequacy of High Hindi. 9. Inadequacy of Urdu. 10. Inadequacy of Hindustani. 11. Need for Borrowing Words. 1.2. Loans in High Hindi. 13.Loans in Urdu. 14. Loans in Hindustani Its Characteristics. 15. Grammar of Hindustani. 16. Hindustani and Common Speech. 17. Origin of High Hindi, Urdu and Hindustani. 18.Khari Boli. 19. Urdu and Braj. 20. High Hindi. 21. How to Develop the Federal Language. 22. Principle of Assimilation. 23. Principle of Inclusiveness. 24. Dangers ofExclusiveness. 25. Technical Terms. 26. Principles of Choosing Technical Terms. 27.International Terms. 28. Recommendations of the Central Advisory Board Committee of 1944. 29 Need for Adopting international Terms. 30. Scientific Backwardness. 31.International character of science. 32. English Terms. 33. Scientific Terms. 34. Societies for Selecting Terms. 35. Difficulties of an Independent Terminology. 36. Solution. Adoption of English Terms and How to do it. 37. Uses of Federal language.

V. Suggested Alternatives : English and Sanskrit

38. Alternatives. 39. English. 40. Objections to English. 41. Sanskrit 42. Objections to Sanskrit. 43. Hindi the only Alternative.

VI. Federal and Regional Languages

14. Difficulties Involved. 45. Its Relation with Regional Languages. 46. Hindi cannot claim Superiority over Regional Languages. 17. Limited Use of Hindi. 48. Federal Language as the Second Language. 49. Its Advantages and Uses. 50. Place of Regional Languages. 51. Federal Language as Alternative to Regional. 52. Pockets of Minorities.

VII. Script

53. Devanagari Script 54. Other Scripts 55. Measures for Developing Languages.

VIII. Place of English

56. Need for Caution 57. Study of English.

IX. 58 Recommendations

The following recommendations were made in the report:

1. That the Federal Language be developed through the assimilation of words from various sources and the retention of words which have already entered into Indian languages from different sources, thereby avoiding the dangers of exclusiveness.
2. That international technical and scientific terminology be adopted, the borrowed words be properly assimilated, their pronunciation be adapted to the phonetic system of the Indian language and their spelling fixed in accordance with the sound symbols of Indian scripts.
3. That for the medium of instruction for higher education English be replaced as early as practicable by an Indian language which cannot be Sanskrit on account of vital difficulties.
4. That
   (i) pupils at the higher secondary and University stages be made conversant, with three languages,- the regional language, the Federal language and English (the last one in order to acquire the ability to read books in English); and

(ii) Higher education be imparted through the instrumentality of the regional language with the option to use, the Federal language as the medium of instruction either for some subjects or for all subjects.

5. That for the Federal language one script, Devanagari be employed and some of its defects be removed.

6. That immediate steps be taken for developing the Federal and Regional languages:

(i) A Board consisting of scientists and linguists be appointed to prepare a scientific vocabulary of words which will be common to all Indian languages and also to arrange for the preparation of books in different sciences to be rendered into all Indian languages;

(ii) Provincial Governments be required to take steps to introduce the teaching of the Federal language in all classes of higher secondary schools, in degree colleges, and in universities."

Mudaliar Commission-1952-53

The Mudaliar Commission makes an extensive study of the language issue. "No subjects attracted greater attention and we found not infrequently that strong opinions were expressed on the so-called language controversy..... In view of the development of regional languages in the different parts of the country and the languages spoken in such areas, it may not be practicable or desirable to attempt to lay down a uniform policy for the whole country. On the contrary some witnesses were strongly of the opinion that there should be some uniformity in regard to the study of the languages and that there was need for a definite policy to be laid down on an all-India basis. It was claimed by some that there should be one language which will be known throughout the length and breadth of the country and that Hindi which is prescribed as the official language at the Centre should be studied compulsorily." The report mentions five groups of languages:

"(1) the mother-tongue; (2) the regional language when it is not the mother-tongue; (3) the official language of the Centre, more commonly called the Federal Language; (4) the classical languages-Sanskrit, Arabic, Persian, Latin, etc.; and (5) English which has come to be recognised as an international language. In those areas where the mother-tongue and the regional language are the same, the number of languages to be taken into consideration will be limited to four and in those areas where the regional language, the mother-tongue and the language of the Union are the same, the number of languages to be taken into consideration will be limited to three. So far as the Federal language or the official language of the Centre is concerned we feel that the areas in the different parts of the country may be divided into three regional groups: (1) regions where Hindi is the mother-tongue, and therefore, is the regional language as well as the language of the Centre; (2) regions where although it is not the mother-tongue, Hindi is spoken by a large number of people of the region; (3) regions where Hindi is neither the mother tongue nor the regional language nor spoken or understood by the vast majority of the people. These are generally spoken of as non- Hindi speaking areas."

The report examines the constitutional provisions related to language: "that the official language of the Union shall be Hindi and that for a period of 15 years from the commencement of the Constitution, English language shall continue to be used for all the official purposes of the Union for which it was being used." It also lays down that Parliament may by majority vote provide for the use, after the said period of 15 years, of the English language. Under Article 345 of the Constitution it is stated that "the Legislature of a State may by law adopt any one or more of the languages in use in the State or Hindi as the language or languages to be used for all or any of the official purposes of the State; provided that until the legislature of the State otherwise provides by law, the English language shall also be officially recognised throughout that State or any part

thereof for such purpose as he may specify". Under the special directives, it is stated that "it shall be the duty of the Union to promote the spread of the Hindi language to develop it so that it may serve as a medium of expression for all the elements of the composite culture of India and to secure its enrichment by assimilating without interfering with its genius the forms, style and expressions used in Hindustani and in the other languages of India specified in the eighth schedule, and by drawing whenever necessary or desirable, for its vocabulary primarily on Sanskrit and secondarily on other languages".

The Commission deliberates on the Place of Hindi, the Place of English, the Place of Classical Languages, the Minority languages and states the following regarding **the Purpose of Language Study:**

"The question has often been raised in the course of our discussions as to the number of languages that can be learnt by pupils in the Secondary schools and at what stages the study of these languages should be commenced. Some maintain that we should, while considering this problem, take into account the purpose which is to be served by the study of each of these languages. We do not wish to dogmatise on such very important issues which should be treated on the academic plane and on the principles of pedagogy. But we agree that there should be a clear perspective of the purpose of study of each of these languages. It is ordinarily accepted that the mother-tongue is the most suitable language as a medium of instruction for the child beginning its study. If the same advance had taken place in regional languages as has taken place in many foreign languages, mother-tongue or regional language would have been the medium of instruction at all stages of the educational ladder. As the regional language is likely to be the language used by the majority in the region it is desirable to acquire knowledge of this language. In view of the difficulties in particular regions to cater to the needs of very small groups and the paucity of teachers of the

particular language, linguistic minorities isolated in different regions who would not come under the provisions of the Resolution passed by the Central Advisory Board of Education in this behalf may have to adopt the regional language as the medium of instruction. However, we have already referred to the provision in some States for linguistic minorities to be given the option of having their children taught through the mother-tongue, and we believe this is a wise policy in the general interests of all concerned."

SUMMARY OF RECOMMENDATIONS

1. Mother-tongue or the regional language should generally be the medium of instruction throughout the Secondary school stage, subject to the provision that for linguistic minorities special facilities should be made available on the lines suggested by the Central Advisory Board of Education.
2. During the Middle school stage, every child should be taught at least two Languages. English and Hindi should be introduced at the end of the Junior Basic stage, subject to the principle that no two languages should be introduced in the same year.
3. At the High and Higher Secondary stage, at least two languages should be studied, one of which being the mother-tongue or the regional language.

Kothari Commission-1964-66

The evolution of a language policy would assist in social and national integration. "Of the many problems which the country has faced since independence, the language question has been one of the most complex and intractable, and it still continues to be so. Its early and satisfactory solution is imperative for a variety of reasons- educational, cultural and political." Following are excerpts from the Indian Education Commission Report on the Development of modern Indian languages and the evolving of the Language Policy:

"It is hardly necessary to emphasize that the **development of the Indian languages** is both urgent and essential for the development of the Indian people and as a way of bringing together the elite and the masses. It can make scientific and technical knowledge more easily accessible to the people in their own languages and thus help not only in the progress of industrialization but also in the wider dissemination of science and the scientific outlook. Energetic action is needed to produce books and literature, particularly scientific and technical, in theregional languages. This should be regarded as a specific and imperative responsibility of the universities; and the UGC should provide general guidance and allot adequate funds for the programme."

Regarding **the Medium of Education in Schools and Colleges**, the Commission states, "The development of the modern Indian languages is inextricably linked with the importance given to them in the educational system, especially at the university stage. The medium selected should enable students to acquire knowledge with facility, to express themselves with clarity and to think with precision and vigour. From this point of view, the claims of the mother-tongue are prominent."

About thirty years ago, before this report, while delivering the convocation address of the Calcutta University, Rabindra Nath Tagore had expressed his views in this matter in no uncertain terms:

'In no country in the world, except India, is to be seen this divorce of the language of education from the language of the pupil. Full hundred years have not elapsed since Japan took its initiation into Western culture. At the outset she had to take recourse to textbooks written in foreign languages, but from the very first, her objective had been to arrive at the stage of ranging freely over the subjects of study in the language of the country. It was because Japan had recognized the need of such studies, not as an ornament for a select section of her citizens, but for giving power and

culture to all of them, that she deemed it to be of prime importance to make them universally available to her people. And in this effort of Japan to gain proficiency in the Western arts and sciences, which was to give her the means of self-defence against the predatory cupidity of foreign powers, to qualify her to take an honoured place in the comity of nations, no trouble or expense was spared. Least of all was there the miserly folly of keeping such learning out of easy reach, within the confines of a foreign language.

Learning through a foreign medium compels the students to concentrate on cramming instead of mastering the subject-matter. Moreover, as a matter of sound educational policy, the medium of education in school and higher education should generally be the same. Prior to 1937, the position was at least consistent. English was the medium both in the upper stages of school and college education. As we have rightly adopted the regional languages as the media of education at the school stage, it follows that we should adopt them increasingly at the higher stage also.'

This proposal has also been supported strongly as a measure to promote social and national integration. The Emotional Integration Committee was of the view that the use of regional languages as media of education from the lowest to the highest stage of education was a matter of 'profound importance for national integration'. This was supported by the National Integration Council (June 1962) which said:

"The change in the medium of instruction is justified not so much by cultural or political sentiments as on the very important academic consideration of facilitating grasp and understanding of the subject-matter. Further, India's university men will be unable to make their maximum possible contribution to the advancement of learning generally, and science and technology in particular, unless there is a continuous means of communication in the shape of the region al languages between its masses, its artisans

and technicians and its university men. The development of the talent latent in the country will also, in the view of the Council, be retarded unless regional languages are employed as media of instruction at the university stage."

The Commission generally agrees with these observations.

"It has been sometimes argued that there should be a single medium of education at the university stage-English for the time being, to be ultimately replaced by Hindi-on the ground that it would promote mobility of teachers and students from one part of the country to another, provide for easy communication between academic and professional men and administrators, further intellectual cooperation amongst the universities and help in other ways in developing a corporate intellectual life in the country. We are inclined to think, on a balance of considerations, that this solution is not feasible. In practice, it will probably mean the indefinite continuance of English as the only medium of higher education, a development that we cannot support in the larger interests of the country. The adoption of Hindi as a common medium of education in all parts of India is not possible for some years to come, and in non-Hindi areas it will still have some of the disadvantages associated with the use of a foreign medium and are likely to be resisted. It would, therefore, be unwise to strive to reverse the present trend for the adoption of the regional languages as media of education at the university stage and to insist on the use of a common medium in higher education throughout the country."

Channels of International Communication

The introduction of the regional languages as media of education should not be interpreted to mean underrating the importance of English in the university. For a successful completion of the first degree course, a student should possess an adequate command over English, be able to express himself in it with reasonable case and felicity, understand lectures in it and avail himself of its literature.

Therefore, adequate emphasis will have to be laid on its study as a language right from the school stage. English should be the most useful 'library language' in higher education and our most significant window on the world. It is also important to encourage the study of other foreign languages on a more extensive scale for a variety of academic and practical purposes; Russian has a special significance for the study of science and technology in the present-day world. In addition, French, German, Japanese, Spanish and Chinese are important world languages for communication and for acquiring knowledge and culture. We recommend that all universities, some selected colleges, and also a small proportion of carefully selected schools should provide for the teaching of these languages. The knowledge of another foreign language (especially Russian) besides English should be a requirement for a doctorate degree, and in certain subjects, even for the Master's degree.

The country will need in increasing numbers a group of persons, small but extremely proficient in important foreign languages and their literature. From this point of view, it would be necessary to establish a few schools which will begin teaching, right from an early age, the important foreign languages referred to above and will use them also as media of education. The admission to these schools should be on a selective basis and there should be an adequate provision of scholarships.

It would be an important step towards the general development of higher education, and also towards international cooperation and understanding, if there were established a small number of institutions, at university level, with some of the important 'world languages' as media of education. A beginning has already been made with the Institute of Russian Studies at New Delhi. It would be desirable to set up, during the Fourth Plan, institutions on somewhat similar lines for German, French, Spanish and Japanese languages. We could also establish one or two

more institutions for Russian. The institutions will have to be largely residential. It will be an advantage to have them as constituent units of universities in their neighbourhood."

Channels of Internal Communication

Hindi (or any other Indian language for that matter) must be greatly developed and enriched before it can attain the status of a library language, that is, a language which can serve as a vehicle for acquiring a substantial part of the current and rapidly expanding stock of world knowledge. This has to be taken into account fully in determining our language policy. This implies, as stated earlier, that every graduate will need to acquire a reasonable proficiency in a library language, which will be English for most students. It will thus serve as a link-language in higher education for academic work and intellectual inter-communication. It is interesting to note that the number of students studying Russian in the UK is larger than that of the students studying Russian in India.

It is, however, equally obvious that English cannot serve as the link-language for the majority of our people. It is only Hindi which can and should take this place in due course. As it is the official language of the Union and the link-language of the people, all measures should be adopted to spread it in the non-Hindi areas. The success of this programme will largely depend on the extent to which it is voluntarily accepted by the people of these areas. We were interested to know that in the Kerala University, where students can take Hindi in place of Malayalam at the undergraduate stage, a large proportion of students choose to study Hindi. We have also seen increasing evidence on the part of non-Hindi areas to take to the study of Hindi. AR their efforts in this matter, particularly in the non-official sector, should receive encouragement. In addition to Hindi, it is essential to provide multiple channels of inter-State communication in all modem Indian languages. In every linguistic region, there should be a number of persons who know all the other modem Indian languages

and some who are familiar with their literatures and able to contribute to them. For this purpose, we recommend that there should be adequate arrangements, both in schools and colleges, for teaching different modern Indian languages. In addition, steps should be taken to establish efficient departments in some of the modern Indian languages in every university. It may also be advisable to create a Small Dumber of special institutes (or advanced centres) for the comparative study of different languages and their linguistic problems. At the B.A. and M.A. levels, it should be possible to combine two modern Indian languages. This will incidentally supply the bilingual persons needed for language teaching in schools and colleges."

The Kothari Commission sums up its deliberations in the following words:

"(1) We are convinced of the advantages of education through the regional languages. We regard the development of regional languages as vital to the general progress of the country, and as an important step towards the improvement of quality in education. To avoid any misunderstanding we would emphasize that this does not mean the shutting out of English, or other world languages. In fact we will profit from these languages all the more when our education becomes more effective and useful.

(2) In view of the importance of the problem, we suggest that the UGC and the universities carefully work out a feasible programme suitable for each university or group of universities. The change-over should take place as early as possible, and, in any case, within about ten years, since the problem will only become more complex and difficult with the passage of time. A large programme of producing the needed literature in the Indian languages will have to be undertaken, and adequate arrangements will have to be made for the training and re-training of teachers.

(3) What is required is to formulate a clear policy, to express it in unambiguous terms, and to follow it up

with firm, bold and imaginative action. We should avoid a policy of drift which will only be harmful. Nor should we get involved in the vicious circle of no production because no demand' and 'no demand because no production'.

(4) We recognize that suitable safeguards would have to be devised, in the transitional stage, to prevent any lowering of standards during the process of change-over because of inadequate preparation. In fact the desirability and success of the change should be judged in terms of the contribution it makes to raise the quality of education. But caution should not be equated with delay or procrastination. It is meaningful only if it is part of a policy of determined, deliberate and vigorous action."

The National Policy on Education 1968

The 1968 National Policy also gave us an extensive report on the Development of languages in India. Following is an excerpt from the Policy document:

"(a) Regional Languages: The energetic development of Indian Languages and literature is a sine qua non for educational and cultural development. Unless this is done, the creative energies of the people will not be released, standards of education will not improve, knowledge will not spread to the people and the gulf between the intelligentsia and masses will remain if not widen further. The 39 regional languages are already in use as media of education at the primary and secondary stages. Urgent steps should now be taken to adopt them as media of education at the university stage. (b) Three-Language Formula: At the secondary stage, the State Governments should adopt, and vigorously implement, the three-language formula which includes the study of a modern Indian language, preferably one of the southern languages, apart from Hindi and English in the Hindi-speaking States, and of Hindi along with the regional language and English in the Non-Hindi-speaking States. Suitable courses in Hindi and/or

English should also be available in universities and colleges with a view to improving the proficiency of students in these languages up to the prescribed university standards. (c) Hindi. Every effort should be made to promote the development of Hindi. In developing Hindi as the link language, due care should be taken to ensure that it will serve, as provided for in Article 351 of the Constitution, as a medium of expression for all the elements of the composite culture of India. The establishment, in non-Hindi States, of colleges and other institutions of higher education which use Hindi, as the medium of education should be encouraged. (d) Sanskrit. Considering the special importance of Sanskrit to the growth and development of Indian languages and its unique contribution to the cultural unity of the country, facilities for its teaching at the school and university stages should be offered on a more liberal scale. Development of new methods of teaching the language should be encouraged, and the possibility explored of including the study of Sanskrit in those courses (such as modern Indian languages, ancient Indian history, Indology and Indian philosophy) at the first and second degree stages, where such knowledge is useful. (e) International Languages: Special emphasis needs to be laid on the study of English and other international languages. World knowledge is growing at a tremendous pace, especially in science and technology. India must not only keep up this growth but should also make her own significant contribution to it. For this purpose, study of English deserves to be specially strengthened."

National Policy on Education 1986

The NPE'86 corroborates the view of the 1968 document in the following manner:

"The Education Policy of 1968 had examined the question of the development of languages in great detail; its essential provisions can hardly be improved upon and are as relevant today as before. The implementation of this part of the 1968 Policy has, however, been uneven. The Policy will be implemented more energetically and purposefully."

Language Policy: As it exists today

India is a multilingual, multiethnic and pluralistic nation, The 8th Schedule of the Indian Constitution has 22 Scheduled languages. Besides the scheduled languages there are 1576 rationalized languages and 1796 other mother-tongues. After independence it was necessary to evolve a national policy on language so as to ensure participation of citizens in national progress and development.

In 1961, the chief ministers of different states came to a consensus and adopted a three language formula in school education. ***D P Pattanayak*** terms this adoption, a strategy and not a policy to accommodate at least three languages in the ten years of schooling. The interest of the group identity was accommodated through the regional language or the mother tongue, the national pride and unity was accommodated through Hindi (the official national language); and the administrative efficiency and technological progress was accommodated through English (the associate official language). The Kothari Commission, the National Policy on Education 1968, the National Policy on Education 1986 reiterates the importance of the three language formula and recommends its adoption.

According to the formula every child has to learn the following—

(1) The First Language to be studied must be the mother tongue or the Regional language.

(2) **The Second Language**

- In the Hindi speaking states the second language will be some other modern Indian language (preferably a South Indian language) or English.
- In non-Hindi speaking states the second language will be Hindi or English.

(3) **The Third Language**

- In Hindi speaking states the third language will be English or any other modern Indian language not studied as the second language.

- In non-Hindi speaking states the third language will be English or a modern Indian language not studied as the second language.

Definition of terms and Related Controversies

(1) **First Language (L1):** The first language is the language that we learn from our childhood, from our parents, relatives, neighbourhood through informal interaction. In this sense our first language is generally assumed to be our mother tongue, our home-language. But when first language connotes the regional language, it may not necessarily be our mother tongue. It is the majority language of the state. In that case, the mother tongue ceases to be the first language in school situation, it becomes the minority language or a home language different from the school language. The medium of instruction is conducted in the child's first language. Hence in the several English medium schools, English becomes the official first language (as per the school curriculum), even when the child uses the regional language/mother tongue for informal communication.

(2) **Second Language:** The Second language (L2) is the language which is learnt consciously and deliberately to gain knowledge, gather information and communicate in situations other than personal. In our country the second language is either Hindi or English and it is usually introduced at a later stage in the primary level of schooling. Again, in English medium schools, the regional language/mother tongue of the child is given the status of second language as per the school curriculum.

(3) **Third Language (L3):** The language which the child needs to communicate in situations other than which he/she uses for his/her first or second languages in termed the third language. Classical languages like Sanskrit or Arabic and foreign languages like French

or German are also taught as third languages, contrary to the spirit of the three language formula. The reason behind the inclusion of such languages is either to acquaint the learners about the heritage of the country or to foster global communication and provide a new perspective of the world.

Language at School: The Reality

The strategy of adopting the three language formula has been reiterated in the National Policy documents but the states have not adopted it unanimously. In West Bengal students are given an option of 14 languages in primary and secondary schools; in Mumbai there are as many as 9 languages as medium of instruction in primary schools. The multilingual character of school education is maintained by providing such language options. However, states like Tamil Nadu uses only Tamil and English and Gujrat has only Gujrati and Hindi as the languages in school. So these two states virtually follow a two language formula. Several Hindi speaking states have substituted Sanskrit as a third language thereby including the classical language instead of a modern Indian language. The South Indian languages are not found in the curriculum of Hindi speaking states, just as Hindi is not given much preference in South Indian regional language medium schools. The Central schools follow a bilingual medium consisting of English and Hindi with Sanskrit as an addition but the students who pass out from these schools go to English medium colleges because they cannot cope up in the vernacular medium colleges.

Four types of schools have been identified across the country:

(1) Government regional language medium schools run by district and municipal education authorities.
(2) Government aided regional language medium schools.
(3) New English medium private schools.
(4) English medium private/Government aided elite schools.

The medium of instruction in (1) and (2) is the regional language while that in (3) and (4) is English. The controversy of First language and Second language (as discussed earlier) persists in these types, even though they belong to the same state. The prevalence of both regional medium schools and English medium schools in the same state has created a social divide and there is a general tendency to look down upon the regional language medium schools. Many perceive English as an 'aspirational language' and parental aspirations for greater economic opportunities have caused them to forego the state aided regional language schools in favour of the English medium schools.

The three language formula in schools propagated two ideas—

(1) Children will learn the same number of languages.
(2) Learning Hindi and English will help them to officiate and communicate.

But these two assumptions undermine the Plurilingual ethos of our country. The Minority languages have not gained its status to the fullest extent as guaranteed by our constitution. Not all minority languages have been made the medium of instruction. Major languages such as English and Hindi and other languages in the 8th Schedule occupy a place of importance even in the states where the speakers of the non-scheduled languages are a majority. Linguistic minorities and users of tribal languages have set forth their demands to study in the mother tongue at the primary level, but their demands have not always been met.

The issue of languages at school is beset with controversies. The three language formula has not been implemented in its true spirit, perhaps because of the changing scenario. Time has come to overhaul the education system with a new language policy which sustains the multilingual entity of India without compromising the national unity and global demand.

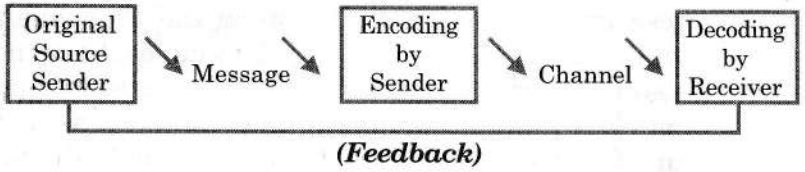
3.4. LANGUAGE AS A MEDIUM OF COMMUNICATION

Understanding Communication

"The interchange, dialogue, sharing, communion and interaction between organisms are termed Communication. The Encyclopedia Britannica defines communication as "The exchanges of meaning between individuals or groups through a common system of symbols or language". Communication, as a process of passing information from one organism to another has at least four elements. These are—

1. The transmitter or the encoder
2. The signal or the message
3. The channel or the medium
4. The receiver or the decoder

The simple communication process can be diagrammatically represented as follows—



Before the onset of a communication, a message is to be generated from a source. The message must have a purpose and that purpose is to be conveyed to the receiver. The sender encodes or makes a symbolic representation of the message and the encoded massage is routed through a medium or channel. The receiver retranslates or decodes the symbolic message. Communication thus involves a transmission of message which is to be interpreted and how far the interpretation has been achieved by the receiver comes to the sender as a feedback.

Human Communication and Language

Communication can be done verbally, through signs or through written language. Animals too have their own communication systems. But human beings have developed

their own system of communication through a complex process of evolution. The development/evolutionary stages/ ages of human communication can be enumerated in the following manner—

1. Age of signs and symbols
2. Age of speech and language
3. Age of writing
4. Age of print
5. Age of mass communication
6. Age of Information Revolution

A cursory glance at the aforementioned evolutionary stages makes it clear that humans have used languages of different types and sorts to communicate their thoughts and ideas to others.

Communication as information-transfer: Role of Language

Language is called a rule-governed system. In the process of communication as information-transfer language operates with its–

1. Phonemic (minimum unit of sound) and Phonological (sound related) rules
2. Syntactic (Word order/grammar) features and rules. The sender and the receiver must operate under the same rules for information transfer to occur.

Communication for Interaction: The Role of Language

Communication is a dynamic process of interaction where information transfer is also punctuated with meaning-making and interpretation. The connotation of communication in this sense is not so simplistic as language now operates with its other complex elements namely,

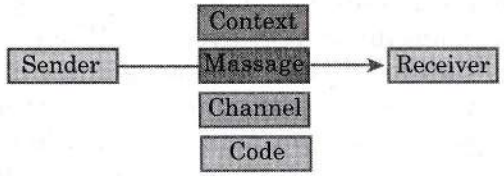
1. Semantic (meaning related) rules
2. Pragmatics (Usage related)

Although there is a sound-meaning link in every language, every language is infinite in the nuances and varieties of meaning that it can convey.

Communication may at times be thwarted by barriers and the barriers of communication will not make interaction between the sender and the receiver possible. Some barriers to communication are—

1. **Physical barriers:** where the environmental noise prevents decoding of message
2. **Contextual/Cultural barriers:** where formal rites, body language, personal space and ethnocentrism prevent the interchange of thoughts and ideas and causes contextual difference.
3. **Perceptual barriers:** where selective perception on the part of the receiver causes him to be subjective and judgmental about the sender and his message.
4. **Linguistic barriers:** where communication suffers due to lack of commonality of language; intra-language variations as found in dialects and most importantly through semantic barriers. Any word may have a multiplicity of meanings-i.e. the denotative or dictionary meaning and the connotative or the meaning the receiver attributes to the word. The desired communication is threatened when the receiver's connotation mismatches with the encoder's denotation.
5. **Emotional barriers:** Distortion of meaning can take place if the individual has personal and emotional barriers pertaining to the aforementioned barriers. Emotional barriers can cause the receiver to manipulate or filter information to suit his/her own purpose.

Roman Jakobson defined six communication functions of language, according to which an effective verbal communication act can be described.



The six factors of an effective verbal communication are Sender, Context, Message, Channel, Code and Receiver. To each one there is a corresponding communication function. The six functions are listed below:

1. The Referential Function corresponds to the 'Context'. Referential function is expressed through definite descriptions of situations, objects or mental states. Eg. "The autumn leaves have all fallen now."
2. The Poetic Function focuses on "the message for its own sake" (the code itself, and how it is used) and is the operative function in poetry as well as slogans.
3. The Emotive (alternatively called "expressive" or "affective") Function relates to the Addresser (sender) and is best expressed through interjections and other sound changes that do not alter the literal meaning of an utterance but do add information about the Addresser's (speaker's) internal state, e.g. "Wow, what a scene!"
4. The Conative Function engages the Addressee (receiver) directly and is best illustrated by vocatives and imperatives, e.g. "Ram! Come inside and study!"
5. The Phatic Function is language for the sake of interaction and is therefore associated with the Contact/ Channel factor. The Phatic Function can be observed in greetings and casual discussions of the weather, particularly with strangers. It also provides the keys to open, maintain, verify or close the communication channel: "Hello?", "Ok?", "Hummm", "Bye"...
6. The Metalingual (alternatively called "metalinguistic" or "reflexive") Function is the use of language (what Jakobson calls "Code") to discuss or describe itself.

The metalingual function often stems from a disruption in the communication-process. When two or more figures speak different languages, there are often many utterances with metalingual function. Different languages mean two things–first when two figures really speak two languages and secondly when two figures use different codes within one language such as dialects, sociolects and idiolects.

Critical Theory of Communication: The Role of Language

The role of language as a means, a tool for communication is not accepted by all. Post-modernist researches are examining the additional forces which are not consistent with the 'Sender-Message-Medium-Receiver' paradigm. For example, language can be a medium of dis-communication. There the sender really does not want to communicate and language evolves tools to allow his silence.

The conflict of interest in society and the way communication perpetuates domination of one power group over another is discussed in the critical theory of communication and language is treated not merely as a medium of communication. Language, here, is described to have an intricate and subtle role in determining the power structure, the constructed and de-constructed identity of individuals and groups in this Post-modernist perspective.

3.5. LANGUAGE IN THE SCHOOL CURRICULUM

Aims of Teaching Languages

From time immemorial languages have been taught in schools either with a linguistic aim or a combination of linguistic and literary aim together with a cultural perspective. The linguistic aim enables the learner to—

(a) Understand language when spoken
(b) Understand language when written
(c) Speak the language
(d) Write the language

Thus when language is studied with a linguistic aim emphasis is given to the four language skills: Listening, Speaking, Reading and Writing. Of these, Listening and Reading are receptive skills while Speaking and Writing are productive skills.

The literary aim enables the learners to appreciate the form and content of the body of literature written in the particular language. The cultural aim enables the learners to acquaint themselves with the tradition, mores, folkways, customs and way of life posited by the linguistic and literary inputs in the target language.

The National Curriculum Framework 2005 pleads for a "holistic perspective on language proficiency" and hence advocates the following concepts to be the guiding principles in determining the aims of teaching languages–

1. *Multilingualism is to be used as a resource in a language classroom*

The aim of language education in India today is to foster multilingualism. Instead of looking at a language as interference to the attainment of proficiency in another language, policy framers have now shifted their attention to encourage proficiency development in all the languages with a sharing and a caring mentality. Sensitivity to the multicultural ethos and multilingual reality has made the policy framers look into this issue in a new light. Every language is to be studied in schools in relation to other languages.

A scientific study of languages is thus one of the prime objectives of Language Education. The scientific method involves—collection of data, observation of data, analysis of data and formulation of hypothesis. In a multilingual class, similarities and differences between the languages can be collected, observed and analyzed to derive the rules/ hypothesis. Thus the multilingual classroom can do away with the prescriptive tradition of studying languages and adhere to the descriptive tradition.

2. *Language across the Curriculum*

The belief that language is best acquired through different meaning contexts has led the policy framers to adopt the 'Language across the Curriculum' approach. Language teaching is thus not restricted only to the language classrooms; language is also to be taught while teaching other school subjects. A common cognitive academic linguistic proficiency is to be built up in the learners through language education and education through language. It is necessary for learners to have a control over different registers found in music, games, sports, construction work, cookery etc. The innumerable shades and colours which surface on different domains and situations are called registers. By gaining control over the different registers the learners become proficient linguistically, cognitively and academically.

3. *An Integration of language skills, creativity and sensitivity*

The school should foster in the child—

(i) A competence to understand what she hears
(ii) Ability to read with comprehension
(iii) Effortless expression
(iv) Coherent writing skill

Skill development is not to be treated in a discrete manner.

All the language skills are to be integrated to each other so that listening skill leads to speaking and reading; Reading lends to speaking and writing. The child through her exposure to language learns to—

- Employ verbal and non-verbal cues
- Make connections with previous knowledge
- Draw inferences
- Pose critical questions
- Construct meaning
- Employ communicative skills in a variety of situations

- Choose from a range of styles
- Discuss logically, analytically and creatively
- Organize thoughts
- Use cohesive devices
- Communicate with a sense of audience
- Use language with confidence.

Care should be taken that the child can nurture her imagination and creativity through the language curriculum. The language curriculum should foster sensitivity to the diverse cultures, the surroundings, the neighborhood the heritage and national values. An integration of the cognitive development of the child is thus mingled with affective development through language education.

Language Issues and Debates

India is a multilingual state with no single mother tongue. It is home to four linguistic families namely, Indo-Aryan, Dravidian, Austro-Asiatic and Tibeto-Burman. The eighth schedule of the Indian constitution recognizes 22 official languages.

According to article 343(1)-"the official language of the Indian union shall be Hindi in the Devanagari script. Article 343(2) of the constitution provides for the use of English for all official purposes. English was given the status of an associate official language in 1965. The constitution also provides for the rights of its citizens to make representations in any language to the state. Article 350(A) [7th Amendment act, 1956] provides for adequate facilities to linguistic minorities by including the provision for instruction in the primary stage in their mother tongue. The three language formula was arrived through a consensus at a meeting of chief ministers of different states in 1961. According to Sridhar (1989) the three language formula was modified by the Kothari commission to accommodate the interests of group identity (mother tongues and regional language); national pride and unity (Hindi) and administrative efficiency and technological progress

(English). Pattyanayak (1986) is of the opinion that the three language formula is only a strategy and not a national language policy. According to him a national policy on language has to take into issues and domains that are not covered either by the constitution or by the three language formula. It is because of this situation that several debates have emanated in the Indian union.

Majority Languages and Minority Language

The Indian states were created on the basis of linguistic boundaries. Every state thus has a predominant language and the other users are designated linguistic minorities. Citizens using the minority language often suffer severe linguistic deprivation and at times they become a marginalized group using minority and tribal languages. Intellectuals thus debate on the issue: 'Can a plurilingual country allow its languages to disappear?' 'Should we not allocate new communicative roles and functions to the endangered languages?'

Languages, especially a language used by majority group, connote power and a minority language user can face ignominy and identity crisis because of his/her language. To regain power and prestige the minority language users protest and revolt and yearn for a separate geographical territory where their language would not be designated as a minority language. Telengrana was born because of this. Numerous such situations prevail in the country. To take on example, the minority Bengali language users in the Kachchar district of Assam had faced a severe crisis after the Bangladesh war, when several Bengali speaking Non-Assamese Bangladeshis took refuge in the north eastern state. All Bengalees were dubbed 'foreigners' by the users of the state language. The ensuing debate was, 'Should Indians be discriminated on the grounds language?'

Another minority language, Urdu, has been getting a differential status on the grounds of religion. For linguists, there is no fundamental difference between Urdu and Hindi

because of a similar phonology and syntax. But during the last fifty years efforts have been made to Sanskritise Hind and Arabicize Urdu. The distance between the two languages has been created and today Urdu is a minority language. Intellectuals proficient in Urdu, debate on the issue of distancing Urdu from the mainstream majority language, Hindi and call it an act of political maneuvering.

Hindi as the National Language

States like Tamil Nadu and West Bengal made strong protests when Hindi was declared the official national language after independence. It was looked upon as an imposition by these states and because of rampant protests English was given the status of associate official language in 1965. The debates on the issues of national language took several dimensions. Questions like the following were asked—

(a) Why Hindi? Why not English? Why not Sanskrit?
(b) Why should we use a foreign language?
(c) Is English 'foreign' to us?
(d) When shall we get out from the colonial mindset?
(e) Why should we not take pride in our heritage?
(f) Is there a necessity for having a national language?
(g) What about global communication? Can we be technologically progressive without English?
(h) Isn't Hindi a decolonizing agent? Etc.

The three-language formula was perhaps a strategy to end these debates, but the national language issue still causes analytical and emotive outbursts.

The Medium of Instruction

Should the mother tongue be the medium of instruction in school or should it be English to keep pace with the global market? This debate has several issues to consider.

Educationists are of the opinion that mother tongue should be the medium of instruction all through the school and especially in the primary school because:

(i) It enables people to participate in national reconstruction.
(ii) Knowledge is freed from the pressures of the elite group.
(iii) Interactive and interdependent societies are built.
(iv) It fosters greater participation and ensures democracy.
(v) It leads to de-centralization of information, greater access to education, better personal development.
(vi) It eliminates the linguistic and cultural gaps caused by the difference between school language and home language.

The proponents of English as a medium of instruction cite the following reasons:

- English is no longer a foreign language in India.
- It is a link language for inter-state and intra-state communication.
- It is a world language.
- English is still a library language in India and hence indispensable for higher education.
- English as a language is much esteemed in the job market.
- It provides social mobility.
- It is the language of trade, commerce and information technology.

The policy planners, teachers, administrators and parents are divided in their opinion about the medium of instruction in schools. The average performance of the children in mother tongue/state language schools when compared to their English medium counterparts have deteriorated in the past few years. Research proves that mother tongue as a medium of instruction is never detrimental to the scholastic achievement of an individual. Yet, the mushrooming of so many English medium school in cities and towns point out to the preference of parents for English medium instruction to their children.

The negative feeling for state-run regional language schools is perhaps caused because of other factors - lack of discipline, lack of human resources, infrastructural factices etc. but the brunt is borne by the language used as a medium of instruction and the debate continues.

3.6. PHASES OF LANGUAGE DEVELOPMENT

Before attempting to discuss the phases of language development in human beings, it is necessary to remember two basic points. They are—

1. All children, irrespective of their place of living manifest a similar pattern of speech development.
2. No matter what language the child speaks, language seems to be the same experience for all human beings.

Psychologists have pointed out that the stages of human language development traverses through his/her infancy, early childhood and middle childhood. By the time a child reaches ten or eleven years he/she is capable of adult-like speech. The phases of development of language in a human being can be described in the following manner.

Phase 1: *Vocalization*

The infant begins to communicate soon after birth by crying and fussing. In 6-8 months the infant takes to cooing; they are tuned to the speech they hear and sensitive to the context in which they live. During this initial phase their care-givers communicate with them with a baby language which is technically called 'motherese'. The infant of four months starts babbling which is an approximation of speech.

Phase 2: *Holophrastic speech*

The consistent babbling sound patterns increase in frequency and suddenly the first words which is termed 'holophrastic speech' emerges. It is difficult to analyze holophrastic speech by words. The infant is now about 12 months of age when her first speech emerges.

Phase 3: *Words used with multiple meanings*

The infant from 12-18 months uses one word to express

multiple meanings. However there is lack of grammatical correctness, as the infant grapples with tense and number.

Phase 4: *Telegraphic speech*

The infant of two years is capable of making telegraphic speech i.e. use simple sentences. This however depends on how much the infant hears in her immediate environment. Telegraphic speech may be a two word sentence but it has a clear organizational structure.

Phase 5: *Expansion of vocabulary and use of three word sentence*

An infant after two years ascribes a name to everything around her and naturally her vocabulary expands. By the time the infant is of three years she is capable of making three- word sentences using plurals, tense and possessives.

Phase 6: *Gradual elimination of over-extensions and over-regularities*

A child of three sometimes has the tendency of creating her own word/grammar for any object that she comes across and wishes to express her own thoughts. Thus any quadruped can be termed a dog by a child who is making an 'over extension'. Again the child's language may have words like 'comed' (instead of came) or 'goed' (instead of went) when the child is acutely 'over-regularizing' the use of '-ed' to make a past tense. Such practices are gradually eliminated in early childhood. By the time the child is of three years such over-regularities and over -extensions are eliminated.

Phase 7: *Metalinguistic Awareness*

Early childhood is the stage when the child understands that language is a means of interaction with the environment. The child now engages in socialized speech, has a vocabulary of several thousand words and understands complex sentences. This phase of metalinguistic awareness helps the child "to acquire the ability to look at language and not through it."

Phase 8: *Expansion of structural knowledge and Improvement of the use of language*

By the time the child has attained 10-11 years of age she is capable of

(a) Using language to recall things.
(b) Using language for her own purpose.
(c) Using figurative language.
(d) Using language to understand relationships.
(e) Using language according to relationship.

For children between 6-10 years the relationship between language development and functional literacy becomes crucial. It is necessary for a child to be exposed to reading by the time she attains this age because without interpreting the written word and attaining functional literacy, language development in later years will receive a setback.

Michael Halliday has charted child language development in terms of the increasing range of language functions to be found in the growing child's repertoire. - Initially language is used to fulfill a need on the part of the speaker. The child uses language instrumentally to obtain food, drink and comfort. When the child persuades / commands / requests and gets other people to do things she wants, language operates with its regulatory function. The child uses language with its personal function when she announces herself to the world. This, 'Here I am,' function enables the child to express her personal identity and personal preferences. When the child uses language to exchange information, the representational function is operative. The language used by the child to learn and explore the environment is heuristic (function) in nature and the imaginative function is explored by the child in her imaginary world of play or in her storytelling.

Questions

Objective type (2 marks)

Q.1. What do you mean by centrality of language in education?

Ans. Language is central to the understanding of academic subjects and disciplines as an instrument for knowledge acquisition, as a medium of expression, thoughts and feelings. There is a close relationship between language, mind, society, knowledge and power. We understand our science, history and culture through language. We define ourselves through language.

Q.2. Mention one function speech performs in society.

Ans. Speech accounts for establishing the identity of an individual in the society. It is the medium of communication and interaction of the individual with others.

Q.3. What is Language Acquisition Device? / Inner speech? / Egocentric speech? / Scaffolding? / Zone of Proximal Development?

Ans. According to Chomsky every human possesses a Language Acquisition Device (LAD) and this innate language faculty causes human beings to create, even in childhood, language systems of enormous complexities. Unlike the behaviourists, who held that the human mind was like a blank state, Chomsky was of the opinion that language is already there in the human mind 'hard-wired' in the form of Universal Grammar.

Vygotsky mentions four stages of language development of which inner speech is the last stage. After the stage egocentric speech, comesinner speech, when the child silently verbalises his thoughts. This helps a human being in guiding and planning behaviour and action. Inner speech is the main force for cognitive development according to Vygotsky.

The third stage of language development according to Vygotsky is called Egocentric Speech.- the child now is about three years old and he/she carries on conversation with himself/herself and does not care if someone is listening to him/her. This according to Vygotsky is inner speech, but it is manifested in an outer form.

Vygotsky coined the concepts of Zone of Proximal development (ZPD) which he defined "as the distance between a child's actual development level, as determined by independent problem solving, and the higher level of potential development, as determined by problem solving under adult guidance or in collaboration with more capable peers."

The guidance that the adult bestows to the child to help him/her to proceed from the zone of proximal development to development is called scaffolding. Scaffolding thus stimulates the developmental process. This is equally true for both language development and cognitive development.

Q.4. Name one strategy adopted in the national policy related to language education.

Ans. The adoption of the Three Language formula is one strategy mentioned in the national policies. The First Language to be studied must be the mother tongue or the Regional language.In the Hindi speaking states the second language will be some other modern Indian language (preferably a South Indian language) or English. In non-Hindi speaking states the second language will be Hindi or English.In Hindi speaking states the third language will be English or any other modern Indian language not studied as the second language.In non-Hindi speaking states the third language will be English or a modern Indian language not studied as the second language.

Q.5. What is the aim of teaching a first language/ second language?

Ans. Transmission of a society's written culture and standard speech is done through the first language. Hence first language (L1) is taught with a linguistic aim at the outset and in the post-elementary stage language paves the way to literature and culture. The first language is thus taught in such a way that its users not only communicate in the language but also express their thoughts, feelings and emotions in an accurate, fluent and lucid manner.

The Second language (L2) is the language which is learnt consciously and deliberately to gain knowledge, gather information and communicate in situations other than personal. In our country the second language is either Hindi or English and it is usually introduced at a later stage in the primary level of schooling. The second language is thus taught primarily with a linguistic aim in schools so that the learners can communicate and receive information in situations other than personal.

Q.6. Mention one debate related to language in Indian schools

Ans. One debate related to language in Indian schools centres around the medium of instruction. Should the medium of instruction be the regional language or English? Or should it be the mother tongue in case of minority languages? Or should it be Hindi instead of the regional language or English?

Q.7. Mention two guiding principles for formulating the aims of teaching languages as per the NCF 2005.

Ans. The NCF 2005 prescribes some guiding principles for formulating the aims of teaching languages. Two such guiding principles are: following the Language across the curriculum approach and using Multilingualism as a resource.

Q.8. What is communication?

Ans. 'The interchange, dialogue, sharing, communion and interaction between organisms are termed Communication. The Encyclopaedia Britannica defines communication as "The exchanges of meaning between individuals or groups through a common system of symbols or language".

Q.9. Mention the four elements of language.

Ans. The four main linguistic elements/ components of language are Phonology; Semantics; Syntax and Pragmatics.

Q.10. What is holophrastic speech? / Telegraphic speech?

Ans. **Holophrastic speech:** The consistent babbling sound patterns increase in frequency and suddenly the first words

which is termed 'holophrastic speech' emerges. It is difficult to analyse holophrastic speech by words. The infant is now about 12 months of age when her first speech emerges.

Telegraphic speech: The infant of two years is capable of making telegraphic speech i.e. use simple sentences. This however depends on how much the infant hears in her immediate environment. Telegraphic speech may be a two word sentence but it has a clear organizational structure.

Q.11. Give one instance to show that language is "gendered".

Ans. "My father is in the office and my mother is in the kitchen," is an instance of gender-stereotyping through language. The use of the pronoun , 'he', 'his 'or 'him' to refer to common nouns also shows that language is gendered.

Q.12. What is phonology? / semantics? / syntax? / Pragmatics?.

Ans. Phonology is the sub-field of linguistics that studies the structure and systematic patterning of sounds in human language

The meaning of words is dealt by another sub-field of linguistics calledSemantics.

The internal structure of sentences and the relationships of their component parts are studied through that sub-field of linguistics called syntax.

Pragmatics is another subfield of linguistics which studies the use of words and phrases and sentences in the actual context.

Q.13. What is phoneme?

Ans. The smallest unit of spoken language is termed phoneme. /p/ /b/ /t/ /d/ etc are examples of phonemes. Phonemes do not convey any meaning.

Q.14. What is morpheme?

Ans. Morpheme is the smallest meaningful element of spoken language. It comprises of phonemes. /dig/ is a morpheme comprising of the phonemes /d/ /i/ and /g/.

Q.15. State two areas of language development during childhood.

Ans. The child uses Telegraphicspeech before two years of age. This type of speech may be a two word sentence but it has a clear organizational structure.

By the time the infant is of three years she is capable of making three- word sentences using plurals, tense and possessives.

After a gradual elimination of over-extensions and over-regularities the child displays a

Meta-linguisticawareness of language.

Q.16. Mentions any two functions of language in learning.

Ans. Roman Jacobson defined six communication functions of language. Of these-

The Referential Function corresponds to the 'Context'. Referential function is expressed through definite descriptions of situations, objects or mental states. Eg. "The autumn leaves have all fallen now."

The Poetic Function focuses on "the message for its own sake" (the code itself, and how it is used) and is the operative function in poetry as well as slogans

Q.17. Write two purposes of including languages in the syllabus of Secondary Education.

Ans. The centrality of language in education is undisputed. The two central purposes of including Languages in the curriculum is to foster both internal and international communication and enable every learner to express himself/ herself in every situation.

Q.18. State two recommendations of Kothari Commission as regards language education as secondary level.

Ans. Regarding the Medium of Education in Schools and Colleges, the Commission states, "The development of the modern Indian languages is inextricably linked with the importance given to them in the educational system, especially at the university stage. The medium selected should enable students to acquire knowledge with facility, to express themselves with clarity and to think with

precision and vigour. From this point of view, the claims of the mother-tongue are preeminent."

"The introduction of the regional languages as media of education should not be interpreted to mean underrating the importance of English in the university.....English should be the most useful 'library language' in higher education and our most significant window on the world"

Q.19. What is language?

Ans. The Oxford dictionary defines language as-

- The means of human communication, consisting of the use of spoken or written words in a structured way.
- The system of communication used by a particular community or country.
- A particular style of speaking and writing (as in legal language)
- Computing a system of symbols and rules for writing programmes.

Q.20. What is the role of language in communication of information?

Ans. Language is called a rule- governed system. In the process of communication as information-transfer language operates with its phonemic and syntactic features. Communication is a dynamic process of interaction where information transfer is also punctuated with meaning-making and interpretation. The connotation of communication in this sense is not as simplistic as language now operates with its other complex elements namely, semantic (meaning related) rules and Pragmatics (Usage related).

Q.21. What are the different theories of language development?

Ans. Skinner's Behavioural Theory; Chomsky's mentalist theory; Piaget's cognitivist theory and Vygotsky's social cognitivist theory are some of the major theories of language development.

Q.22. What are the recommendations of Radhakrishnan Commission on language education?

Ans. The major recommendations of Radhakrishnan Commission are:

That the Federal Language be developed through the assimilation of words from various sources and the retention of words which have already entered into Indian languages from different sources, thereby avoiding the dangers of exclusiveness.

That international technical and scientific terminology be adopted, the borrowed words be properly assimilated, their pronunciation be adapted to the phonetic system of the Indian language and their spelling fixed in accordance with the sound symbols of Indian scripts.

Q.23. What are the objectives of language learning?

Ans. Language learning enables a learner to:

- Employ verbal and non-verbal cues
- Make connections with previous knowledge
- Draw inferences
- Pose critical questions
- Construct meaning
- Employ communicative skills in a variety of situations
- Choose from a range of styles
- Discuss logically, analytically and creatively
- Organize thoughts
- Use cohesive devices
- Communicate with a sense of audience
- Use language with confidence

These are the objectives of language learning

☛ Short type/Short note (5 marks)

Q.1. Show your acquaintance to any one of the following concepts to justify the centrality of language in education: Language, Culture and thought; Language and Identity: Language and Aesthetics; Language and Gender; Language as a Rule-governed system.

Ans. See Page No-65-71

Q.2. Explain the role of language in children's intellectual development with reference to Piaget or Vygotsky's theory of language development.

Ans. Page No. 71-75

Q.3. What are the languages studied in Indian schools?

Ans. Page No. 92-93

Q.4. What are the aims and objectives of teaching languages in Indian schools?

Ans. Page No. 98-101

Q.5. Explain any one language issue or debate.

Ans. Page No. 101-102

Q.6. Write a short note on Language as a Medium of Communication.

Ans. Page No. 94-98

Q.7. Explain the 3-language- formula.

Ans. Page No. 88-89

Q.8. Choose any one developmental stage in the life of a human life and explain the phases of language development.

Ans. Page No. 105-107

☛ Essay type (10 marks)

Q.1. Language is not only a medium of communication. Give a holistic perspective of language and justify the centrality of language in education.

Q.2. What is the role of language in children's intellectual development and learning.?

Q.3. Write a brief note on the aims and objectives of teaching language in present day India.

Q.4. Explain any one language related debate or issue and point out its implications.

Q.5. Suggest a scheme of language education in school giving appropriate reasons

Q.6. Explain the concept of language as a medium of communication.

Q.7. Is language only a medium of communication? Justify your viewpoint.

Q.8. Enumerate the phases of language development.

(Answers to all the these questions can be obtained from the short answer questions only explain them in detail.)

4

MATHEMATICS AS A SUBJECT AND DISCIPLINE

4.1. NATURE AND HISTORY OF TEACHING MATHEMATICS

Mathematics has been accepted as methodical application of matter. It may also be said that when person studies mathematics he is likely to become methodical and systematic in his approach. Our life becomes orderly and less chaotic when we grasp mathematical concepts. Because it nurtures the qualities like power of reasoning, creativity, abstract or spatial thinking, critical thinking, problem-solving ability and even effective communication skills. Mathematics is the springboard of all creations, without which the world cannot progress. Persons of any vocation or profession like a cook or a farmer, a carpenter or a mechanic, a shopkeeper or a doctor, an engineer or a scientist, a musician or a magician, everyone has to depend on mathematics in their day-to-day life.

A pertinent question may be asked in what ways mathematics can be a part of our life. First and foremost, mathematics is a useful tool in everyday activities like shopping, managing money, reading and discussing about issues. All these daily life activities require understanding of mathematical concepts and skills. These skills are categorized under the term numeracy. Secondly knowledge of mathematics may be considered as a social token. That is, a person with good mathematical skills enjoys high social

esteem and uses them as weapon. Another way of using mathematics is to investigate the world. So many scientific, social problems require mathematical skills for their solution.

Mathematics can also be a great source of enjoyment. It is used for fun and can be exciting when problems and puzzles are solved. When tough mathematical problems are solved it gives immense gratification.

Microsoft Encarta Encyclopedia has defined Mathematics as the study of relationships among quantities, magnitude and properties and also of the logical operations by which unknown quantities, magnitudes and properties may be deduced. Essentially it is the study of quantity, structure, space and change.

Aristotle said mathematics is the science of quantity. Comte defined mathematics as a science of indirect measurement while Russell maintained that all mathematics is symbolic logic. The Oxford Dictionary has defined mathematics as the abstract science of number, quantity, and space, either as abstract concepts (pure mathematics), or as applied to other disciplines such as physics and engineering (applied mathematics).

A few phrases are used to elaborate the nature of mathematics. These are–

- Mathematics is a science
- It is an intellectual game
- It is the art of drawing conclusion
- Mathematics is a tool subject
- It is a system of logical process
- It adopts intuitive method.

The contemporary mathematics has a number of characteristics. Generally five of its characteristics can be considered–

1. ***Applicability and effectiveness:*** A General applicability is an important characteristic of mathematics because there are distinct areas and

phenomena where mathematical truths are applied for better understanding. So its application is observed to acquire insight into matters from universe to across the road. So its wide use is due its ubiquitous nature. Its use is the natural reflection of man's intention to seek explanation, to arrive at generalization and to improve his organization of knowledge. This is why more and more subjects take recourse to mathematics for solving complex problems.

2. ***Abstraction and Generality:*** Abstraction means understanding the essence of the subject and generalization means particularities of the subject are organized around the essence. Thus a manageable framework is constructed. This conceptual framework unifies the diverse instances. Mathematics does it exactly. The mathematical abstraction simplifies the topics otherwise they become over whelming and difficult to access and handle.
3. ***Simplicity:*** It is difficult to believe that simplicity is a characteristic of mathematics. But a mathematician considers simplicity to be characteristic of mathematics. Simplicity means that mathematical practitioners want simplest possible single exposition. As the abstraction process continues additional terminologies and machinery allow the particularities to fit into exposition at the higher level. In contemporary mathematics this apparent simplicity has higher level exposition underneath.
4. ***Logical Derivation and axiomatic arrangement:*** Logical derivability and axiomatic arrangement emerged from the ancient Greek tradition when Thales and Pythagoras presented Geometry by Euclid. The early mathematics was mainly based on man's perceptions of number (quantity), space (configuration), time and change (transformation). But later on mathematics became an abstract science from an empirical one. Today it is considered as an axiomatic

science. However, it is not that mathematics today has no connection with reality. It simply means that its relationship with real experiences is useful but not essential.

5. ***Precision, correctness:*** The language of mathematics, developed during the thousands of years during its evolution is highly efficient and powerful tool for mathematical expression, exploration and reconstruction after exploration and communication. When the mathematical language is used effectively it becomes precise, unambiguous, yet concise without being unnecessarily superfluous. However, like all other languages it can be used well or poorly.

From being verbal in the beginning, mathematics can be practiced in apparent symbolic shorthand without really need for many words. To compute correctly and to interpret the results without any fault the symbols are to be carefully and precisely defined. The symbolic modes should be learnt by the students. It may be said mathematical language is 'write only' language. But for communication, mathematician has to switch to direct or expository styles.

Mathematics is characterized by a culture of precision. That is, what is said should be correct and should have a definition? So it may be concluded that mathematics has developed precise, highly symbolic language and the mathematical concepts have developed in a dialectic manner.

The nature of mathematics is best explained on the basis of the following characteristics—

(a) Mathematics is a science of pattern and order. Hidden pattern within it helps one to understand the world full of information
(b) The domain of mathematics includes number, chance, form, algorithms, and change.
(c) Mathematics relies on logic and reason but also uses observation, simulation and even experimentations. It helps to develop distinctive mode of thoughts.

(d) Theorems and theories in mathematics offer foundation of truth and a standard certainty.

(e) Mathematical knowledge is exact, systematic logical and clear

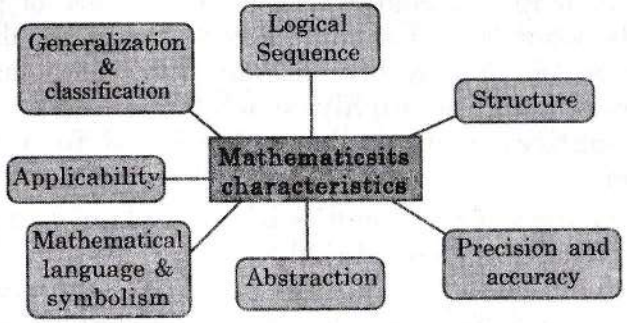
(f) The rules laws and formulae in mathematics are universal and are verifiable at any place or time.

(g) It has its own language, symbols signs, theories and terms.

(h) Mathematics develops certain capacities of mind for example–to read critically, identify fallacies, detect bias assess risk and suggest alternatives.

(i) The cross fertilization between mathematics and science has helped to solve problems, develop theories and concepts. Mathematics has exerted tremendous influence on almost all the sciences which include physics, chemistry biological science, medical science, computer science and also social science and human behviour. Different sciences have also helped in the progress and development of mathematics.

The following flow chart graphically depicts the nature and characteristics of mathematics.



Nature and Characteristics of Mathematics

Different sub fields of mathematics-

The major subfields of the subject mathematics are mentioned below–

- ***Foundation of mathematics***-It refers to axiomatic underpinning of mathematics.

- ***Algebra and combinatorics***-It contains the structure and relation between discreet objects.
- ***Topology and geometry***-It is the part of the mathematics which deals with spatial structure, pattern and shapes.
- ***Number theory***-It is about property of numbers and polynomials.
- ***Analysis***- It contains theory of functions, extensions, generalization of calculus
- Probability deal with randomness and stochastic phenomena.
- The branch of statistics which is about collection, analysis and application of data.
- Applied mathematics deals with modeling analyzing and optimizing the systems
- Computational mathematics-It is based on computer based experimental mathematics.

History of Mathematics

It is difficult to say when Mathematics as a subject was born. Its history is as old as human civilization. From time immemorial it was the basis of science, engineering and philosophy. Mathematics in the beginning was the tool for counting measuring and calculation and studied the shapes and motions of physical objects. As a method it used abstraction, imagination and logic and today it is one of the most abstract and complex discipline. The first surviving examples of geometrical and algebraic calculations derive from Babylon and Egypt in about 1750 BC. Chinese and Egyptian civilizations introduced number system and various artifacts reflected their computational knowledge.

From Babylon knowledge of Mathematics reached Greece. One of the most important developments in mathematics took place when Pythagoras and his followers organized a seat of study of mathematics. They introduced Pythagorean Theorem and postulated that sum of the three angles of a triangle is two right angles. The Pythagoreans

showed that the musical notes varied with the length of the vibrating string. Euclid and Archimedes were two famous mathematicians of that period.

In medieval period mathematics flourished in Muslim countries. A significant event was a book written in Baghdad in about 825 ADby al-Khwarizmi entitled Kitab al jabrw'al-muqabala ('Book of Restoration and Reduction'). The book became popular in Europe and from it the word algebra emerged.

During Renaissance mathematics in Europe flourished with some revolutionary developments. By 19th century Mathematics as a discipline became more and more complex and abstract.

Names of some of the famous mathematicians of Greek period are mentioned below.

Pythagoras (540 B.C) established the Pythagorean school of Mathematics and postulated the famous Pythagorean Theorem.

Euclid (300 B.C.) was the author of 'Elements'. He introduced geometry as a logical system, based on axioms, postulates, theorems and proof.

Archimedes (225 B.C.), one of the most renowned scientists of all time, discovered the fundamental laws of physics, area and formula of volume.

Ptolemy (125 B.C.) proposed sphere model of the universe with the earth at the centre. His theory was, however, discredited and replaced by that of Copernicus.

The different branches of mathematics developed during early modern period (1500 A.D. to 1800 A.D. are given below-

Trigonometry–The first European text book on trigonometry was compiled by Regiomontanus in 1464. From 1530 to 1600 A.D. precise trigonometry tables, surveying methods using trigonometry and mathematical analysis of trigonometric relationship were developed.

Logarithms–Napier in 1614 introduces the system of logarithms. Later on during 1620 to 1625 logarithic tables and the slide rule were developed as calculation tools.

Analytic Geometry–During the period of 1630 to 1640 Rene Descartes and Pierre Fermet developed Cartesian coordinate system. Algebra and geometry were also synthesized during this time.

Calculus–Isaac Newton and Gottfried Leibniz put forth the central ideas of calculus. It was later expanded and refined by the Bernoulli family and L.Euler around 1660 to 1750 A.D. Calculus, a powerful tool for the solutions of scientific and engineering problems was a landmark development in the history of mathematics.

History of Mathematics in India

The history of mathematics is as old as Indian civilization. As early as the days of Mohenjo-Daro and Harappa civilization mathematics was used as a tool for development. During the period of 3000B.C. to 600 B.C.E mathematics continued to develop in India.

Civil engineering and especially brick making in Harappa was the outcome of the study and application of mathematical rules.

The Shukla Yajur Veda discussed the geometrical construction of altars for Yajna. Shulba Sutras were named after four authors. They were Baudhyana (600B.C), Manava (750 B.C.) Apastamba (600 B.C.) and Katyayana (200B.C.) The Sutras contained famous theorems of Pythagoras. The irrational numbers were mentioned in it.

Like Vedic mathematics, Jain concept of mathematics was also influenced by theology. The Jain philosophy conceptualized the idea of infinity and number theory, computing with fraction flourished during 600BCE .During Buddhist period large number calculation without forms of place value system was in practice. In 300 BCE Brahmi numerals developed and Devnagari numerals developed slowly during 600-1000 CE. During this time place value and decimal system were used in India.

The classical era of mathematics in India was the period of 500 to 1200 CE.

The famous Indian mathematicians of this period were Aryabhata (500CE), Brahmagupta (700 CE), Bhaskara I (900 CE), Mahavira (900 CE), Aryabhatta II (1000 CE) and Bhaskarachrya or Bhaskara II (1200 CE).

The two centers of mathematical researches were established in Kusumapura near Pataliputra and in Ujjain. Aryabhat (500CE) introduced the method of solving linear equations. He also proposed the approximation of Pie to four decimal places (3.144146). His works were related to trigonometry, including tables of values of sine functions.

Like Aryabhatta, Brahmagupta studied astronomy. He compiled a book on mathematics named Lilavati (1200CE) He refined the Kuttaka originally proposed by Aryabhata. In south India too mathematics developed and the famous mathematicians from southern region were Mahavira of Karnataka,and Madhava from Kerala during 14th century. Mahavira wrote Ganita sara sangraha and Madhava set up a school of mathematics.

During the pre-colonial days the village master in Pathshala was the single teacher who taught mathematics along with reading and writing. The monitorial system was used to be followed. The functionality of such curriculum was evident from the fact that education was linked to material and social world of people. Riddles and folklore related to use of arithmetic skills were common. The objective was to train competent skilled participants in transaction of letters and measurement. Education was restricted to upper classes yet the labour and oppressed classes were familiar with arithmetic practices like counting, weighing measuring, estimating and other mercantile practices. In higher centers of learning likeTol and Madrassa logic, computational astronomy, algebra was taught. Even Euclid and Ptolemy's theory were not unknown. The British accepted the Indian system of Mathematics as 'very ingenious' but inferior to European mathematics. It was alleged that the Indian system of mathematics learning was based on rote learning and the

memory was tested only. In reality learning progressed through stages of memorizing set of rules, practice and was followed by problem solving. It was training to develop capacity for reasoning. During colonial period modern English mathematics texts were translated in vernacular and Sanskrit languages. Till 1850 Pathshala, textbook centered mathematics, slate centered mathematics coexisted. But gradually these indigenous system of teaching mathematics was replaced by official system of education when Wood's Despatch in 1854 required the indigenous schools to adapt modern curriculum otherwise they would not receive grant in aid. Thus functional aspect of mathematics learning was replaced by mechanics of memory.

4.2. PLACE OF MATHEMATICS IN SCHOOL CURRICULUM

It has already been mentioned that mathematics is the science of magnitude, number, shape, space and relationship based on symbols. The knowledge of it helps a learner to analyse, describe and explain wide range of experiences. He also learns through use of mathematical skills to predict, illustrate, interpret and solve problems. Mathematics is an indispensible and essential tool to deal with requirements of human society influenced by rapid economic, technological and scientific development. Therefore a child in school must learn to think and communicate quantitatively, spatially, solve problems and to recognize situations where mathematics can be applied.

Mathematics is now taught as a compulsory subject in school. So access to quality mathematics education is right of every child. The National Curriculum Framework (2005) pointed out that it is more important to develop higher order aim of thinking and reasoning rather than lower order aim of learning number, number operation, measurement, decimals and percentage. The higher order skills will help the learner to draw logical conclusion and handle abstraction. The ultimate objective is to develop the attitude

to formulate and solve problems. Ideally the skills in arithmetic, algebra and geometry should help the students to address problems coming from science and social science.

The present mathematics curriculum should aim at developing problem solving analytical skill. This can be done when the students—

(a) Enjoy mathematics, realizes the social application and uses of mathematics

(b) Talk, discuss and work together on mathematical problems

(c) Pose Mathematics related questions and solve mathematical problems and puzzles

(d) Should not only realize the utility and instrumental value of learning mathematics but also should develop inner appreciation of mathematics.

The problems related to mathematics teaching are many and transaction of curriculum often is also not successful.

(a) The curriculum does not satisfy the talented students and on the other hand non participant majority of the students are seldom benefited. It gives more importance to procedure and knowledge of formula neglecting the understanding of concepts. Then there is the pressure of completing the syllabus within the time frame.

(b) The traditional method of assessment emphasizes on memory and mechanical computation. Concept learning is replaced by procedural knowledge.

(c) There is little scope for the activities of the teachers within a textbook centered pedagogy.

There is an urgent need to shift from content to learning environment. Most importantly the teachers can make students realize that everyone can learn mathematics and learning mathematics is more than using formula and mechanical procedure. A mathematics teacher must develop reflective teaching skill, understands the maturity levels of the students, plans and manages the lessons efficiently.

In recent times a question is often asked. 'Should mathematics be taught throughout the period of compulsory schooling? Or should there be differential mathematics curriculum? Whether students be given choice as to learning of mathematics. These are debatable issues. But it is to be accepted that mathematics literacy is needed for survival as knowledge of it is required in every sphere of socio economic life.

The vision of teaching mathematics in school

NCERT in the Position paper on teaching mathematics in school (2006) proposed the following broad aims of teaching mathematics in school-

- The students must learn to enjoy mathematics in school. The teaching of mathematics should develop a taste for mathematics.
- Learning important mathematics. The students should understand when and how a mathematical technique is to be used instead of merely recalling these techniques room memory.
- Mathematics should be a part of child's life experiences.
- The students need to pose and solve meaningful mathematical problems.
- Mathematics teaching should develop logical thinking of the students.
- The basic structures of mathematics should be taught which include arithmetic, algebra, geometry and trigonometry.
- The mathematics teachers expect to engage every child in the class.

The National Policy on Education 1986 suggested that Mathematics should be visualized as the vehicle to train a child to think, reason, analyze and to articulate logically. Apart from being a specific subject, it should be treated as a concomitant to any subject involving analysis and reasoning. The National Curriculum Framework for School

Education (NCFSE) 2000 document echoes such sentiments as well. Yet, despite this history of exhortations, mathematics education has remained pretty much the same, focused on narrow aims.

4.3. MATHEMATICS IN DAY-TO-DAY LIFE

The use of mathematics in our daily life is so pervading that its application often goes unnoticed. As a matter of fact the mathematics is used with the birth of the baby when his weight is measured to the time he dies when mathematics is needed for burial or burning.

Right from the beginning of the day when an individual wakes up knowledge of mathematics is required to read the clock, manage time to do one's daily chores. The amount of water used, electricity consumed is to be calculated for various reasons like saving energy or reduce expenditure. The food he eats is also based on mathematical calculation. The activities in kitchen measuring ingredients, buying groceries, cooking time all are based on mathematical calculations. The decoration of the house, gardening or building and renovation of the house are not possible without mathematical skills.

As the person moves out of the house for work and business purposes, he requires more sophisticated knowledge of mathematics in work place in different types of vocations. The employees and the students or any one engaged in any type of work must calculate their salaries and fees to take relevant decisions in this regard. An individual without mathematical knowledge is easily deceived and likely to suffer financial loss.

Travelling to work place, driving car or using modes of transport, all are based on the individual's financial position requiring balancing of cost and cash in hand. The travelling cost, time required to travel, the baggage one carries are related to mathematical calculations.

From rudimentary knowledge of mathematics required to buy a cup of tea to buying highly sophisticated gadgets and cars one cannot do anything without mathematics.

Banking, which more and more people are involved with, requires quite good knowledge of mathematics. As technology is developing rapidly mathematics is becoming more and more indispensible.

Not only in work life, but also an individual applies mathematics when he is engaged in leisure time activities like playing games. Even organizing dinner party and other entertainment related activities mathematics is needed.

Thus it is obvious that a man is unable to live a meaningful life without mathematics. Unfortunately such a practical skill is taught poorly in schools where many students develop phobia of mathematics and remain disinterested in mathematics without realizing its ubiquitous presence in our daily life. The root cause of ineffective teaching of mathematics in school that it is taught as a subject devoid of daily applications in human life.

4.4. RELATIONSHIP OF MATHEMATICS WITH OTHER SUBJECTS

It has been observed that mathematics is not disconnected from the rest of daily life and all the subjects taught at school level reflect the knowledge base of human progress. Without skills in mathematics it is very difficult if not impossible to survive in this world.

As ***Roger Bacon*** said "Mathematics is the gate and key of the sciences. Neglect of mathematics works injury to all knowledge, since he who is ignorant of it cannot view the other sciences or the things of the world. And what is worse, men who are thus ignorant are unable to perceive their own ignorance and so do not seek a remedy. Virtually all other areas of curriculum relate somehow or other with mathematics.

The objectives of mathematics instruction in school are—

(a) Helping students acquire knowledge and abilities concerning the subjects mathematics.

(b) And helping students gain knowledge and abilities in other subjects to which mathematics offers some services.

Although mathematics is connected with almost everything that is taught in school, their relations with few school subjects are mentioned below—

(a) **Science:** Science as a general subject heavily depends on mathematics as Bacon pointed out. The branches of science namely physics, chemistry, biology, earth science, environmental science and others related curricular areas apply mathematical principles and laws to explain, analyze and comprehend their contents. In physical science topics like motion, gravitation work and energy require mathematics for their explanation and understanding. In chemistry mathematics is applied to specify and comprehend chemical bonding, molecular structure, chemical reaction etc. Physics and chemistry in higher secondary level depends on complex mathematics like algebra and calculus.

(b) **Social Sciences:** Social Sciences are more and more using mathematical models to explain related issues and problems. History needs mathematics to calculate the time frame of the human artifacts and scriptures. Topics within the subject Geography weather prediction, impact of atmospheric change on aquatic and non aquatic lives are calculated by mathematics. Economics is now highly mathematized. **Mathematical economics** is the application of mathematical methods to represent economic theories and analyze problems posed in economics. Mathematics allows economists to form meaningful, testable propositions about many wide-ranging and complex subjects which could not be adequately expressed informally. Economists make clear, specific, positive claims about controversial or contentious subjects that would be impossible without mathematics. [Much of economic theory is currently presented in terms of mathematical economic models, a set of stylized and simplified mathematical relationships that clarify assumptions and

implications. Application of mathematics in economics further includes optimization problems as to goal equilibrium, dynamic analysis etc. Economics is now highly mathematized. Education too using more and more mathematics and statistics to explain various phenomena. The graphical representations and probability statistics are used often to develop and test models.

(c) **Commerce:** Accounting and other related topics are obviously mathematical representations of commercial transaction and such concepts. Almost all commerce subjects are special applied branches of mathematics and therefore integrally related to it.

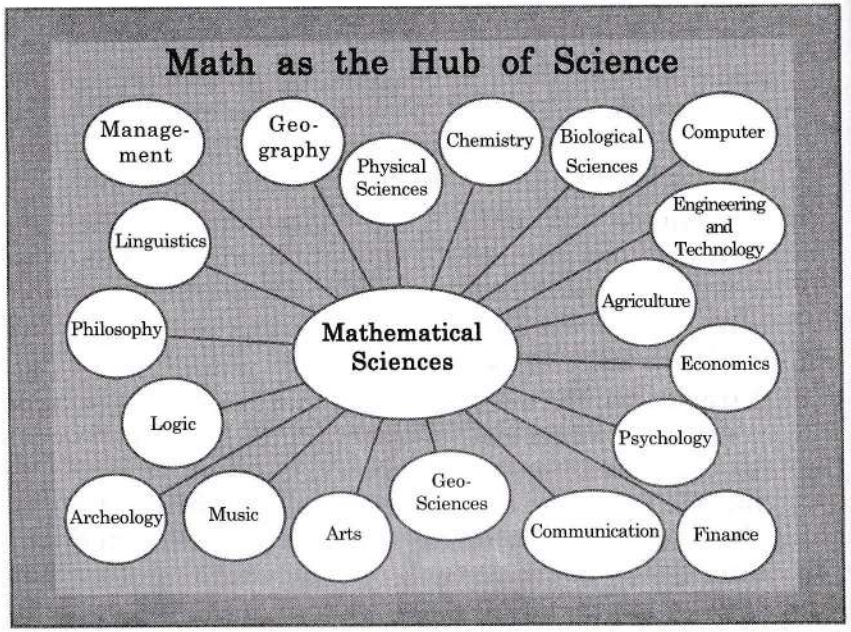
(d) **Literature:** Even literature and writing requires concepts of mathematics. Mathematics helps the learner to understand meter of poetry, number of words to include in a line and the effect of certain rhythms on the readers. At a lower level mathematics help the students to manage time for studying literature and writing papers on them. The subject mathematics helps students to develop linear logical thinking which is acquired from solving mathematical problems.

(e) **Arts:** Music dance, art and theatre are also related to mathematical skills. Art and craft are very much associated with geometry. Musical rhythms are associated with complex mathematical series. Measurements in work education rely on mathematics.

Apart from the idea that knowledge of mathematics is important for better understanding of other subjects, mathematics itself is a fundamental part of human thought and logic. It helps to understand the world around us. Besides learning mathematics leads to building of mental discipline and encourages logical reasoning and mental rigour.

It's important and unique place in school curriculum is attributed to its transversal nature (mental discipline required for other subjects.). Mathematical literacy is crucial for effective living as constructive, concerned and reflective citizens.

How mathematics is related with other subjects is shown by the following figure.



Application of mathematics in society and technology

Mathematical application has revolutionized the development of technology which has immensely contributed to human society. The following shows the application of mathematics in technology.

(a) Integral transforms and geometry is applied in MRI and CAT imaging.

(b) Graph theory, linear algebra, wavelets are used in internet search engine compression etc.

(c) Financial options valuation is based on Black-Schools model and Monte Carlo simulations.

(d) Signal processing, image processing and data mining in mathematics help in global reconnaissance

(e) Number theory, cryptology combinatorics are used in confidentiality and integrity.

(f) Modeling of atmosphere and oceans is based on wavelets, statistics and numerical analysis.

(g) Human genome is analyzed with the help of data mining, pattern recognition and discreet algorithms.

(h) Data mining and statistics are also used in rational drug design.

(i) Signal processing, geometric and graphic algorithms are applied in digital entertainment and animation.

(j) Aero dynamical designs are created by differential equations and optimization.

(k) Earthquake analysis and prediction use statistics, dynamical systems and turbulence.

The students may be encouraged in the class to find out the various applications of mathematics in the laboratory or nearby places. They may be asked to find out mathematical implications of finance, genome research, cryptography, simulation of physical system (airplane, hurricane etc), simulation of discreet system like traffic flow, network, battlefield etc.

The teaching of mathematics in school in the present context

The teaching of mathematics is at present a matter of concern. The position paper on teaching mathematics published by NCERT (2006) had mentioned the problems of teaching mathematics in our schools.

(a) A sense of fear and failure regarding mathematics among a majority of children,

(b) A curriculum that disappoints both a talented minority as well as the non-participating majority at the same time,

(c) Crude methods of assessment that encourage perception of mathematics as mechanical computation, and

(d) Lack of teacher preparation and support in the teaching of mathematics. Systemic problems further

aggravate the situation, in the sense that structures of social discrimination get reflected in mathematics education as well. Especially worth mentioning in this regard is the gender dimension, leading to a stereotype that boys are better at mathematics than the girls.

The Qualities of a successful mathematics teacher

(a) A successful math teacher should have an extensive knowledge of mathematics. He or she also is conversant with different areas of mathematics algebra, geometry, statistics, and calculus. This knowledge boosts the confidence of the teachers to explain the concepts and processes of mathematics.

(b) The teacher must know that the students learn differently. Therefore he must be aware of best practices for teaching mathematics and incorporate them in different situations.

(c) The mathematics teacher should realize that there are multiple ways of solving problems. These alternate strategies should be used to help those students who are struggling with mathematics.

(d) Her lesson plans must engage all students and make them feel confident.

(e) In a mathematics classroom an effective teacher does not take "because I said so" approach. Neither should play the role of a 'know all' person.

(f) The role of a teacher is that of a facilitator of learning, providing students with the knowledge and tools to solve problems. If the students fail to solve the problem or do it incorrectly he must encourage them to find out where they have gone wrong instead of asking them to quit.

(g) An effective mathematics teacher should play the role of a leader in her classroom and in the school. He must earn the respect of his students, not only for her knowledge of mathematics, but for her overall attitude and actions. The teacher is able to control the

classroom, lay out clear rules and expectations for students to follow.

(h) A good mathematics teacher cares about her students. He finds out when a student is having a bad day or needs some encouragement and deals with the problem in a straight forward manner. He also does everything to help the student refocus on the material. The mathematics teacher should hold high expectations from the students. But he also knows that there might be occasional problems at home or family obligations which interfere with the students' study hours and progress. He is always ready to give them second chance and time/help to catch up.

The position of mathematics in school curriculum has changed rapidly. It is no longer a strange subject having no link with real world. Neither this subject is only for geniuses so that general public has better leave it alone. Mathematics has now infiltrated in all the aspects of human life. It is true, however, that school mathematics is not based on application only but increasing importance of mathematics in daily life has made teaching of mathematics a real challenge. One of the infiltrations of mathematics in the real world has been triggered by development of computers. The question is now how this revolution penetrated the school. In India quite a large number of students either own computers or can handle it with internet access. They are actively engaged with games, chatting, processing and are part of social network but do they use computer for mathematics? Does the school teach mathematical modeling (ambitious problem solving), algorithmic thinking (expressing mathematics in such a way that the computer can handle it)? In this context there is need to change curriculum textbook and everyday life at school.

The NCERT (2006) in its position paper on mathematics suggested what should be the central directions for action towards the stated vision. The suggestions were grouped into four central themes:

a. Shifting the focus of mathematics education from achieving 'narrow' goals to 'higher' goals,
b. Engaging every student with a sense of success, while at the same time offering conceptual challenges to the emerging mathematician,
c. Changing modes of assessment to examine students' mathematisation abilities rather than procedural knowledge,
d. Enriching teachers with a variety of mathematical resources.

It is a matter of concern that mathematics are often taught in isolation as separate subject in school without highlighting its .correlation with other school subjects. The teachers should make this relationship explicit and visible. They should send the message that all students can learn mathematics and they need to learn it.

It is a matter of concern that mathematics are often taught in isolation as separate subject in school without highlighting its .correlation with other school subjects. The teachers should make this relationship explicit and visible. Only then learning will be meaningful to them. The emphasis on the integration of mathematics and other subjects is all the more imperative as more and more these subjects are being mathamatized. In the 21st century we find be two types of people mathematically abled and mathematically disabled. The responsibility of the school is to reduce the number of such disabled persons.

Questions

Objective type (2 marks)

Q.1. Give any two characteristics of the discipline mathematics.

Ans. The nature of mathematics is best explained on the basis of the following characteristics–

(a) Mathematics is a science of pattern and order. Hidden pattern within it helps one to understand the world full of information.

(b) The domain of mathematics includes number, chance, form, algorithms, and change.
(c) Mathematics relies on logic and reason but also uses observation, simulation and even experimentations. It helps to develop distinctive mode of thoughts.
(d) Theorems and theories in mathematics offer foundation of truth and a standard certainty. (Any two)

Q.2. Why is it said that history of mathematics is as old as human civilization?

Ans. Its history is as old as human civilization. From time immemorial it was the basis of science, engineering and philosophy. Mathematics in the beginning was the tool for counting measuring and calculation and studied the shapes and motions of physical objects. As a method it used abstraction, imagination and logic and today it is one of the most abstract and complex discipline. The first surviving examples of geometrical and algebraic calculations derive from Babylon and Egypt in about 1750 BC.

Q.3. What should be the main aim of teaching mathematics in school?

Ans. The present mathematics curriculum should aim at developing problem solving analytical skill. This can be done when the students-

a. Enjoy mathematics, realizes the social application and uses of mathematics.
b. Talk, discuss and work together on mathematical problems.
c. Pose Mathematics related questions and solve mathematical problems and puzzles.

Q.4. What is meant by instrumental value of learning mathematics?

Ans. Instrumental value of learning mathematics means utilitarian value of learning mathematics. It also signifies learning mathematics for learning other related subjects. But apart from instrumental value learning mathematics should develop intrinsic value, that is students should enjoy mathematics.

Q.5. Why is it said that mathematics is gateway to learning science?

Ans. Science as a general subject heavily depends on mathematics as bacon pointed out. The branches of science namely physics , chemistry, biology, earth science, environmental science and others related curricular areas apply mathematical principles and laws to explain, analyze and comprehend their contents. In physical science topics like motion, gravitation work and energy require mathematics for their explanation and understanding

Q.6. How does mathematics contribute to learning social science?

Ans. Social sciences are more and more using mathematical models to explain related issues and problems. History needs mathematics to calculate the time frame of the human artifacts and scriptures. Topics within the subject Geography weather prediction, impact of atmospheric change on aquatic and non aquatic lives are calculated by mathematics. Similarly economics, education sociology also depend on mathematical models for explaining various issues.

Q.7. What is the main defect of teaching mathematics in school?

Ans. It is a matter of concern that mathematics are often taught in isolation as separate subject in school without highlighting its .correlation with other school subjects. Also students are not taught to enjoy it rather they develop fear towards it.

Q.8. How can literature and mathematics be related?

Ans. Literature and writing requires concepts of mathematics. Mathematics helps the learner to understand meter of poetry, number of words to include in a line and the effect of certain rhythms on the readers. At a lower level mathematics help the students to manage time for studying literature and writing papers on them. The subject mathematics helps students to develop linear logical thinking which is acquired from solving mathematical problems.

☛ Short type/Short note (5 marks)

Q.1. Write a short history of mathematics.

Ans. Page No. 116 Sub heading 4.1 However it is to be made brief.

Q.2. Write about the nature of mathematics.

Ans. Page No. 116 Sub heading 4.1. Second paragraph

Q.3. Why is mathematics important in daily life?

Ans. Page No. 128 Sub heading 4.3 .

Q.4. Mention how different subjects have been merged in the discipline of mathematics.

Ans. Sub heading 4.4 Page No-129

Q.5. Should mathematics be taught as a compulsory school subject? Give your reasons.

Ans. In recent times a question is often asked. 'Should mathematics be taught throughout the period of compulsory schooling? Or should there be differential mathematics curriculum? Whether students be given choice as to learning of mathematics. These are debatable issues. But it is to accept that mathematics literacy is needed for survival as knowledge of it is required in every sphere of socio economic life. Apart from the idea that knowledge of mathematics is important for better understanding of other subjects, mathematics itself is a fundamental part of human thought and logic. It helps to understand the world around us. Besides learning mathematics leads to building of mental discipline and encourages logical reasoning and mental rigour.

Its important and unique place in school curriculum is attributed to its transversal nature (mental discipline p required for other subjects.). Mathematical literacy is crucial for effective living as constructive, concerned and reflective citizens. So it should be taught as a compulsory subject.

Q.6. Write a short history of mathematics in India.

Ans. Page No. 123-125

Q.7. Mention any five characteristics of teaching Mathematics.

Ans. The teaching of mathematics is at present a matter of concern. The position paper on teaching mathematics published by NCERT (2006) had mentioned the problems of teaching mathematics in our schools.

(a) A sense of fear and failure regarding mathematics among a majority of children,

(b) A curriculum that disappoints both a talented minority as well as the non-participating majority at the same time,

(c) Crude methods of assessment that encourage perception of mathematics as mechanical computation, and

(d) Lack of teacher preparation and support in the teaching of mathematics. Systemic problems further aggravate the situation, in the sense that structures of social discrimination get reflected in mathematics education as well. Especially worth mentioning in this regard is the gender dimension, leading to a stereotype that boys are better at mathematics than the girls.

Q.8. Justify mathematics as an interdisciplinary education.

Ans. Sub heading 4.4 Page No.-129

Q.9. Write a short note on inter relationship mathematics with other school subjects.

Ans. Same as answer to question 8.

☛ Essay type (10 marks)

Q.1. Write about the Nature and History of teaching Mathematics.

Q.2. Discuss the relationship of mathematics with other school subjects.

Q.3. Discuss the place of mathematics in school curriculum.

Q.4. Write a note on Mathematics in Day-to-day Life.

(Answers to all the these questions can be obtained from the short answer questions only explain them in detail.)