MATHEMATICS CURRICULUM

In modern idealogy education has three poles-teacher, pupils and curriculum. If any one of them is less or left then the teaching process remains incomplete. The preface of curriculum in teaching process is as same as the preface of teacher and students. The curriculum of all subjects are framed in keeping mind the teaching objectives that are social, intellectual and cultural values. Today life is more complecated than it was a hundred years ago, the pupil of tomorrow will be pupil of a more complex and intricate world than those of today.

The 'what' and 'How' of mathematics have always been determined by its 'why'. These objectives are fundamentally important to guide curriculum constructors, textbook, writers, teachrs and other education officers and adminstrators.

Meaning of Curriculum

Curriculum originates from a latin word **'Currere'** which means to **'run'**. It is, therefore, defined as a , **'course to be run for reaching a certain goal'**. This definition does not inform us enough specifically and intelligently. Historically speaking, it meant classified selections made from the accumulated knowledge into separate subjects or disciplines to be taught to students. From there arose other specialized curriculums as a business curriculum and the college preparatory curriculum etc. in U.S.A.

Other activities or learning experiences considered important by the school were first of all called extra-curricular and late on the term co-curricular came into vogue.

Narrow Meaning of Curriculum

According to traditional or narrow meaning of education it is confined to school education. In traditional meaning curriculum has been defined as a group of subjects of study arranged in a particular sequence. The influence of traditional meaning of curriculum has been confined it to only subject matter arranged and preserved in the form of books. It involves only the content of academic interest. It neither includes nor solves the present problems of society.

The narrow or traditional curriculum lacks realistic experiences. It is a collection of unrelated items based on wrong psychology of learning that learning in parts is better than learning in whole. The result is drill, recitation and memorisation.

Broader Meaning of Curriculum

In Broader meaning it means which the school adopts to discharge effectively its fundamental social responsibilites. So, it is not merely a group of subjects but includes the whole program of the school. Broader meaning consider the nature of the child and the requirement of the community as two main determine of the curriculum.

The curriculum should not be only child-centred but also consider the ideal and values of the society. It assumes that the child is to grow in the way society likes him to grow. Curriculum should be framed according to the vital interests of the child and should give him the opportunities for self-experience and personal activity so that his individuality is developed to the full.

Hence, the curriculum should concentrate on the experience of the human race as a whole.

Definitions of Curriculum

To make the meaning of curriculum more clear and comprehensive, some important definitions are as follows :

According to **Munroe,** "Curriculum embodies all the experiences which are utilized by the school to attain the aims of education."

According to **Crow & Crow,** "Curriculum includes all the learner's experiences, in or outside school that are included in a programme which has been devised to help him develop mentally, physically, socially, spiritually, emotionally and morally."

According to **Cunningham,** "Curriculum is the tool in the hands of the artist (the teacher) to mould his material (the pupil) according to his ideal (objectives) in his studio (the school)."

According to **Sayler and Alexandar,** "The total effort of the school is to bring about desired outcomes in school and out of the school situation."

According to **Stephen Leacock,** "The teacher stands at the door that he has opened, his keys in his hand. It is dark within and silent. In the darkness lie the mummified bodies of learnings that were alive once, but perished one by one in the dead mephitic air of scholasticism, of learning that had turned to formalism and lost its meaning to body, its soul to formula and lost its living force."

According to **Shane and Mc Swain,** "The psychological curriculum may be defined as the sum of the experiences as the learning, skills, habits, and attitudes that the child has made a part of himself and that governs his behaviours as a result of the environment provided by the school."

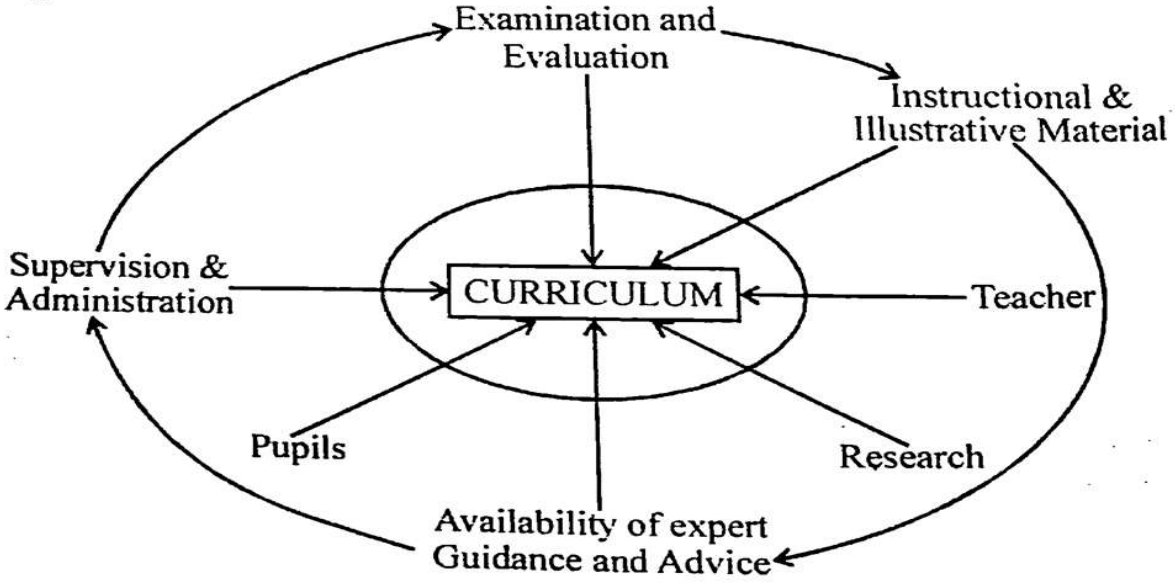
According to **Froebel,** "Curriculum should be conceived as an epitome of the rounded whole of the knowledge and experiences of the human race."

According to **P. Samuel,** "The curriculum is the sum total of the experiences of the pupil that he receives through the manifold activities that go on the school, in the classroom, in the laboratory, in the library, in the playground and in the numerous informal contacts between teacher and pupils."

In Secondary Education Commission Report (1952-53)

"Curriculum does not mean only the academic subjects traditionally taught in the schools, but it includes totality of experiences that a pupil receives through the manifold activities that go on in the school, in the classroom, library, laboratory, workshop. playgrounds and in the numerous informal contacts between teachers and pupils. In this sense the whole life of school becomes the curriculum which can touch the life of the students at all points and helps in the evolution of the balanced personality."

On the basis of above definitions it can be concluded that curriculum is that field of race, in which child race to achieve his/her goals. In other words, curriculum is a source of to achieve the goal. Curriculum is a set up of study and experiences through which the aims of education are realised and the behaviour of learner is changed. In educational process the teacher, learner and curriculum have equal importance. It is shown by following diagram :



Definitions of Curriculum giving different Dimensions and View Points

Descriptive: Those aspects of schooling which have been deliberately planned comprise the curriculum.

Perspective: Curriculum is a set of content units which are arranged in a way that the learning of each unit may be accomplished as a single act provided the capabilities described by specified prior units in the sequence have already been mastered by the learner.

Static: Curriculum is a judiciously organized subject matter.

Dynamic: It is an organized set of processes, procedures, programmes and the likes which are applied to learners To achieve certain kinds of objectives.

Scientific: Curriculum is purely and simply a teaching strategy. A teaching strategy is, in turn, conceived of as being a series of goal-oriented activities or procedures to be carried out by teachers with respect to a class of learners, and in the context of a syllabus or a body of subject matter.

The Goals of Mathematics Curriculum

There are many goals of mathematics curriculum. Some goals are as follows :

1. To provide continuous and systematic experiences from beginning to the end to the pupils.
2. To develop the view of adopting concept.
3. To give the training of those methods in which mathematical methods are used.
4. To take in mind the individual differences of the pupils like capabilities, interest etc.
5. To provide maximum opportunities to use skills and teaching material.
6. To promote and develop various constructive and creative abilities of child in conformity with the different stages of his development.
7. To develop the all round personality of a pupil and to develop appropriate mental and emotional point of views and habits.
8. To lay foundation for rich, useful and moral life so that the child may contribute for social welfare.
9. To develop interest and abilities in child for search.
10. To create new values for themselves by means of their resourcefulness, courage, behaviour and scientific attitude.
11. To develop appropriate social and economic relations, so that the child may lead life in family, school and society.
12. To develop the thinking, searching, understanding and decision making abilities of a child for moral development.

Meaning of Curriculum, Syllabus and Course of Study

For curriculum, syllabus and course of study words are also used. Earlier they were taken in the form of curriculum. But they are different from in the wider meaning of curriculum concept. Curriculum includes all those experiences which pupils achieve in school life. It includes indoor and outdoor activities which are organised in class. But in syllabus, the statement of subject matter is prepared for teaching which a teacher teaches a student.

According to bludites the difference between curriculum and syllabus can be understand as :

"Curriculum in whole teaching session shows the definate information about the quantity of knowledge given by the teacher to the students whole in curriculum, it shows by which type of teaching activities a teacher will fulfill the needs of syllabus."

According to **UNESCO publication, "Preparing Text book manuscripts",** "Curriculum for study the subject of study, their

arrangement and sequence and definates the uniformity in study's subject. From this to establish the interrelationship between the subjects is convenient. Along this curriculum, distributes the time limit of school for different subjects, objectives to teach each subject, speed to achieve connative skills or fores the differences of teaching in school of rural and urban areas.

Difference between Curriculum and Syllabus

Curriculum	Syllabus
1. On the basis of teaching objectives formation of a curriculum is possible.	1. On the basis of one curriculum, formation of various syllabus is possible.
2. In curriculum to follow referenced instruction is necessary.	2. There is flexibility to follow referenced instruction.
3. Construction of curriculum in a central level.	3. Its contruction can be done in school level.
4. In curriculum all systematic activities that happens in a school is included.	4. Syllabus is a work of curriculum in which syllabus related to special subject is included.
5. Along with the knowledge of subject matter, cocurricular activities and from planning of other activities are helpful in the all round development of child.	5. Syllabus is helpful in the development of child's knowledge about subject matter and bookish knowledge.
6. Curriculum is whole.	6. Syllabus is a part of curriculum.
7. Curriculum is understanding in form of its activity and experiences.	7. Syllabus is a collection of acquired knowledge.

On the basis of above discisions syllabus is a part of curriculum, not a whole.

Defects of the Present Curriculum of Mathematics

What is wrong with the existing curriculum? The curriculum has remained traditional in spite of ambitions and repeated efforts to improve it. The existing curriculum is far from being satisfactory. The teacher and the taught have been subordinated to some set processes of mathematics. The emphasis is only on the nature of the subject and future needs of the learner. The child receives a setback rather than education in this process.

The teacher remains indifferent and shows no enthusiasm about the curriculum.

Some defects of the present curriculum of mathematics are :

1. It is subject-centred and topical by which maths teacher, student and other related persons are not clear knowledge about the mathematics.
2. It does not achieve the aims and objectives of mathematics teaching.
3. A number of topics and problems that have been included are dull, uninteresting and useless.
4. So many rules, principles, concepts and problems are not all connected with our daily life.
5. Present curriculum is exam based. On the basis of exam, teach the curriculum. It is unable to develop other mental activities, on the development of memory.
6. The curriculum of primary, upper primary, secondary and senior secondary stage are not corelated carefully, so that the contents of many topics are repeated in higher classes.
7. No place is given to the leisure time in present curriculum.
8. Lack of variety and flexibility in present curriculum of mathematics.
9. Present curriculum emphasises on examination.
10. No improvement in mathematics curriculum with the social progress.
11. There is no use of non-formal aid in education.
12. In the existing curriculum separate content is written for arithmetic, algebra and geometry. It shows they are not correlated with each other.
13. Lack of creative works in present mathematics curriculum.
14. Only arithmetic is included in the curriculum at primary stage.
15. Teaching of geometry in class 6^{th} is not according to psychological principles.

On the basis of above decision we concluded that the present curriculum of mathematics is bookish, theoretical, unpsychological and over crowded.

According to **Kothari Commission (1964-1966)** the main defects of present, curriculum of mathematics are:

1. The mathematic curriculum is highly over crowded because we know the old education level.
2. In present mathematics curriculum emphasises on examination.
3. Present curriculum of mathematics is inadequate. In this there is no contribution of whole experience of students.

According to **Secondary Education Commission (1952-53)** the main defects are:

1. The present curriculum of maths is very narrow.
2. It is based on bookish and theoretical knowledge.
3. It is not satisfaction of need of students.
4. It is exam based.
5. Present mathematics curriculum is not related with daily life of students.
6. In present curriculum gives no attention the need and interest of students.
7. The construction of curriculum in unpsychological way.
8. The execution of curriculum is not effectivelly.

Suggestions for Improving Curriculum

For removal of present mathematic curriculum some suggestions are as follows :

1. Determinations of aims of mathematics teaching is precautionally.
2. Construction of curriculum on the basis of interest, need and individual differences of the student.
3. Construction of aims is according to cognitive, affective and psychomotor domain of the students.
4. To give the satisfactory instruction for the use of different type of teaching aid in curriculum.
5. Give importance to the practical works in curriculum.
6. Present the arithmetics, algebra and geometry in highly correlated order.
7. Give the same importance of oral and home work with written and drill work in curriculum.
8. Give the specific attention of flexibility at the time of construction of curriculum.
9. For the evaluation of curriculum give the sutaible guide line or idea for children by which they evaluate their achievement.
10. Give the clear instruction for the teacher and student in curriculum.
11. Organisation of content in logical order.

For the improvement of present mathematics curriculum **Secondary Education Commission (1952-53)** gave following suggestion in its report:

1. More relation of curriculum with the social life of child.
2. Give the equal importance of theoretical and experiences in curriculum.
3. Relation of different subjects and daily life of curriculum.

4. Variety and flexibility in curriculum.
5. Students achieve the knowledge according to their own ability, interest and need.

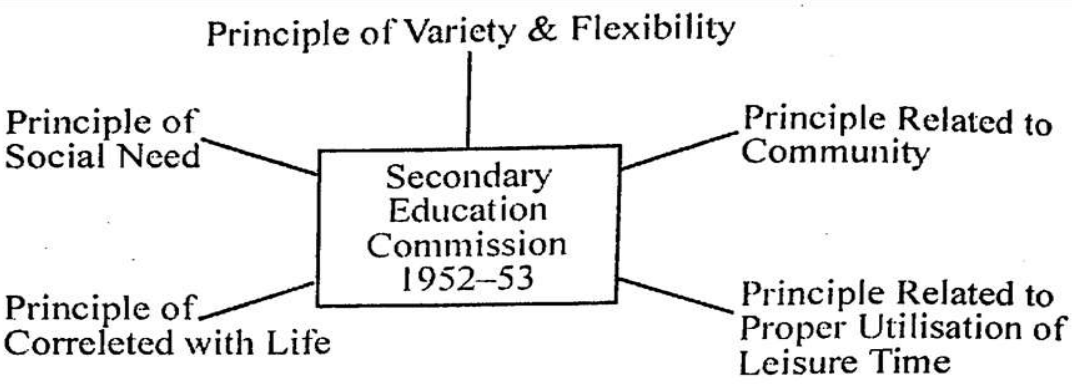
Principles of Curriculum Construction

At the time of the construction of mathematics curriculum at different levels mainly the following principles should be kept in mind:

1. Principle of Utility
2. Principle of Flexibility
3. Principle of Activity
4. Principle of Creativity
5. Principle of Correlation and Integration
6. Principle of Preparatory Value
7. Principle of Based on Democratic Values
8. Principle of Social Orientation
9. Principle of Psychological
10. Principle of Totality of Experience
11. Principle of Relationship with Life
12. Principle of Training for Leisure
13. Criterion of Teacher's views and Experiences
14. Principle of fulfilment of Higher Educational Needs

1. Principle of Utility–In the present materialistic age, the significance of any subject matter is less in its practical utility. The knowledge which is applicable in daily life is everybody's necessity. In the construction of mathematics curriculum, we should include only those topics which are useful for a particular grade in many ways. Firstly we should include only those topics, which are useful in our daily life, as-profit, loss, taxes, graphs, areas etc. secondly it is used in various vocations and in appreciating the part played by mathematics in the development of civilization in its various aspects in commerce, industry, engineering, social sciences etc.

2. Principle of Flexibility–Flexibility means that curriculum where a child gets education is according to his interest, age and wisdom. In this curriculum is child-centered not subject-centered. Because the curriculum is for child, not the child for curriculum. Hence, on keeping mind the child's interest the fixation of mathematics curriculum should be done. Along this from time to time the modification of mathematics curriculum should be done on the basis of social needs and recent knowledge, trends and useful topics should be concluded on curriculum from time to time.



According to **Secondary Education Commission,** "There should be enough of elasticity in the curriculum to allow for individual differences and adaptation to individual needs and interests."

3. Principle of Activity–Curriculum of mathematics should be actively-centred rather than theoretical or bookish. The structure of content should be practical. By which pupils can achieve the real knowledge and happiness while working. In this way pupils become physically and mentally activated and easily understand the typical facts of mathematics.

According to **T.P. Nunn,** "The school should be thought of not a knowledge monger's shop but a place where the young are disciplined in certain forms of activity."

So, in curriculum, there should have some problems by which pupils get opportunities to remain active and on the basis of their own experiences they can easily study this subject.

4. Principle of Creativity–At the time of constration of mathematics curriculum it should be kept in mind that what is the intellectual level of the pupils. Some pupil having creative tendency, some are geneous and active. They believe in the principle of 'Learning by doing.' The view of these children are heuristical or they discover of realness of things.

5. Principle of Correlation and Integration–It has been universally admitted that a new piece of knowledge is not an isolate fragment. In some way, it is related with what is already there in the mainfold structure of the mental content. Therefore, the knowledge is not to be imparted in isolated units but it should take place through a well integrated and interlinked process. Thus, the contents of curriculum should be correlated and integrated with each other.

6. Principle of Preparatory Value–In this principle, the content should include topics which prepare the child for university education and for life. There is only a small percentage of students. Which go upto the university stage whereas for most of the students, school is a terminal stage. Thus the requirements of the college course need not dominate the school

curriculum. We should include the topics and materials which are useful for a wide variety of vocations.

7. Principle Based on Democratic Values–Our country is democratic. At the time of construction of curriculum following democratic values should be kept in mind :

(i) Respect of an individual.
(ii) Work on Group Basis.
(iii) To make balance between work and duties.
(iv) Diagnoses the problems
(v) To give values of new ideas.
(vi) To give knowledge of social sensitivity.

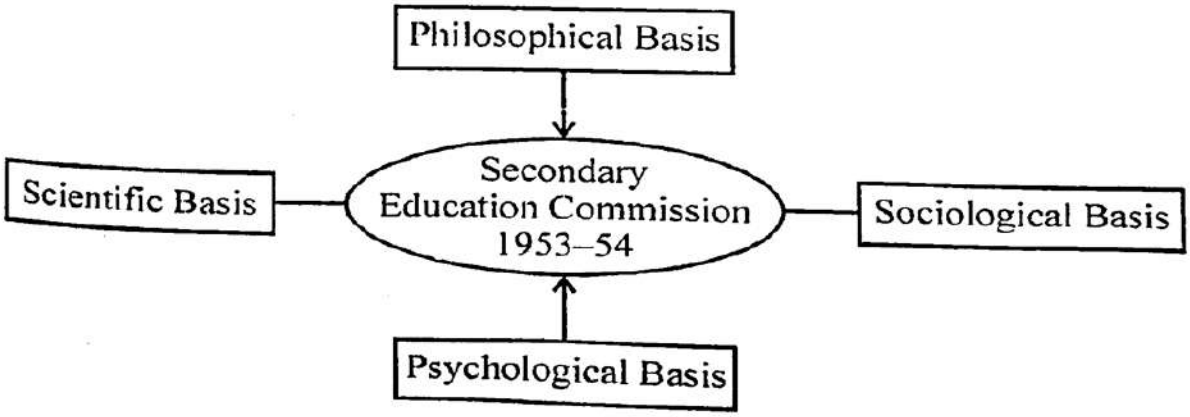
8. Principle of Social Orientation–Keeping society in mind mathematics is a useful and important subject because the present objectives and needs of society. leave their impression on curriculum.

According to **Albearty**, "No conflict between society-centredness and child-centredness."

9. Principle of Psychology–During construction of mathematics curriculum at different levels, should keep in mind the mental level, interest, needs, ability, age etc. psychological facts of that level children. According to psychological principles curriculum should be child-centred not subject-centred.

10. Principle of Totality of Experiences–According to this principle, on curriculum along with the principle subject which are taught in a traditional way, those experiences should be given a place which a child given by various actitivities.

According to **Secondary Education Commission Report,** "Curriculum does not mean only the academic subjects but it includes totality of experiences."



11. Principle of Relationship with Life–In curriculum the relation of subjects with real life is important, then the child after taking entrance in life can achieve success on it.

12. Principle of Training for Leisure–During the formation of curriculum it should include some activities by which a student can utilize his leisure time. For this, students should be given some mathematics related puzzles or problems to solve by which study work become entertaining and the pupils will utilise the leisure time.

13. Criterion of Teacher's Views and Experiences–The most important but unfortunately most neglected criterion for the selection of subject matter is the teacher's view. In the real sense, teachers have to deal the curriculum. So, their, views and experiences must be given due consideration in the construction of curriculum. An experienced teacher know the levels of students and the suitable content which should be taught to them. But, mostly it happens that curriculum is imposed on teachers and they are unaware about the significance of changes in the curriculum if any. Though few teachers are included in the curriculum committee to represent the teacher's side but their selection is arbitrary rather than academic specialities. There should be a good representation, participation and contribution of experienced and academically well equipped teachers in the curriculum construction committee.

14. Principle of Fulfilment of Higher Educational needs–After primary classes, in high primary stage, middle stage and university any technical knowledge is required. So while making curriculum a proper place should be given to all those facts, trends, laws, principles etc. which are necessary in the achievement of high knowledge and which is useful in child's future life.

On the basis of above principles we can say that the formation of curriculum should be done on keeping in mind the child's necessities, interests, capabilities and individual differeces. This curriculum along with development of pupils personality can also prepare them for future life.

Various Types of Curriculum of Mathematics

There are various types of curriculum in mathematics. In brief they are as follows :

1. Subject-centred Curriculum–This curriculum gives more emphasis on subject matter in place of the child. It is also called **'Book-centred curriculum'** because it lays emphasis on bookish knowledge and learning. It is based upon a clear specific ideology of education and sociability. It can achieve an effective correlation among various subjects.

Subject-centred curriculum is unpsychological in nature because it pays no consideration to the needs, interest, attitude, capacities and abilities of the child.

2. Activity-centred Curriculum–In this curriculum various activities are emphasized in a specific manner. In activity-centred curriculum, a child will develop interest in useful and purposeful activities which will promote his developments to the fullest extent possible.

3. Experience-centred Curriculum–In experience-centred curriculum, experiences are regarded as more important for the development of child in comparison with emphasis on subject and activities. It is psychological in nature because it takes into consideration the needs, abilities, interest, attitudes and capabilities of the child. It is flexible and progressive. The basis of experience-centred curriculum is democratic.

4. Child-centred Curriculum–In this curriculum greater importance is given to the child in place of subject, experiences and activities. Such type of curriculum is constructed according to the needs, capacities, attitudes, interest, hobbies and physical as well as mental level of the child.

Kinder-gartem, montessori, project and heuristic method etc. are the examples of child-centred curriculum. Hence, it is constructed on the basis of psychological principles and theories.

5. Correlated Curriculum–Correlated curriculum is more a methodology rather than a type of curriculum construction. This signifies the intimate connection and correlation of various subjectis in the curriculum. Correlated curriculum emphasizes that instead of presenting knowledge in parts, it should be presented as an integrated whole through integration and correlation.

6. Core Curriculum–In this curriculum, some subjects are grouped together as essential and compulsory subjects and many other subjects become optional. The aim of core-curriculum is to develop individual and society both. It is child-centred and gives practice and experiences to solve social problems. Thus according to it so many subjects are taught together and the child becomes a dynamic, efficient and socially useful individual.

Organization Method of Curriculum in Mathematics

While organizing the curriculum in any subject generally two methods are adopted. They are :

1. Topical Vs Concentric Method

1. Topical Method

Under this method the fixation of topics for different classes is according to mental level and age of the children. Topical arrangement is based on the unity of the topic. It implies that a topic should be completed in all respect at one stage or at a stretch. This approach is unpsychological and impracticable because all possible portions and problems, simple as well as complex of a topic cannot be understood by the students of lower classes at a time. Thus, topical arrangement should be made only for few small and easier topics.

Merits of Topical Method

This method has following merits :

1. It is useful in the mental development of the children of higher classes
2. In this method reading a topic for a long time, children's attention is centred on topic and they learn it easily.
3. By this method mental abilities are developed in pupils.
4. By this method pupil understands the typical problems completely in a definite time period.

Demerits of Topical Method

Having the above merits it has also some demerits, these are as follows :

1. This method is not useful for the lower classes children.
2. It introduces in the curriculum a large mass of irrelevant material for which the pupil finds no time and no immediate need or the use of which can not be appreciated by the pupil at that stage.
3. There is no correlation between the topics of different subjects is not achieved.
4. This method treats a child like a machine.
5. In this method the subject is not organised on the basis of from 'Simple to Complex'.

Concentric Method

In this method any of topics is not completely finished while teaching in a particular class. According to the children's age and mental level only those difficult questions are solved which a child easily understands. In this method the sequence of questions is according to 'simple to complex'.

In this method the conceps are told on the beginning, after that on the basis of previous knowledge, new knowledge is demonstrated.

Merits of Concentric Method

1. This method is from 'simple to complex' so the pupils easily gain the knowledge.

Mathematics Curriculum for Different Stages

It is essential to develop democratic feeling in pupils and to create interest towards hardwork on them and to create precision in mathematics. To develop the morality, purity etc. qualities in pupils at different levels the mathematics curriculum should be of following type :

1. At primary level or stage.
2. At middle stage
3. At higher middle stage

The children of these three different stages have different psychology, interest, capabilities and ages. So the mathematics curriculum should be different in these stages:

1. At Primary Stage–At primary stage the formation of mathematics curriculum should be on the basis of children experiences. At this level curiosity of child is increased in very large amount. To keep in mind these curiosities, the formation of curriculum at primary stage should be favourable to the pupils. At this stage ordinary addition, subtraction, multiplication, division, kilogram, gram, addition related to rupees, subtration, profit-loss questions etc. include in arithmetic.

2. At Middle Stage–At this level students increase their interest and ability. By this it is essential to elaborate the curriculum. At middle stage students understand the abstract things. So geometry theorems are teach at this stage.

3. At High School Stage–At high school stage the pupils of different category study mathematics as a compulsory like art group, science group, agriculture, commerce group. After that a student becomes a good doctor, teacher, professor, engineer etc.

Suggestions of Kothari Commission

1. To give more emphasis to the new thoughts of mathematics at secondary and higher secondary stages.
2. For the deep study of subject we motivate the students to specific subjects as physics, chemistry etc.
3. The main aim of mathematics education is to create the mental discipline in the students on secondary level.
4. To organize higher study of gifted children.

National Educational Research and Training Council

Give some suggestion for integrated mathematics curriculum at class 6^{th} to class 8^{th}. These are :

1. To give the knowledge of importance of mathematics in daily life of the students.
2. To give the knowledge of different teaching methods in mathematics teaching.

Need and Importance of Mathematics Curriculum

Needs and importance of mathematics curriculum are :

1. Helpful in Organising Educational Process–On the basis of curriculum only at the different stages in school the information is given about the knowledge of mathematics that at which limit the knowledge is given to pupils at different stages. Curriculum is helpful in the organisation of the process of education.

2. Helpful in Achieving Aims–Curriculum is helpful to achieving the educational aims. By curriculum only it is definated that the teachers, writers etc. of mathematics teacher how much? what? and how?

3. Helpful infulfilling the Psychologicai Needs–Curriculum is helpful in fulfillment of the psychological needs in the students. By this the feeling of systematic, regular and interesting work is developed in the students.

4. Helpful for Student Evaluation–Curriculum is also helpful in the process of evaluation, when the teacher teaches the pupils according to curriculum then he wants to evaluate the taught lesson. So that he knows about their progress.

5. Helpful for Cyclic Order–Mathematical development is based on the number system and four fundamental operations viz. addition, subtration, multiplication and division which reappear everywhere in simple or complicated forms. This repetition of fundamental ideas in building of structure and development of mathematics is known as cyclic development of the subject.

And also it can be state that Need and importance of mathematics in school curriculum:

Why do we need to know Mathematics? Why should we memorise so many formulae, theorems, proofs, etc? How will this information help us in our later life? What is its importance in my life? These are some of the common questions that we can see among those who are not interested in learning Mathematics. How far, as a teacher of Mathematics, we are able to convince our students to appreciate the importance of Mathematics?

'Why should we learn Mathematics?', is a valid question, and as Mathematics teachers, it is our responsibility to understand and conceptualise its importance and unique place among other school subjects. Why do our curriculum designers place Mathematics as a core school subject, and what is the significance of Mathematics in the overall school curriculum? The following values justify importance of mathematics curriculum.

Social Aspects

- The routine activities of daily life demand a mastery of number of facts and number of processes. To read with understanding much of the materials in newspapers requires considerable mathematical vocabulary. A few such terms are percent, discount, commission, dividend, invoice, profit and loss, wholesale and retail, taxation, etc. As civilization is becoming more complex, many terms from the electronic media and computers are being added.
- Mathematical operations like addition, subtraction, multiplication, division and so on, are used in our daily activities. From poor to rich, all have to use Mathematics in their real lives in one or the other way.
- Certain decisions require sufficient skill and understanding of quantitative relations. The ability to sense problems, to formulate them specifically and to solve them accurately requires systematic thinking.
- To understand many institutions and their management problem, a quantitative viewpoint (modeling) is necessary. It is illuminating to hear from an economist, an architect, an engineer, an aviator, or a scientist what in mathematics is helpful to them as workers.
- Many vocations need mathematical skills.
- The child should gain an appreciation of the role played by mathematics in many fields of work. Since, scientific knowledge and technology are linked with the progress and prosperity of a nation; we should be able to appreciate the role of mathematics in acquiring these.
- Mathematics has helped in bringing together the countries of the world which are separated from each other physically.
- Mathematics helped man to discover the mysteries of nature and to overcome superstitions and ignorance.

Mathematical Aspects

- Mathematics teaches us how to analyse a situation, how to come to a decision, to check thinking and its results, to perceive relationships, to concentrate, to be accurate and to be systematic in our work habits.
- Mathematics develops the ability to perform necessary computations with accuracy and reasonable speed. It also develops an understanding of the processes of measurement and of the skill needed in the use of instruments of precision.
- Mathematics develops the ability to
    a) make dependable estimates and approximations,

b) devise and use formulae, rules of procedure and methods of making comparisons,
c) represent designs and spatial relations by drawings, and
d) arrange numerical data systematically and to interpret information in graphic or tabular form.

Application of Mathematics

- The history of mathematics is the story of the progress of civilizations and culture. "Mathematics is the mirror of civilization".
- Egyptian and Babylonian civilizations have given a pertinent position to Mathematics. They considered it as a subject to be learnt in order to perform daily life activities in a better way. Elementary arithmetic and algebra were built up to solve the problems related to commerce and agriculture. They used this knowledge generally for money exchange, simple and compound interest, computing wages, measuring weights and lengths, determining areas of fields, etc. Since ancient times, the subject of Mathematics has been given a pivotal position due to its utilitarian and disciplinary values. It is believed that study of Mathematics improves our mental power and reasoning ability.
- A country's civilization and culture is reflected in the knowledge of mathematics it possesses.
- Mathematics helps in the preservation, promotion and transmission of cultures.
- Various cultural arts like poetry, painting, drawing, and sculpture utilise mathematical knowledge.
- Mathematics has aesthetic or pleasure value. Concepts like symmetry, order, similarity, form and size form the basis of all work of art and beauty. All poetry and music utilizes mathematics. Quizzes, puzzles, and magic squares are both entertaining and challenging to thought. Mathematics Hence, the teaching of mathematics is inevitable in our schools

Recent Trends in Curriculum Construction:

1) Digital Diversity

Present age is an age of ICT technology has touched to al the wakes of human life. Technology has made various tasks easy, convenient and of quality. To survive in the concern filed it is necessary for everyone to have a knowledge and skill of technology. Education makes man enable to contribute, it strengthens the capabilities. For the effective transaction of curriculum ICT is must.

Web 2.0 applications must be used for the effective teaching learning process. Curriculum makers should give clear guidelines regarding this. E.g.teacher tube is very useful source for the educational resources. Khan academy.org also provides good videos, lectures and many more which makes learning meaningful, easy and effective. Curricki merlot, K2-12 Hippocamus all these provides educational resources which students can use, edit reconstruct and so on. All these things should be interlined with every curriculum.

2) Need based Curriculums

Researches in all the fields resulted in to specialization. Need based curriculum is the foremost need of the present education system. Many universities are developing need based short term programs for this purpose.

E.g. Mumbai University has introduced courses like – certificate course in Power Point, certificate course in tally, certificate course in marketing, YCMOU- introduced –English communication skills program for Mumbai Dabawala.

3) Modular Curriculum with credit base system

Modular curriculum gives real freedom of learning .especially in the open learning system his approach has been adopted at first but now majority of traditional universities also accepting his system; this is a real emerging trend in the modern curriculum.

4) Online coerces (3rd person present)

Need based and choice based curriculums are available online also. E.g. course era.com has introduced many useful need based courses for free of cost. Government also takes initiative for this e.g. Right to Information certificate curse has been introduced by Government of India to the Indian people. This course is free and online.

5) 21st century skills

All the curriculums of various courses should focus on 21st century skills. Skills like collaboration, critical thinking, effective communication, multitasking stress management, empathy are must for all the personals.

6) International Understanding

Globalization has made converted the world in to global village. We should consider world as a one family and for this international understanding must be inculcate through curriculum

7) Constructivism

Constructivist approach believes that learner should be given freedom to construct his/her knowledge. Spoon feeding must be avoided. If a learner is fully active in construction of knowledge then learning process will be highly effective. In all the curriculums constructivist strategies must be given important place.

Organization of Syllabus

1) Topical and Spiral method:

Topical approach suggested by its name advocates to cover a topic as a whole in a particular grade. Here a few topics of the subject mathematics may there by marked for being included as in the curriculum of one grade or the other then it is expected to cover all the content or learning experiences related to that very topic only in that very class and not to repeat it in any way in the junior or senior grades. Thus a topic marked for a particular grade should have its beginning and end it that every grade without having its need to be taught in the earlier and later grades. We have different sets of topic for their inclusion in the curriculum of different grades of secondary stages of school education.

It has been described under the head criterion of difficulty that easier topics should be dealt with earlier than the difficult ones. Certain portions of a topic are always easier than the other portions of the same topic. Thus Square Measure is easier than cubical measure. Again V=LXBXH is easier than the area of a circle or a triangle. Similarly in profit and loss, certain problems are easier than other. Inverse problems are generally more difficult than the direct ones.

Spiral system is based on the principle that a subject cannot be given an exhaustive treatment at the first stage. To begin with, a simple presentation of the subject-matter is given, gaps are filled in the following year and more gaps a year or two later, in accordance with the amount of knowledge which pupils are capable of assimilating. Spiral method demands the division of the topic or the subject into number of smaller independent units to be dealt with in order of difficulty suiting the mental capacities of the pupils, while the topical method demands that a topic once taken should be finished in its entirety. Spiral method is more natural and less tiring to the pupil. The child loses nothing in accuracy and gains considerably in the power of intelligent application of rules to problems.

Spiral approach may run contrary to the topical approach there we do not include topic as a whole and finish it entirely in a particular grade as practiced in topical approach but

try to spread it over to different grades by covering easier portion in the lower grades and the difficult ones in the higher and higher grades. In this way while expecting concentric (Spiral) approach in any single topic may find its place in the curriculum of different grades on that school education in accordance of the difficulty level of the subject matter/learning experience suiting to the mental level of the students.

The chief defect in the topical plan is that it introduces in the curriculum a large mass of irrelevant material for which the pupil finds no time and no immediate need or the use of which cannot be appreciated by the pupil at that stage. They are introduced with a view to making the teaching of the topic complete and thorough.

Ex. –Multiplication and division with 6 or 7 digits in the first or second standard.

2) Logical and Psychological Arrangement:

Logical arrangement leads to the rigorous treatment of the subject-matter which is based on logical reasoning whereas psychological arrangement is from the point of view of the students. It seems that both the approaches are different but these can be easily merged. The organization can both be psychological and logical. All thinking is psychological. Psychology throws light on the power of understanding of students at a particular stage. We can be logical in various ways. Psychology should decide which logical approach will suit for a particular topic. Logic will help in maintaining proper sequence of topics, so we should organize the topics in such a way that we may follow psychology and logic at the same time. The happy combination of two is always desirable.

Psychology should decide what kind of logic is appropriate for the pupil of a certain age and what type of topics will be most suitable for the development of such logical thinking. Logic will help in maintaining the link and sequence of topics found useful and meaningful for the child.

For **Example**, logically decimal fraction is to follow immediately after numerical notation, but psychologically it should not. This is said because the place value of the digits is the common principles involved. This principle of the place value of digits is involved also, multiplication, division, etc and any one of these topics can follow immediately after number notation. On the other hand, there is a principle not common to both. The idea of a fraction should be known before its notation, so both psychology and logic require that it should come after a fraction. There is no opposition between psychological and logical approaches.

COMPARISON OF CBSE AND STATE BOARD MATHEMATICS SYLLABI:

CBSE and State Board Syllabus

Each board of education in India has its own education pattern (i.e.) it will follow different syllabus, books and exams patterns & dates. Before discussing about the difference between CBSE and State Board Syllabus, we have to know about CBSE and state board education.

CBSE:-

Central Board of Secondary Education (CBSE) is a board for the schools under the Union Government of India. It determines the policies and curriculum for the schools in India. This standardized curriculum is mostly preferred by parents who relocate within India due to their job (Central Government).

State Board:-

State Board is a board for schools under the state Government. Each state has its own education board for determining the standard of education and examinations for the schools in that state.

Let's now discuss about syllabus of CBSE and State Board

CBSE syllabus:-

- In CBSE, the main focus is given to science, maths and application based subjects.
- Mode of instruction followed in CBSE schools will be English and Hindi.
- All central government schools have to follow guidelines of CBSE.
- CBSE uses Continuous and Comprehensive Evaluation (CCE) in its grading system.
- It gives importance to scientific methods in subjects.
- CBSE often review and update syllabus.

State Board Syllabus:-

- State Board gives preference to the regional language, culture, state level topics and concepts of local relevance.
- Mode of instruction followed in state board schools will be English and regional languages.

- Only the schools registered with the state board of particular state will follow the policies.
- Each state has its own grading system for schools.
- It gives importance to practical implications in subjects.
- State Boards rarely update their syllabus and curriculum.

Both CBSE and State Board have its own pros and cons. So, students have to opt for the one according to their preference and ability. Success does not come from the board of education but it depends on the effort of every student.

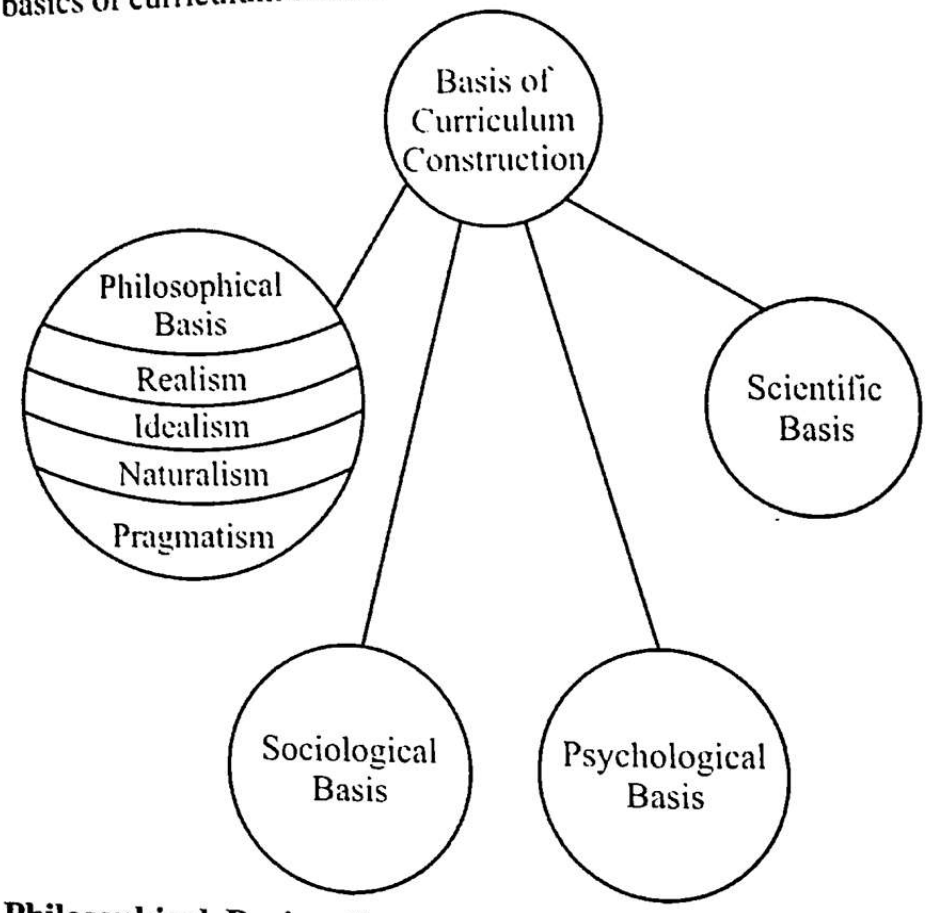
Conclusion:

Hence, curriculum development essentially is a ceaseless process of searching for quantitative improvement in education in responses to the changes taking place in the society. As such, it is not a static but a dynamic phenomenon. A meaningful school curriculum has to be responsive to the society, reflecting the needs and aspirations of its learners. Even in the new millennium, some of the country's important societal concerns would remain unchanged because these could not be addressed adequately in the past.

At the same time, many new concerns have emerged in response to the fast changes in the social scenario of the country as well as the world. The curriculum has to lead to a kind of education that would fight against inequity and respond to the social, cultural, emotional and economic needs of the learners. Curriculum must stand on the three pillars of relevance, equity and excellence.

Basis of Curriculum Construction in Mathematics

It is clear that curriculum is positively correlated with the needs and requirments of the society for which it is formulated, Organised and developed. There are four important basics of curriculum construction :



1. Philosophical Basis—Construcion of curriculum is done for achieving objectives of education. The curriculum is determined in different forms. Here, we are throwing light on the curriculum construction according to the following philosphics :

(i) ***Realism***—It includes those activities in curriculum through which knowledge can be obtained in real situations of life. Realistic curriculum is developed according to utility and needs. Subjects concerning day-to-day activities are included in realistic curriculum.

(ii) ***Idealism***—The main aim of curriculum assumes thoughts, eternal values and ideas of man. Idealism provide principal place to literature art, music etc. in curriculum. In idealistic curriculum humanistic subjects are emphasized.

(iii) ***Naturalism***—Free development of individuality of child is one of the major aim of education. Due to this reason, naturalists are supporters of providing unlimited liberty to the child for self-expression. In naturalistic curriculum science subjects occupy main place.

(iv) ***Pragmatism***— Pargmatic curriculum is based on subjects of utility. Construction of pragmatic curriculum is done according to interests of child. They build curriculum of elementary classes on the basis of curiosity practical interest, sophisticated expression, interest of mutual exchange of thoughts. Its main principal being utilitarian.

2. Psychological Bases—Psychological basis emphasizes that the education of the child should be based on psychological methods and principles. According to this base formulation of curriculum is done according to interest of child, natural tendencies, requirements, capabilities and abilities of child. It emphasizes that the child is the centre of education, so both education and curriculum is meant for the child. Hence child should be imparted education according to his abilities and capacities.

3. Sociological Basis—The main aim social tendency is to develop society. According to this base those subjects and activities are included in the curriculum, which provide assistance in developing appreciation of sociability. This tendency emphasize inclusion of social qualities in children so that they also contribute their best to social welfare and advanvements.

4. Scientific Basis—According to this base, more importance is given to the scientific subjects in curriculum. Its supporters hold the view that it is only after the study of scientific that man can lead a complete life. It opposes literary education and proposes practical and useful knowledge. it promotes scientific attitude towards life and society.

iv) Spiral and Concentric Approach

The Cambridge Report (1963) on mathematics curriculum emphasized the importance of interrelating and interweaving the different mathematical topics to be taken up throughout the school period and envisages the progressive broadening and deepening of the child's mathematical knowledge and insight by what is called the "Spiral Approach". Therefore, contrary to topical approach, spiral approach demands the division of the topic into a number of smaller independent units to be dealt with, in order of difficulty, matching the mental capabilities of children. It is based on the principle that a topic cannot be given an exhaustive treatment at one stage. In these approaches, to begin with the elementary concepts are presented in one class; gaps are filled after few months or in the class, more gaps a year or two later, in accordance with the amount of knowledge which the students are capable of assimilating. For example, the unit on the 'Real Numbers' arranged in the increasing order of difficulty. These concepts arranged presented in 8^{th} class and still more complex concepts in 9^{th} and 10^{th} class and so on. Thus in spiral approach the entire unit is gradually and successively introduced over the years. Spiral and concentric approaches do not differ substantially. In the spiral approach complex concepts of the same topics can be introduced in the same class after a gap of two or three months whereas in the concentric approach complex concepts of the same topic are introduced after a gap of at least one year.

The spiral and concentric approach have the following advantages over topical approach.

- Subject matter is introduced in the increasing order of difficulty in accordance with the needs and capacity of the students. It helps in better understanding of the content.
- It satisfies the psychological needs of the students.
- The students are able to appreciate the relevance and significance of what they learn.
- It provides sufficient motivation for the students to learn.
- It provides opportunities for revision.
- It provides opportunities to relate the topic with other topics, other branches and other subjects.